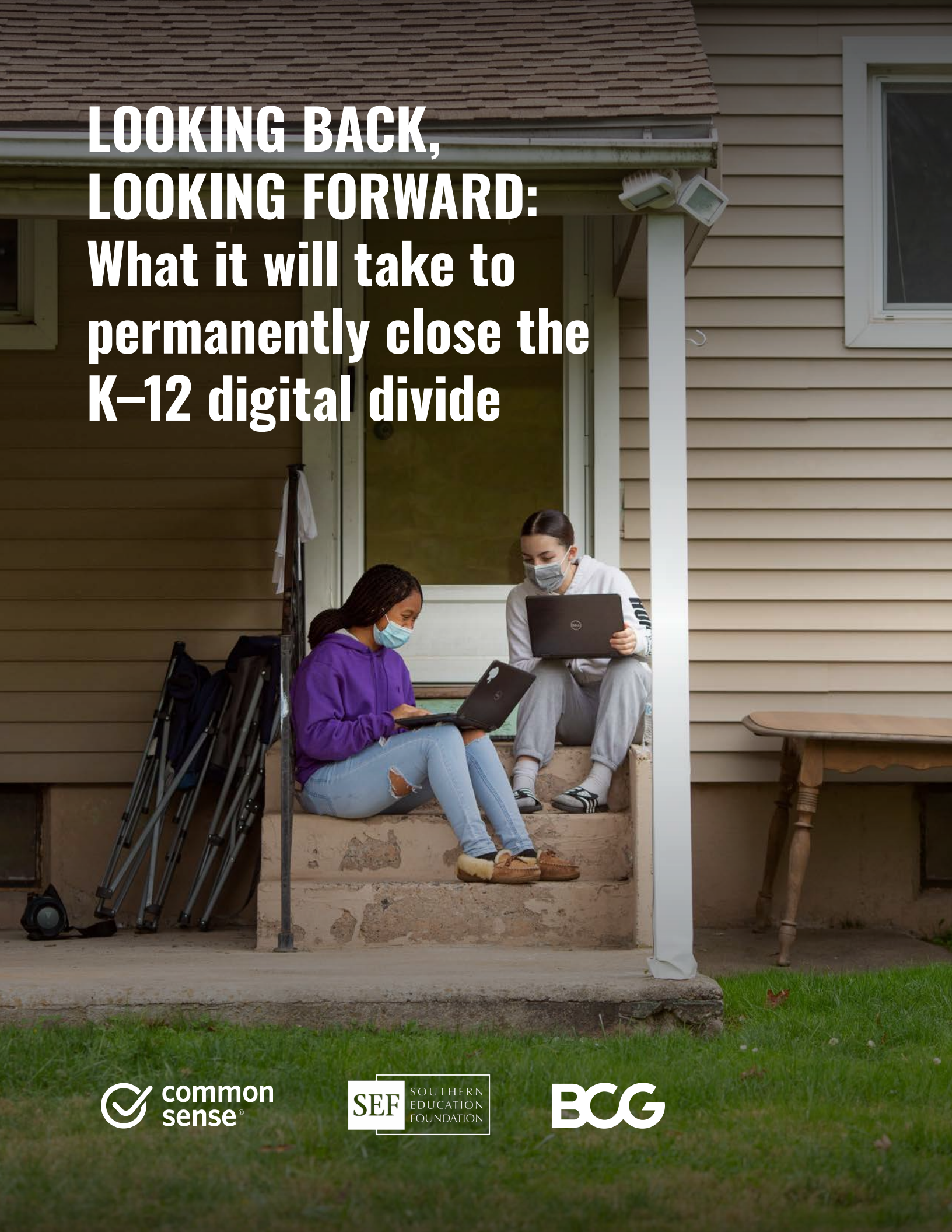


LOOKING BACK, LOOKING FORWARD: What it will take to permanently close the K-12 digital divide



This is the third in a series of reports on the digital divide for K-12 students and teachers. This report was developed by Boston Consulting Group in partnership with Common Sense and Southern Education Foundation.

Boston Consulting Group partners with leaders in business and society to tackle their most important challenges and capture their greatest opportunities in order to unlock the potential of those who advance the world.

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.

Southern Education Foundation, founded in 1867, is a 501(c)(3) nonprofit organization supported by partners and donors committed to advancing equitable education policies and practices that elevate learning for low-income students and students of color in the southern states. We develop and disseminate research-based solutions for policymakers and grow the capacity of education leaders and influencers to create systemic change.

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INTRODUCTION

This report is the third in a series about the digital divide for students and teachers. The reports have been produced by Boston Consulting Group (BCG) and Common Sense, in partnership with EducationSuperHighway and Southern Education Foundation (SEF).

The first report, *Closing the Digital Divide in the Age of Distance Learning*, found that 15 million to 16 million K-12 public school students¹ are caught in the digital divide. While this is a major problem for students in all 50 states, and all types of communities, it is most pronounced in rural communities and households with Black, Latinx, and Native American students. The report calculated that the first-year cost of closing the digital divide for students would be between \$6 billion and \$11 billion, and an additional \$1 billion for teachers.

The second report, *How States and Districts Can Close the Digital Divide*, highlighted case studies of continuing efforts to close the digital divide during the pandemic at the state, city, and school district levels and identified emerging best practices to assess needs, procure solutions, and access funds.

This report provides a more granular understanding of the digital divide for students amid distance learning and the pandemic, and offers a set of policy recommendations at the federal, state, and local levels to permanently close the digital divide.

1. The report also found that up to 400,000 teachers lack adequate connectivity or devices at home to carry out distance education.



EXECUTIVE SUMMARY

This report addresses six key questions:

1. Why does the student digital divide matter?

It matters because it affects almost one-third of K-12 public school students in the U.S. and contributes to significant and inequitable learning loss, consequences that have only been exacerbated during the coronavirus pandemic. As students return to on-again, off-again learning in the classroom, and as vaccines begin to become available, bridging the divide will remain critical to reducing inequities and future-proofing our learning system. Increased broadband access will also support families through online workforce development resources and strengthen our economy and society across sectors, including education, telehealth, e-commerce, broadband, agriculture, and others. The digital divide predated the coronavirus pandemic and will persist beyond it if stakeholders do not seize the moment.

2. Which communities are most affected by the digital divide?

As found in our first report, [15 million to 16 million K-12 public school students across all states and communities are caught in the digital divide](#). While a challenge in all states, the digital divide most severely affects southern, more rural states (40% to 50% of students in Alabama, Arkansas, Oklahoma, and Mississippi are affected). The divide disproportionately affects Black, Latinx, and Native American students (who make up about 55% of disconnected students while representing about 40% of total students). It also disproportionately affects students in lower-income families: About 50% of disconnected students come from families with annual incomes less than \$50,000.

3. What are the size and nature of the root causes of the divide?

This report provides detailed quantitative analyses of three root causes: affordability, availability, and adoption.² Our analysis finds that up to 60% of disconnected K-12 students (9 million students), especially Black and urban students, are unable to afford digital access. Up to 25% of disconnected students (4 million) lack access to readily available and reliable broadband service, a barrier that disproportionately affects rural and Native American students. Finally, up to 40% of disconnected students (6 million) face significant adoption barriers, such as insufficient digital literacy or language barriers.

4. What progress has been made, and how many students are still under-connected?

When the pandemic struck, states and districts took swift and significant action, making use of limited federal CARES Act funding approved in March, discounted broadband services from private sector providers, and other resources.

These efforts closed 20% to 40% of the K-12 connectivity divide and 40% to 60% of the device divide as of December 2020. Yet up to 12 million K-12 students remain under-connected going into 2021 due to limitations of poor broadband mapping data, current infrastructure and supply chains, insufficient marketing and adoption support, and inadequate funding.

Efforts have had a greater effect on closing the divide for Black students compared with Latinx students, potentially due to the disproportionate effect of specific adoption barriers for Latinx communities. Moreover, the majority of solutions are short-term stop-gap measures, focused primarily on short-term affordability and adoption barriers when investment in universal access to broadband is still needed.

More than 75% of state and local student digital divide efforts will expire in the next one to three years.

In December 2020, for the first time since March, Congress approved additional COVID emergency relief funding, including more than \$50 billion in additional funding for K-12 education, that can be used for a range of pandemic-related expenses including distance learning. The bill also includes broadband-specific funding for data collection, expanded broadband infrastructure deployment, broadband service cost support, and other digital inclusion support with a special focus on vulnerable communities. While helpful, the funding is neither sufficient nor properly targeted to close the student digital divide for the duration of the pandemic—and keep it closed.

2. The frame of affordability, availability, and adoption root causes is consistently used across digital divide research (e.g., [Pew Research Mobile Technology and Home Broadband Report](#)).



5. What is needed to sustainably close the digital divide?

Greater federal and state funding and innovative policy solutions are needed to permanently close the digital divide. Federal, state, and local policy must ensure that all students have access to connectivity and devices and that broadband networks capable of serving student needs are available everywhere. Policy should enable bulk purchasing with transparent, affordable pricing and digital inclusion support. It should encourage tech-agnostic investment³ and encourage shared deployment to establish access where none exists and expand access where connectivity is insufficient (e.g., low bandwidth, low speeds). Success will require stakeholders to break down silos; partnering across public, private, and social sectors is needed to assess student-level needs and inform responses, develop and execute a broadband strategy, run effective procurement of affordable solutions, and offer IT support and digital inclusion support.

6. How much will it cost to permanently close the divide?

Closing the student digital divide will require between \$6 billion and \$11 billion in the first year and between \$4 billion and \$8 billion annually thereafter, to address affordability and adoption gaps. In addition, closing the digital divide for teachers will cost approximately \$1 billion in its first year. These costs cover installation, ongoing service fees, devices, repairs, and support for internet connectivity and e-learning devices. Moreover, additional funding is needed to ensure universal deployment of broadband infrastructure capable of 100/100 Mbps. While prior analyses estimated that it would cost \$10 billion to \$20 billion at the low end and \$80 billion at the high end to expand broadband infrastructure, these assessments did not fully account for costs related to home access to adequate speeds and ongoing maintenance to ensure sustainable, universal broadband access. More specific research can further scope out and detail the investment required to sustainably connect all households to broadband service that meets their distance learning needs for today and going forward.

3. All connectivity types (e.g., wired, cellular, satellite) should be used to build a best-fit solution.

DETAILED FINDINGS

1. Why does the student digital divide matter?

The June 2020 report published by Common Sense and BCG found that [15 million to 16 million American K-12 students \(about 30%\)](#) lacked adequate connectivity, an e-learning device, or both.

Historically known as the homework gap, students without high-speed internet and an e-learning device were unable to complete assignments that required digital access. Analysis shows that the homework gap has contributed to those students' lower academic achievement.⁴ When the pandemic hit the U.S. in March 2020, more than 50 million students were pushed into remote learning in a matter of days. The homework gap, henceforth referred to as the digital divide, threatened wholesale learning loss. Even as students return to the classroom and vaccines begin to be distributed, bridging the digital divide remains essential to reduce inequities, accelerate economic growth, and advance society as a whole.

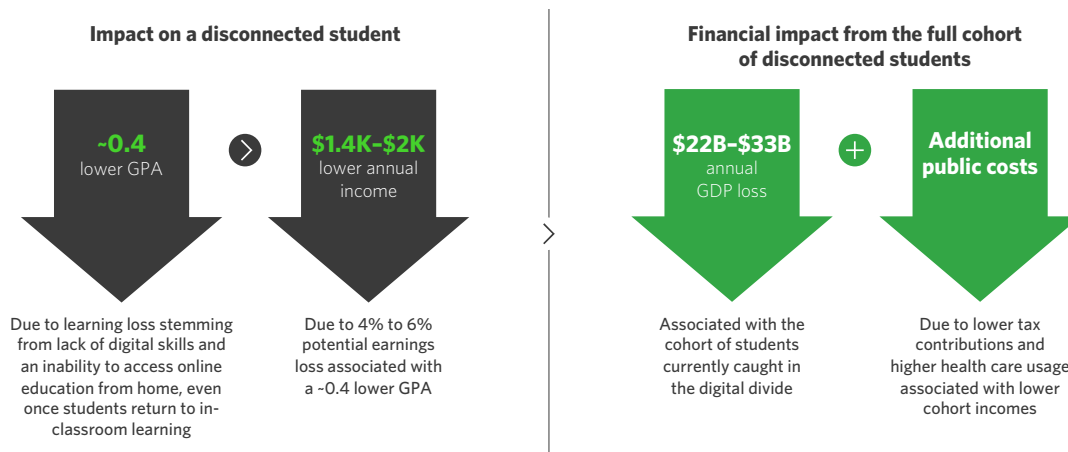
The demand for action from the private sector, education organizations, and the nonprofit sector on the digital divide has grown significantly during the pandemic. Fifty-nine groups, representing educators, librarians, school counselors, and students called on Congress in October to dedicate \$12 billion to close the digital divide.⁵ Earlier in the year, 22 governors highlighted the need for broadband

expansion in their 2020 state of the state addresses.⁶ The CEOs of major corporations, including Microsoft, Land O'Lakes, AT&T, and Salesforce, for example, have called for closing the digital divide. This heightened attention has created a unique opportunity to permanently close the divide once and for all.

While the focus of this report is the K-12 digital divide, it is important to note that the digital divide affects the U.S. education system and the U.S. population more broadly. For example, 400,000 K-12 teachers—10% of all public school teachers—also are caught in the digital divide. When an educator is disconnected, learning limitations are magnified for all students in the classroom. Access to devices and the internet is just the start, too. As the Southern Education Foundation reported, educators need mentoring, coaching, and professional development to design and facilitate high-quality distance learning experiences for all students.

In addition, the digital divide affects 3 million to 4 million postsecondary students—or 15% of all students attending four-year private and public colleges or two-year community colleges. Inequity persists at the postsecondary level, as students of color and students from lower-income families tend to own lower-quality devices and to lack the digital literacy skills needed to support their use of technology.⁷ And finally, there are individuals and families in 20 million to 30 million households with no K-12 or postsecondary students who cannot afford high-speed internet, do not have access to it in their communities, or experience adoption barriers.⁸

A long-term homework gap will have significant impact on lifetime earnings



Sources: Quello Center, University of Miami, U.S. Census—aggregated at household level, BCG analysis.

4. https://quello.msu.edu/wp-content/uploads/2020/03/Broadband_Gap_Quello_Report_MSU.pdf

5. <https://www.washingtonpost.com/technology/2020/11/20/biden-congress-broadband-internet/>

6. https://www.nga.org/wp-content/uploads/2020/11/Broadband_White_Paper_Final.pdf

7. Gonzales, A., Calarco, J. M., & Lynch, T. (2020). Technology problems and student achievement gaps: A validation and extension of the technology maintenance construct. *Communication Research*, 47, 750-770.

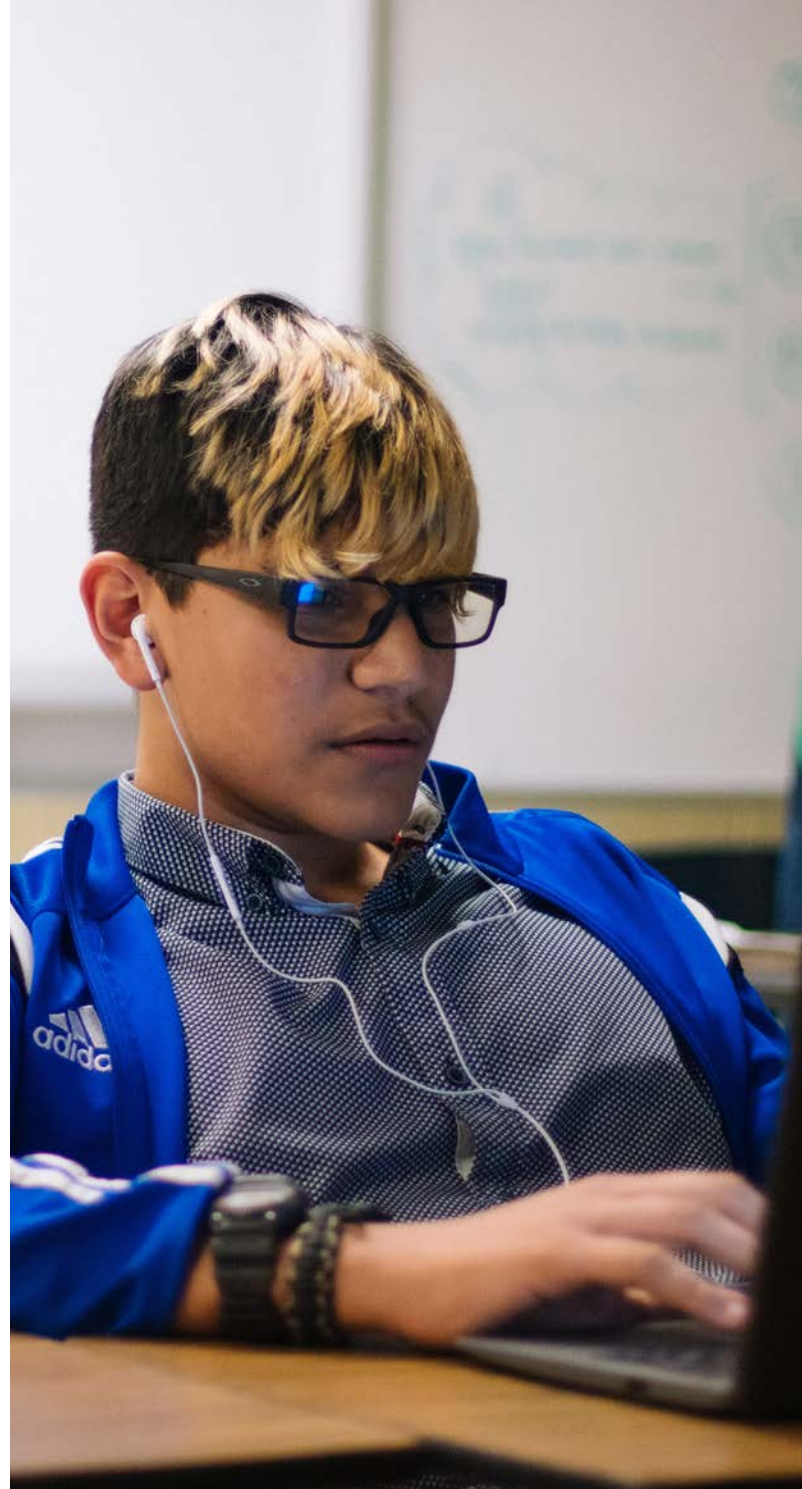
8. Estimated using American Community Survey (ACS) compiled at household level, excluding K-12 and postsecondary segments.

Permanently closing the digital divide is a fundamental matter of equity—specifically, minimizing learning inequities that result in lower academic performance, which leads to lifetime losses in earnings. Historically students caught in the digital divide have had overall GPAs about 0.4 points lower than students with access.⁹ This academic gap leads to a 4% to 6% lower expected annual income¹⁰, amounting to a \$22 billion to \$33 billion annual GDP loss¹¹ across the K-12 cohort caught in the digital divide. This is why access is essential. The coronavirus pandemic has only exacerbated these inequities and increased the economic consequences for affected students. Studies conducted during the pandemic show that the digital divide could lead to an average of 7 to 14 months of learning loss for disconnected students¹², an additional 232,000 high school students dropping out, and an annual earnings deficit of \$110 billion across the K-12 student cohort.¹³

Closing the digital divide promotes a future-proof, resilient learning system. In the near term, closing the divide builds resilience in our learning systems, even if the pandemic continues or another crisis forces schools to close. In the long term, digital access becomes even more imperative as the use of edtech accelerates and our learning systems evolve toward digital models. [Some districts](#) have already indicated that their online learning programs will remain an option for families post-pandemic. Online learning has the potential to unlock individualized learning pathways through gamification, adaptive learning, and asynchronous engagement. These platforms can adjust content based on students' inputs and create a more tailored, future-oriented learning system.

Closing the digital divide also contributes to breaking the cycle of poverty. Closing the digital divide enables families to access workforce development resources and gain the digital literacy and professional and technical skills needed to succeed in modern jobs. Connected families can also take advantage of affordable and high-quality telemedicine, including mental health services and emergency hotlines. High-speed broadband connectivity also benefits private actors across sectors, including broadband, telehealth, digital learning, e-commerce, agriculture, and others.

The digital divide must not be thought of as a short-term problem with a short-term solution. It predated the coronavirus pandemic, and it will persist indefinitely unless we invest in robust and sustainable solutions. Even as students transition back to the classroom, and society eventually moves beyond the pandemic, closing the digital divide in the long term remains essential.



9. https://quello.msu.edu/wp-content/uploads/2020/03/Broadband_Gap_Quello_Report_MSU.pdf
10. Based on 2014 University of Miami study: <https://www.sciencedaily.com/releases/2014/05/140519092835.htm#:about:text=Summary%3A,and%2014%20percent%20for%20women>
11. Additional costs incurred from lower tax contributions and higher government expenditures (e.g., public assistance, Medicaid).
12. Range dependent on quality of instruction in which seven months of learning loss is based on low-quality remote learning and 14 months of learning loss is based on no instruction (e.g., students lacking adequate devices or connectivity).
13. <https://www.the74million.org/article/analysis-covid-learning-earning-losses-could-be-huge-but-there-are-remedies-inside-and-outside-our-schools-here-are-7-of-them/>

2. Which communities are most affected by the digital divide?

As stated above, the digital divide affects 15 million to 16 million American K-12 students. The digital divide is defined by a lack of access to adequate connectivity, devices, and the requisite digital training and support for remote learning. “Internet-insufficient” students are without fixed, wireless, or satellite broadband internet with data allowances and a minimum speed of 25/3 Mbps (it’s important to note that our analysis recommended speeds of 200/10 Mbps to meet the needs of distance learning). “Device-deficient” students lack a dedicated laptop or tablet¹⁴ capable of connecting to distance learning content using an LTE broadband standard or traditional Wi-Fi.¹⁵

However, this digital divide is not monolithic. The size and nature of the divide varies considerably across geographies and populations. Understanding the differences across populations is critical to developing permanent solutions that meet the needs of specific student groups.

Geographic differences

The divide affects students in all 50 states. In states with the largest digital divides, approximately 50% of students lack adequate internet. Even in states with the smallest divides, as many as 1 in 4 students still lack adequate internet. The greatest number of fully or partially

disconnected students (4 million to 5 million) live in the U.S.’s most populous states: Texas, California, and Florida. Nationwide, southern states account for 44% of the overall divide. Rural southern states, including Mississippi, Alabama, Arkansas, and Oklahoma, have the highest portion of disconnected students.

Density differences

The divide occurs in urban, suburban, and rural school districts. Eighty percent of disconnected students nationwide live in urban and suburban regions, as seen in Ohio, where most of the state’s households that lack good high-speed connectivity are in “urban Ohio,” not “rural Ohio.”¹⁶ However, rural students account for 20% of disconnected students even though they represent just 14% of the overall K-12 population.

Racial and ethnic diversity

Forty percent of K-12 disconnected students are White, but the divide disproportionately affects Black, Latinx, and Native American students. These students of color collectively make up 54% of the divide, despite being only 40% of the population.

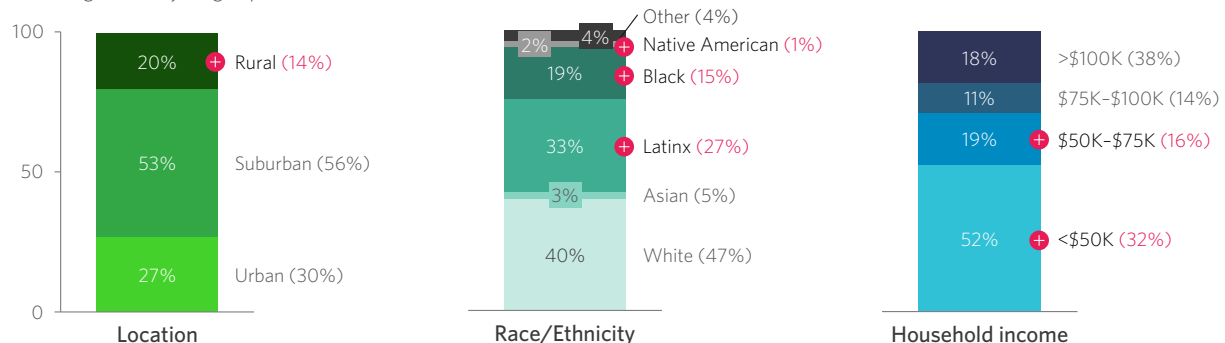
Household income

The digital divide affects students of all income levels, but students from lower-income homes are most likely to be disconnected. Students from families with annual household incomes of less than \$50,000 are approximately 30% of the overall K-12 population yet account for more than 50% of all disconnected students.

Demographic breakdown of the digital divide

K-12 digital divide (15M-16M students)

Divide segmented by subgroup (% of disconnected students)



Note: Figures represent the structural divide, the size of the divide that all permanent, long-term solutions must address. Numbers are rounded. Sources: ACS one-year survey compiled by U.S. Census Bureau—aggregated at household level, NCES, BCG analysis.

14. Given that many education platforms, and content, are not optimized for mobile phones and make it difficult to complete student assignments, individuals with only a mobile phone are not considered to have an adequate device for distance learning.
 15. Detailed definitions of adequate connectivity and device access are available in the [June 2020 report](#)
 16. <http://connectyourcommunity.org/new-census-data-ohios-broadband-divide-is-urban-as-well-as-rural/>

3. What are the size and nature of the root causes of the divide?

Lack of affordability: Students and families who lack the ability to pay for e-learning devices and/or reliable broadband connectivity. To understand how many students are likely to have insufficient disposable income to pay for monthly fees, and insufficient funds to pay upfront for installation and equipment, our analysis looked at disconnected students in homes with an annual household income less than \$50,000, as reported in U.S. Census data. This income threshold is approximately equivalent to the threshold for the National School Lunch Program.¹⁷ Based on this metric, **up to 60% of disconnected students (9 million K-12 students) are estimated to be affected by lack of affordability.**¹⁸ These affordability barriers disproportionately affect Black and Latinx¹⁹ students and students living in urban centers²⁰, given the lower median household income and higher poverty rates in these populations. These families also typically live in communities that have few broadband providers and, as a result, are often reliant on more expensive broadband solutions.

Lack of availability: Students who live in households where there is insufficient coverage to deliver wired or wireless broadband service, or where there is poor service quality (e.g., speed and reliability). **Up to an estimated 25% of disconnected students (4 million K-12 students) lack reliable access to wired or fixed wireless broadband service**²¹, based on an analysis of FCC and BroadbandNow coverage data. This issue disproportionately affects remote learning for students in rural communities where access to fixed broadband is limited. In select southern and rural states—Arkansas, Oklahoma, Mississippi—lack of available and reliable broadband is the root cause of more than 40% of students being caught in the digital divide. Native American students are also disproportionately affected: More than 70% of disconnected Native American students lack coverage. This condition is tied to the underinvestment in infrastructure on remote, rural tribal lands.²² Moreover, a [Brookings analysis](#) found that gaps in broadband infrastructure have been caused, in part, by a decade-long pattern of “digital redlining.” This practice of ISPs systematically under-investing in infrastructure in Black and immigrant neighborhoods mirrors the 20th century’s discriminatory housing practice known as redlining.²³ An NDIA analysis of FCC coverage data and census poverty data found that this pattern holds across U.S. cities, including Cleveland²⁴, Toledo, and Detroit²⁵, among others. The Greenlining Institute also conducted an analysis that demonstrated that historically redlined communities also faced a lack of quality broadband infrastructure.²⁶

Lack of adoption: Students who have yet to sign up for services, despite widely available service and affordable options being put in place. Even where access is available and affordable, students may be disconnected due to a wide range of adoption barriers such as insufficient digital skills, language barriers, discomfort with providing personal data, family mobility, or lack of interest. **An estimated up to 40% of disconnected students (6 million K-12 students) do not have access despite living in regions with available and affordable service.** These barriers may be disproportionately faced by English-language learners²⁷, children of undocumented immigrants, and students experiencing homelessness, who account for approximately 10%²⁸, 8%²⁹, and 3%³⁰ of all K-12 students, respectively.

4. What progress has been made, and how many students are still under-connected?

In March 2020, the Coronavirus Aid, Relief, and Economic Security (CARES) Act unlocked \$13.2 billion to support a wide range of pandemic-related K-12 education needs and another \$3 billion to support a wide range of K-12 and higher education needs. Distance learning was one of many allowable expenses for this funding.

17. Households with less than \$50,000 in annual income were considered “low-income” as a threshold that is aligned with the National School Lunch Program (NSLP) upper-bound qualification (<https://nces.ed.gov/blogs/nces/post/free-or-reduced-price-lunch-a-proxy-for-poverty/>).
18. Calculated using American Community Survey (ACS) compiled at household level; proportion of K-12 students living in households that lack adequate in-home connectivity segmented by annual household income (less than \$50,000, as reported in U.S. Census data. This income threshold is approximately equivalent to the threshold of the National School Lunch Program).
19. <https://www.epi.org/blog/racial-disparities-in-income-and-poverty-remain-largely-unchanged-amid-strong-income-growth-in-2019/>
20. https://nces.ed.gov/programs/coe/indicator_cib.asp
21. Wired broadband connects a physical cable to user modems, while fixed wireless broadband sends radio signals to receivers in the home.
22. <http://nmindepth.com/2020/10/22/covid-complicates-college-prep-for-native-students/>
23. <https://www.digitalinclusion.org/blog/2017/03/10/atts-digital-redlining-of-cleveland/>
24. <https://www.brookings.edu/blog/the-avenue/2020/03/04/how-cleveland-is-bridging-both-digital-and-racial-divides/>
25. <https://www.digitalinclusion.org/blog/2017/09/06/more-digital-redlining-att-deployment-and-poverty-in-detroit-and-toledo/>
26. <https://greenlining.org/publications/online-resources/2020/on-the-wrong-side-of-the-digital-divide/>
27. The Hunt Institute created materials for supporting English-language learners during the pandemic <https://hunt-institute.org/resources/2020/10/covid-19-policy-considerations-supporting-english-language-learners/>
28. https://nces.ed.gov/programs/coe/indicator_cgf.asp
29. <https://www.pewresearch.org/hispanic/interactives/u-s-unauthorized-immigrants-by-state/>
30. https://nces.ed.gov/programs/digest/d18/tables/dt18_204.75d.asp

States and districts acted swiftly to survey students to understand needs, procure internet connectivity and devices, and partner with providers and local organizations on solutions.³¹ There was no one-size-fits-all approach, with several states and districts offering their own models toward closing the digital divide. The [October 2020 report](#) by Common Sense, BCG, and EducationSuperHighway analyzed state and district case examples and highlighted emergency best practices for assessing needs, procuring solutions, and deploying funds to close the divide during the coronavirus pandemic.

For example³²:

- **Texas** established Operation Connectivity and procured 1 million laptops and 500,000 hot spots.
- **Oklahoma** leveraged grants to award 50,000 devices and data plans across 175 districts.
- **California** partnered with Apple and T-Mobile to roll out 1 million iPads with LTE for two years.
- **Vermont** developed a program to provide \$3,000 per family to offset line extension fees.
- **Alabama** established ABC to allocate \$100 million toward free vouchers for eligible students.
- **Ohio** allocated \$50 million in 1-to-1 grants and streamlined the broadband permitting process.

State and district efforts were significant and executed rapidly under very uncertain circumstances. Solutions were most successful when they were able to take advantage of existing infrastructure investments as seen in North Dakota and Hamilton County, Tennessee, where the widespread deployment of fiber made it easier to quickly support underserved households. In areas without robust existing infrastructure, wireless solutions were deployed to connect more than 2.4 million students to distance learning.³³ In addition, some states and districts were able to temporarily expand network access through more creative solutions, including Wireless on Wheels.³⁴

The majority of programs focused on addressing affordability and adoption barriers by purchasing and distributing devices and connectivity to students. Several network providers offered discounted monthly rates and devices for education during the pandemic: T-Mobile's Project 10Million is offering up to 10 million households free data over the next five years³⁵, Comcast Internet Essentials is offering low-cost plans, and Verizon's national Distance Learning Program is offering reliable, affordable plans to 38 million students across more than 40 states.³⁶ Through sponsored service models, states and districts were able to overcome initial adoption barriers (for example, required credit checks, an inability to pay for installation fees, and the need to navigate a sign-up

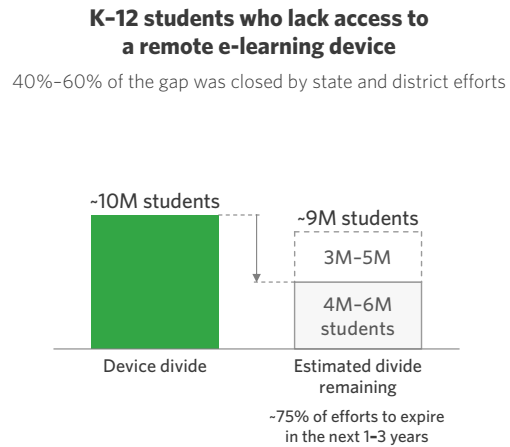
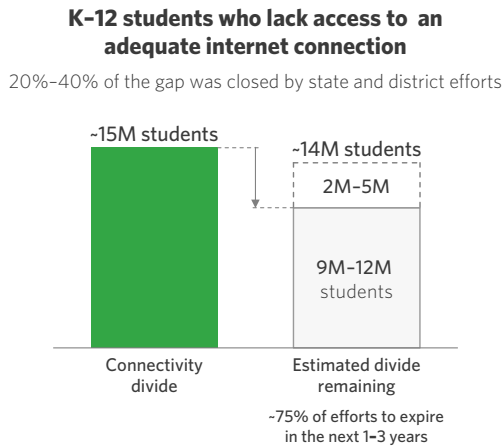
process that requires sensitive personal information) that frequently prevent the families of the disconnected student population from accessing free or low-cost broadband programs.

Ultimately, however, funding support for these efforts has been insufficient to close the full distance learning digital divide. Progress is hindered by funding that is time bound and limited in amount, inadequate data on student needs, lack of universal infrastructure investment, and supply chain bottlenecks. As of October, states and school districts had earmarked only about \$1.5 billion of the CARES Act funds for digital divide initiatives, a fraction of the identified \$6 billion to \$11 billion first-year cost required to close the divide. Even if states had sufficient funding, they were unable to effectively target solutions to students in need due to inadequate student-level data and insufficient technical and adoption support. Many areas are underserved by broadband access, and widespread fixed broadband deployment is needed to provide sustainable connectivity solutions. Historical infrastructure policy had insufficient requirements around build-out, which resulted in an underinvestment in infrastructure, inadequate broadband speeds, and no support for maintenance costs. Finally, throughout the spring and the beginning of the fall semester, states and districts, especially those with smaller student populations, faced supply chain delays that created months-long backlogs of unfulfilled device orders.³⁷ These supply chain delays began to resolve toward the end of 2020. For example, the governor of Connecticut announced the state had fully bridged the device divide in early December³⁸, and the New York Department of Education noted that it expected the remaining 100,000 devices it ordered to be delivered in late December.³⁹

Efforts to date have had a significant, but largely nonpermanent, effect; up to 12 million students remain under-connected.

31. [The Benton Institute](#) analysis of the U.S. Census HPS data indicates that 1.4 million more students had their schools or school districts pay for home internet service bills since the beginning of the pandemic.
32. A comprehensive list of state and district efforts are included in the appendix.
33. <https://chiefsforchange.org/wp-content/uploads/2020/12/K-12-Connections-How-Schools-and-Wireless-Providers-Are-Partnering-to-Get-Students-Online-During-COVID-19.pdf>
34. <https://www.sreb.org/blog-post/wireless-wheels-rural-district-takes-wi-fi-road>
35. <https://www.t-mobile.com/business/education/project-10-million>
36. <https://www.globenewswire.com/news-release/2020/09/10/2091846/0/en/Verizon-enables-distance-learning-for-up-to-17M-students-in-Oregon-and-Washington.html>
37. <https://www.nytimes.com/2020/10/12/technology/laptops-schools-digital-divide.html>
38. <https://ctmirror.org/2020/12/02/lamont-administration->
39. <https://newyork.cbslocal.com/2020/11/20/nyc-schools-ipads-chromebooks/>

Efforts to date have had a significant, but largely nonpermanent, effect; up to 12 million students remain under-connected



Note: “Connectivity divide” and “device divide” figures represent the structural divide, the size of the divide that all permanent, long-term solutions must address. The amount the divide has closed is estimated based on an analysis of state and district commitments and substantiated through U.S. Census HPS and AASA survey findings. Sources: State and district press releases, ACS one-year survey compiled by U.S. Census Bureau—aggregated at household level, NCES, BCG analysis.

In total, our analysis finds that state and district efforts closed, at least for the short term, an estimated 20% to 40% of the national K-12 digital divide for students who lacked adequate high-speed connection and 40% to 60% of the divide for students who lacked access to an e-learning device as of December 2020. Yet up to 12 million students remain under-connected going into 2021 due to limitations of poor broadband mapping data, current infrastructure and supply chains, insufficient marketing and adoption support, and inadequate funding. This estimate is based on an assessment of public commitments to close the divide.⁴⁰ This estimate may understate the impact of recent efforts as some efforts may not be publicly known, yet the estimate may overstate the impact of recent efforts, given that some states and districts may not fully achieve their commitments or be able to fully target solutions to the population in need. We assume that the net of these two impacts remains within the range estimated above.

Our analysis finds that, given underlying funding sources, the majority of efforts since March 2020 are temporary, stop-gap measures. Many initiatives make use of the one-time federal CARES Act dollars but lack ready avenues to source ongoing funding for service, repairs, and replacement. For example, Ohio allocated \$50 million in CARES Act funds toward BroadbandOhio Connectivity, an LEA grant program to provide hot spots and broadband subsidies to students through December 30, 2020. While the program is expected to connect more than 120,000 students out of the estimated 500,000 who are disconnected, it does not provide a sustainable solution for a divide that will continue beyond 2020.⁴¹ **In total, more than 75% of efforts will expire in the next one to three years based on current funding sources.**

Our analysis finds that state and district initiatives to close the digital divide have had an inequitable impact across race and ethnicity. A nationwide analysis of the U.S. Census Bureau’s Household Pulse Survey (HPS) reveals that digital divide efforts by states and districts since the spring have likely **had a greater impact toward closing the divide for Black students as compared to the impact for Latinx students.**⁴² This may be due to certain adoption barriers more commonly or acutely experienced by Latinx families, including language barriers and reluctance toward providing personal information, such as Social Security numbers.

In December 2020, for the first time since March, Congress approved additional COVID emergency relief in Division M of the [Consolidated Appropriations Act 2021](#),⁴³ including an additional \$54.3 billion in funding to flow through the Elementary and Secondary School Emergency Relief Fund (ESSER) that was established in the CARES Act.

40. Analysis conducted on other sources indicated similar findings. An AASA COVID-19 survey of school superintendents found that about 40% of the connectivity divide and about 60% of the device divide closed between March and May surveys. The U.S. Census Bureau Household Pulse Survey of 70,000 to 80,000 households with K-12 students found that about 15% of the connectivity divide and about 25% of the device divide closed between spring (May–June) and fall (Aug.–Oct.); estimate calculated based on the change in the number of households reporting “always” having access.

41. <https://ohio-k12.help/broadbandohio-connectivity-grant/>; <https://www.cleveland.com/news/2020/09/ohio-to-announce-recipients-of-50-million-in-grants-to-increase-internet-connectivity-for-students.html>

42. U.S. Census HPS analysis was performed using national data between spring (April–June) and fall (Aug.–Oct.) periods segmented by “Hispanic origin and race”; analysis is not representative of granular state-/county-level data, trends.

43. <https://rules.house.gov/sites/democrats.rules.house.gov/files/BILLS-116HR1333SA-RCP-116-68.pdf>

Unfortunately, this most recent relief funding again failed to specifically support the schools working to address the homework gap. The December package did include \$65 million to support mapping as required by the Broadband DATA Act and expanded broadband infrastructure deployment, broadband service cost support, and other digital inclusion support with a special focus on vulnerable communities. The package included \$1 billion through the National Telecommunications and Information Administration (NTIA) for broadband deployment and digital inclusion support for distance learning in tribal lands, \$300 million for rural broadband infrastructure deployment, and \$285 million for the creation of the Office of Minority Broadband Initiatives within NTIA to support digital inclusion and broadband deployment efforts in stakeholder communities. The bulk of the cost support for broadband service and devices can be found in the \$3.2 billion in relief funding that establishes the Emergency Broadband Benefit through the FCC.⁴⁴ While the program is still in development at the FCC, it is expected to offer eligible lower-income households cost support for both broadband service and computing devices. However promising these commitments are, greater action and funding are urgently needed to close the digital divide for the duration of the pandemic—and to keep it closed.

5. What is needed to sustainably close the digital divide?

To permanently close the digital divide, solutions must address each of the root causes. Long-term solutions must ensure that there is universal affordable access to the networks capable of delivering connectivity that every K-12 student requires and access to the necessary devices to succeed in education. Although the solutions we present here are focused on the K-12 student population, many of these strategies and initiatives can be applied to the digital divide challenges for teachers and postsecondary school students, and to the broader digital divide encompassing millions of disconnected American households.

Affordability

Standardized, low-cost options for broadband service⁴⁵ capable of meeting the educational needs of students, and streamlined eligibility and sign-up, are necessary to make solutions affordable and sustainable. Policymakers should commit to funding cost-support programs that will cover student connectivity and device costs. These recommendations are supported by the [U.S. Chamber of Commerce](#), [Chiefs for Change](#), the [National Education Association](#), the [Business Roundtable](#), the [National Association of Secondary School Principals](#), the [Association of State Superintendents](#), the [National Urban League](#), and the [Joint Presidential Transition Memo](#)⁴⁶, among many others. To help further drive down costs, policymakers should ensure that all federal and state

broadband programs allow for transparency in pricing and encourage bulk-purchasing efforts by states and districts. States and school systems will also need funding to support outreach for and raise awareness of low-cost broadband service offerings and broadband service cost-support programs.

Availability

Closing the digital divide permanently will only succeed if every household has a robust broadband connection. Policymakers should modernize their infrastructure deployment efforts to help drive buildout of robust “future-proof” networks in all underserved communities across rural, tribal, suburban, and urban areas. Policymakers should ensure that government funding is used to deploy broadband infrastructure that meets current established needs (200/10 Mbps for distance learning) and is capable of meeting future needs (capable of 100/100 Mbps) with little investment to upgrade. Federal and state policy must expand the competitive landscape by supporting low-interest financing to incentivize tech-agnostic investment⁴⁷ as supported by the [Accessible, Affordable Internet for All Act](#). There is strong consensus for infrastructure deployment that takes into consideration the current and future needs of distance learning when developing broadband infrastructure deployment programs, as noted by the [Western Governors Association](#), [Chiefs for Change](#), the [Association of State Superintendents](#), [COSN](#), the [National Education Association](#), the [Arizona Technology Council](#), the [SHLB Coalition](#), the [Pew Research Center](#), the [Business Roundtable](#), the [National Urban League](#), and the [Joint Presidential Transition Memo](#), among others. Policymakers must encourage infrastructure projects to reach unserved areas by leveraging private-public partnerships and streamlining permitting to expand access where none exists, and improve access where connectivity is insufficient.

Adoption

These efforts should seek to build digital literacy and inclusion skills, increase trust in technology solutions, and design solutions to address distinct student needs,

44. <https://docs.fcc.gov/public/attachments/DA-21-6A1.pdf>

45. Minimum network speeds of 25/3 Mbps are required today with upgrades and deployment of networks capable of 100/100 Mbps needed for the future.

46. Recommendations submitted as a collaboration of 11 national organizations (Alliance for Excellent Education, Center for American Progress, EducationCounsel, Education Reform Now, Education Trust, Migration Policy Institute, National Center for Learning Disabilities, National Urban League, SchoolHouse Connection, Teach Plus, UnidosUS) seeking to advance shared education equity priorities through federal, state, and local policy and advocacy.

47. All connectivity types (e.g., wired, cellular, satellite) should be used to build a best-fit solution.

such as multilingual support materials. Federal and state policy should include dedicated budgets for increasing adoption and promoting adoption equity as supported by the [Joint Presidential Transition Memo](#). Districts, community-based organizations, providers, and philanthropies are key stakeholders in helping address parents' potential lack of trust and skepticism of technology solutions through multiplatform outreach and targeted digital inclusion efforts.

Account for accessibility issues and gaps in coverage for English-language learners (ELLs), immigrant students, and students from homes where a language other than English is spoken.

Southern Education Foundation's scan of nearly 50 school districts through the summer of 2020 revealed that the majority of districts had some type of plan in place to support ELLs during virtual learning. However, ELLs, immigrant students and students from homes where a language other than English is spoken continue to face unique barriers to getting connected and learning once connected, including a digital literacy divide, lower engagement with district-led efforts to respond to technology- and connectivity-related needs, and credit checks and deposits as prohibitive factors in receiving otherwise low-cost coverage. One consequence of these inequities manifests in community population survey data showing that internet adoption rates in households where adult members speak only Spanish are lower than those in households where other languages are spoken. The South's population of immigrant students and ELLs is rising rapidly, and investments to adequately support them are necessary to avoid furthering these inequities. School districts' coordination with community groups; translation of materials into the languages that students, parents, and caregivers speak at home; the hiring of culturally and linguistically diverse personnel; and deliberate efforts to dismantle the barriers to internet access for immigrant students and ELLs can help close the digital divide in these communities.

To support efforts to address each of the root causes listed above, sustainable needs assessments⁴⁸ provide national-, state-, and local-level views on the size and shape of the digital divide. Annual, national needs assessments, with appropriate privacy protections, inclusive of information on demographics and root causes serve as a call to action

to inform policy and funding decisions that address each root cause. In addition, real-time data collection at the state and local levels, through standardized questions in student information systems (also with appropriate privacy guarantees), establishes an address-level understanding of student needs. When combined with provider serviceability, this data can inform more accurate and targeted solutions.

Be mindful about how you are assessing and responding to the needs of a community.

As the superintendent of Hazlehurst City School District in Hazlehurst, Mississippi, notes, "You can't use technology to reach people who don't have technology." Relying solely on online surveys to determine broadband and device access in a community guarantees that students and families will fall through the cracks. In Hazlehurst and many other rural communities across the South, school district officials and members of school communities work in tandem with local organizations, faith-based groups and churches, and community advocates. This small-town approach allows districts to meet families where they are and directly provide critical services, and should be considered a necessary first step in identifying a community's needs.

To achieve these goals, policy is needed at the federal, state, and local levels to regulate and finance long-term solutions.

At the federal level

Subsidize broadband service: Fund a continuing program to subsidize connectivity costs and reduce cost-related sign-up barriers, such as credit checks. Several programs, such as E-rate and Lifeline, have proven effective and durable and should be considered for expansion.

Fund device purchases: Expand Title I and Title IV district funding or DOE-supported block grants, or set up a national 1-to-1 program through E-rate to cover devices.

48. See discussion of successful use of needs assessments by states and school districts during the pandemic in our [October report](#) as well as a data collection blueprint for state leaders published by [CCSSO and EducationSuperHighway](#).

Fund deployment of universal broadband infrastructure:

Modernize all broadband infrastructure deployment programs to help drive buildout of robust “future-proof” networks (capable of 100/100 Mbps) in all underserved communities (those with less than 25/25 Mbps).

Collect actionable data: Meet the goals of the Broadband DATA Act to collect granular service-availability data and establish a national student-assessment program to support school-level assessments of student and teacher digital divide needs.

Encourage broadband competition: Support policies that enable a competitive broadband marketplace, consumer protections, quality of service, lower prices, and universal access. Support new entrants and streamline federal permitting, require open access, and eliminate redlining.

Secure the supply chain for devices: Prioritize the supply chain of critical connectivity and learning devices for the educational market and support transparent pricing.

Elevate digital inclusion: Incorporate dedicated digital inclusion resources and strategies in the design of affordability-focused programs, such as Lifeline. Provide direct funding that supports school efforts to teach digital citizenship skills to ensure kids learn how to use technology in a safe, smart, and effective manner. Ensure all students, teachers, and parents have access to comprehensive digital inclusion supports, such as multilingual training and tech support.

At the state and local levels

Develop a state broadband strategy: Each state should establish a broadband office to manage local broadband coverage maps, define community-specific connectivity needs, and direct infrastructure projects. Incorporate details on how to overcome the initial broadband adoption barriers and what is needed to support digital inclusion needs for vulnerable communities. Replicate best practices from the 20 states that have broadband offices today.⁴⁹

Support procurement: Pass legislation to support aggregated procurement at the district and state levels to maximize volume discounts, bridge household information gaps, and minimize risk and churn for providers. Require transparency and publish prices for both device and broadband services procured.

Lower cost of deployment: Decrease upfront investment costs through a suite of potential state frameworks, including “dig-once”⁵⁰ legislation, capacity leasing⁵¹, open access requirements, and municipal networks. Maximize use of available funds for [state broadband projects](#).

Invest in outreach: Dedicate marketing initiatives to increasing program adoption—for example, by posting affordable options on state websites.

Provide digital inclusion support: Strengthen virtual learning by providing professional instruction for educators, promoting digital literacy training for parents, and conducting outreach to inform families about new available resources, making sure to target hard-to-reach populations such as lower-income and unhoused communities.

Ensure data collection for digital divide needs

assessments: Create an ongoing strategy for repeatable data collection and visualization. Support school efforts to stand up secure, privacy-protected exchanges of data on student- and address-level digital divide needs. Establish standardized data elements on digital access to protected student information systems.

Beyond policy, there needs to be leadership, coordination, and capacity building across stakeholders to ensure buy-in and support execution.

Districts and school systems serve as a critical point of execution. They can build a clear understanding of student needs, securely collect the data in student information systems, and assess root causes to inform solutions. They also serve as key operational leads, supporting the negotiation, purchase, and distribution of devices and connectivity technologies, as well as helping students sign up for, set up, and begin to use broadband services and devices.

Private-sector broadband providers and device

manufacturers can help overcome the digital divide by creating cost-effective offerings and investing in connectivity infrastructure to expand access. They must work jointly with other stakeholders to support families and students and encourage adoption

Edtech companies should invest in learning management systems and education platform innovation to build content, digital literacy, and support programs that increase student engagement.

Philanthropies play a critical role as catalysts of change by championing and scaling a call to action at the national and local levels. Their support and advocacy are also crucial for federal, state, and local policy change and to stimulate investment in innovation for the future of digital learning.

49. <https://muninetworks.org/content/new-governors-association-report-covers-familiar-ground-lacks-depth>

50. Policy that leverages rights-of-way to simultaneously install conduit or run fiber at a lower cost during construction or repair of a road or water pipe.

51. Agreements to share or rent bandwidth across provider networks where available.

Use SEF resources to identify and uplift promising practices in equity.

At the beginning of the pandemic, Southern Education Foundation (SEF) released [Distance Learning During COVID-19: 7 Equity Considerations for Schools and Districts](#) to provide recommendations and on-the-ground examples of how district leaders were prioritizing equity as they formulated and executed their distance learning plans.

In advance of the 2020–21 school year, SEF conducted a scan of 48 school districts in 20 states and compiled their findings into the [Distance Learning Equity Dashboard](#), a snapshot of the academic, nutritional, social, emotional, and digital access services offered to students, parents, and staff during the coronavirus pandemic. [Five Ways to Support Teachers as Schools Reopen](#) took a deeper dive into the social, emotional, and professional development and physical health-related needs of teachers.

SEF's research team is currently conducting case studies in Hazlehurst City School District in Mississippi and Hamilton County School District in Tennessee to better understand the policies and practices that support distance learning and offer administrators and policymakers practical insights into potential barriers to distance learning implementation.

Community-based organizations can amplify the voice of families and make sure their ideas are incorporated in solution design. Families' trust in these organizations positions them to be more effective leaders of awareness campaigns and digital inclusion support that will increase adoption.

To ensure buy-in and support for effective execution, solutions must be flexible enough to help break down silos to engage all stakeholders: states and school systems, students and families, the private sector, philanthropies, and community-based organizations. For example, adoption efforts often require collaboration across schools, providers, and community-based organizations to ensure digital platforms are compatible, to coordinate outreach efforts to reach every family, and to deliver adequate digital literacy support.

Additionally, states and providers coordinate on mutually valuable contracts through a win-win model where providers capture a wider portfolio of low-churn customers and offer affordable options for customers that increase bandwidth and expand or eliminate data caps.

6. How much will it cost to permanently close the divide?

Affordability

Our previous analysis found that the first-year cost to bridge the K-12 digital divide for distance learning is estimated to be \$6 billion to \$11 billion. These costs would cover the costs of devices and connectivity for the 15 million to 16 million K-12 students who lack access, including:

- \$3 billion to \$5 billion to cover the cost of laptops and tablets for about 10 million students who lack adequate e-learning devices.
- \$3 billion to \$6 billion to cover the installation and service fees of fixed broadband, hot spot, and satellite solutions for approximately 15 million students without connectivity.

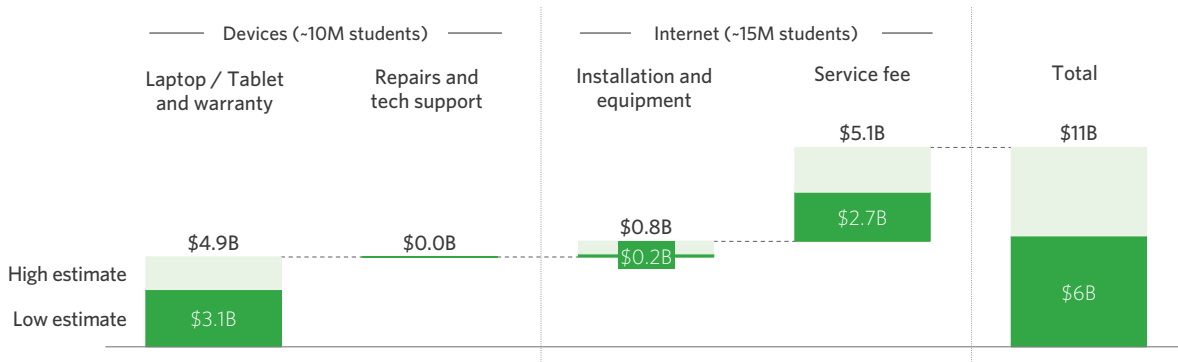
After the first year, an annual, ongoing cost of \$4 billion to \$8 billion—or \$280 to \$550 per student—is required to keep the divide closed permanently. This ongoing cost covers connectivity installation and equipment fees in the event that families move; ongoing monthly service fees; and the expected costs to repair and replace aging devices over time:

- \$1 billion to \$2 billion to cover the cost of laptops and tablets as the costs of these technologies are amortized over time.
- \$3 billion to \$6 billion to cover the installation and service fees as monthly service fees continue to make up the bulk of costs.

The range of these ongoing costs incorporates the expectation that, over time, solutions will shift from a greater reliance on triage solutions, such as hot spots, or creative broadband extension solutions, such as Wireless on Wheels, to more sustainable solutions, such as fixed broadband.⁵² This shift should correspond to an expansion of broadband infrastructure to ensure universal access.

52. "First-year costs" focuses on immediate solutions with current infrastructure (e.g., 50% fixed, 45% hot spot, 5% satellite) while long-term leverages a more sustainable breakdown in line with K-12 digital bridge estimates (e.g., 77% fixed, 17% hot spot, 6% satellite).

Estimated \$6B-\$11B first-year cost and additional \$4B-\$8B annually to permanently close the K-12 divide



Sustainable model	Replace every ~5 years	~\$50-\$100 / yr. for each student	Needed every ~3 years	Monthly	
Amortized cost per year		\$1B-\$2B		\$3B-\$6B	\$4B-\$8B
Per student		\$105-\$190		\$175-\$360	\$280-\$550

This ongoing cost of \$4 billion to \$8 billion is in a range in line with other federal programs. The National School Lunch Program costs \$14.2 billion annually while the Universal Service Fund costs \$9 billion annually, of which \$3.9 billion would go toward the Lifeline program if it is fully utilized.⁵³ As noted earlier, the long-term economic benefits of preventing learning loss will help offset the cost of this programming, balance the playing field for educational opportunity, and avoid the \$22 billion to \$33 billion annual GDP loss that is projected to occur if the digital achievement gap persists.

Availability

Additional investment is needed to build future-proof, universal broadband access. This investment must enable home access for all students, with networks capable of 100/100 Mbps and offer an efficient path forward for ongoing maintenance and service costs. Previous analyses have estimated that it would cost approximately \$10 billion to \$20 billion to expand broadband access at the low end and \$80 billion at the high end, but none of these studies fully accounts for the cost to ensure that all households get access to fixed broadband capable of meeting today’s needs for distance learning (200/10 Mbps⁵⁴).

While the lower estimates connect households to broadband with a more triaged approach, the higher estimates approximate the cost to lay universal fiber across the nation:

Low-end estimates to expand internet access in the short term:

- In 2018, a [BCG study](#) estimated that it would cost \$10 billion to provide broadband (defined as 25/3 Mbps) access to all residents in rural America with a mix of technologies (e.g., LTE, satellite) assuming coordinated deployment of a cost-optimized mix of solutions.
- In 2018, [CTC Technology & Energy](#) estimated it would cost \$13 billion to \$19 billion to deploy fiber to remaining unconnected anchors (e.g., libraries, schools, health providers) while excluding cost of last-mile deployment for in-home access.

53. Lifeline program spends historically \$972 million annually; would cost \$3.9 billion annually if all eligible households participated.
 54. Connectivity speeds required for robust distance learning as referenced on page 23 of our [June report](#).

High-end estimates that include more comprehensive fiber build-out:

- In 2017, an [FCC white paper](#) estimated that a total upfront capital expenditure of \$80 billion would be needed to deploy fiber to the 14% of residential and small-and-medium business locations⁵⁵ that lacked 25/3 Mbps internet.
- In 2018, a [CostQuest Associates analysis](#)⁵⁶ estimated that \$61 billion would be required to deploy fiber to unserved U.S. rural areas using GPON⁵⁷ fiber-to-the-premises technology.

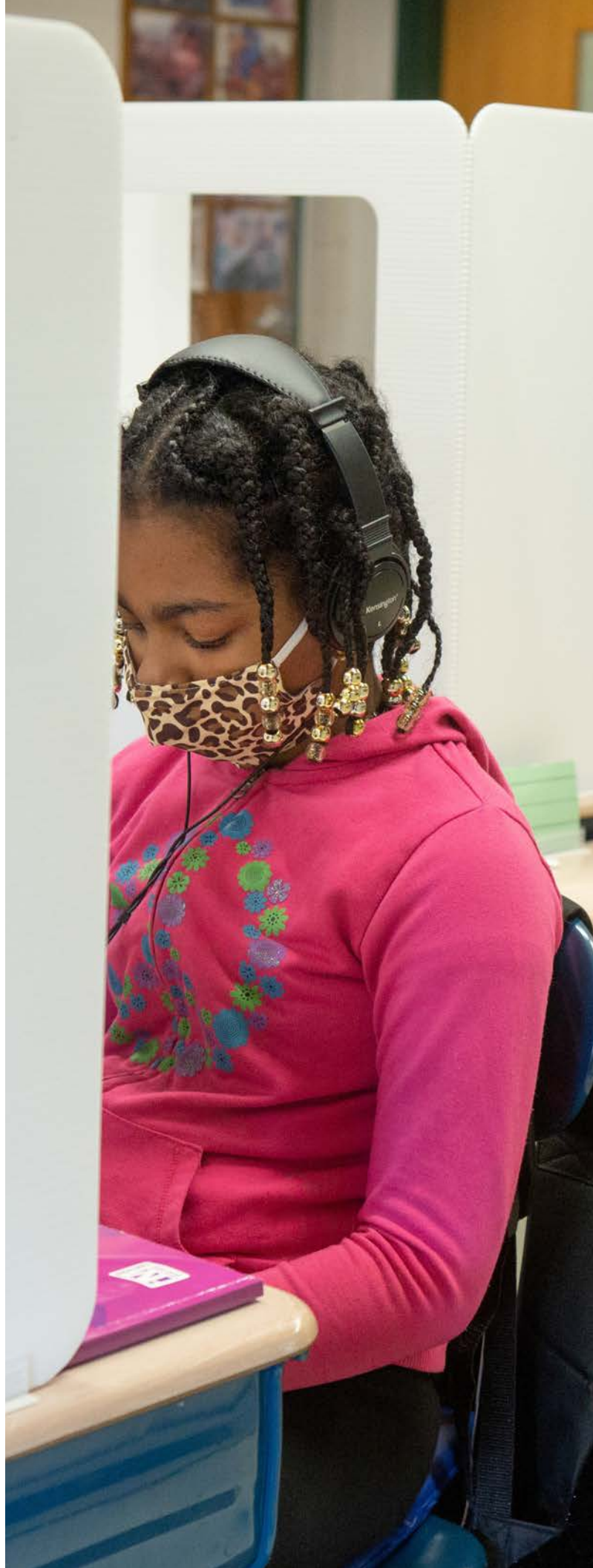
The most recent Congressional infrastructure package unveiled in 2020 included funding for broadband and incorporated South Carolina Representative James E. Clyburn's [Accessible, Affordable Internet for All Act](#), which included incentives to encourage fiber deployment and would spend \$80 billion to fund competitive infrastructure bidding in unserved areas and prohibit states from inhibiting municipal and cooperative networks.

Beyond the initial investments to build out networks, additional ongoing investments to maintain and upgrade infrastructure will be needed. With this in mind, policymakers will need to factor in not just the impact of upfront costs related to build-out but also the potential cost savings associated with various technologies when it comes to longevity of the build and upgrades. More specific research can further scope out and detail the investment required to sustainably connect all households to broadband service that meet their distance learning needs for today and going forward.

55. Based on study from December 2015.

56. An economic consultancy specializing in the communications industry around knowledge of costs, network modeling, telecommunications economics, and regulation.

57. A gigabit-capable passive optical network (GPON) extends fiber all the way to the home or premises, and uses an entirely passive outside plant.



CONCLUSION

Across our more granular analysis of the digital divide for students and our recommendations to permanently close the digital divide, eight key findings emerge:

- 1. The digital divide is a fundamental equity issue, and closing it is essential to the future of our economy and society.** Closing the divide reduces learning inequities, creates a resilient learning system, and is a contributing element to breaking the cycle of poverty. It also benefits private actors across sectors including broadband, telehealth, digital learning, e-commerce, agriculture, and many others.
- 2. Long-term solutions must address the needs of the 15 million to 16 million K-12 students who were affected by the digital divide in the U.S. when the pandemic began.** The digital divide affects students in all 50 states but is not monolithic; it disproportionately affects southern, rural states and students of color, students from lower-income families, and students in urban areas.
- 3. State and district efforts during the pandemic have been significant but insufficient, and up to 12 million K-12 students remain under-connected going into 2021.** States' and districts' efforts to assess needs, procure solutions, and deploy CARES Act funding have closed 20% to 40% of the K-12 connectivity divide and 40% to 60% of the device divide on a short-term basis. Initiatives have been hindered by poor broadband mapping data, limitations of current infrastructure and supply chains, insufficient marketing and adoption support, and inadequate funding.
- 4. Solutions have largely been temporary; more than 75% of these efforts will expire in the next one to three years.** The majority of efforts have focused on near-term, stop-gap solutions. CARES Act funding will expire in September 2021. Many two-year provider agreements may not be renewed, and programs include limited budget for repairing or replacing equipment as it ages.
- 5. Long-term solutions must address all three root causes of the divide: lack of available broadband, lack of affordable solutions, and nontechnical, nonfinancial barriers to adoption.** Up to 60% of disconnected K-12 students (9 million students), especially Black and urban students, are unable to afford digital access. Up to 25% (4 million) lack access to readily available and reliable broadband service, especially rural and Native American students. Finally, up to 40% (6 million) face significant adoption barriers, such as lack of digital skills or distrust of providers.
- 6. Closing the divide will require \$6 billion to \$11 billion for the first year and \$4 billion to \$8 billion annually to address affordability and adoption gaps.** These costs cover installation, ongoing service fees, devices, repairs, and support for internet connectivity and e-learning devices. However, additional investment is required to provide sustainable, universal broadband access capable of 100/100 Mbps. Historical guideposts offer an initial estimate of \$10 billion to \$20 billion of infrastructure investments at the low end and \$80 billion at the high end.
- 7. Federal and state policy must unlock sustainable funding and innovative solutions to ensure that affordable options exist long-term for all students.** Policy should enable a sustained federal funding stream for bulk purchasing with transparent, affordable pricing. It should incentivize tech-agnostic investment and encourage shared deployment both to establish access where none exists and expand access where connectivity is insufficient (e.g., low bandwidth, speeds).
- 8. Cross-sector partnerships are needed to close the divide—and keep it closed.** Partnership among public, private, and social sectors is needed to assess student-level needs with ongoing data measurement and tracking, develop and execute a broadband strategy, run effective procurement for affordable solutions, and offer the requisite technical and adoption support to ensure usage.

It is our hope that, taken together, this report and the two that preceded it will spur policymakers and stakeholders at the federal, state, and local levels to embrace the student digital divide with the sense of urgency that it deserves and act quickly to close the digital divide now and keep it closed.

APPENDIX

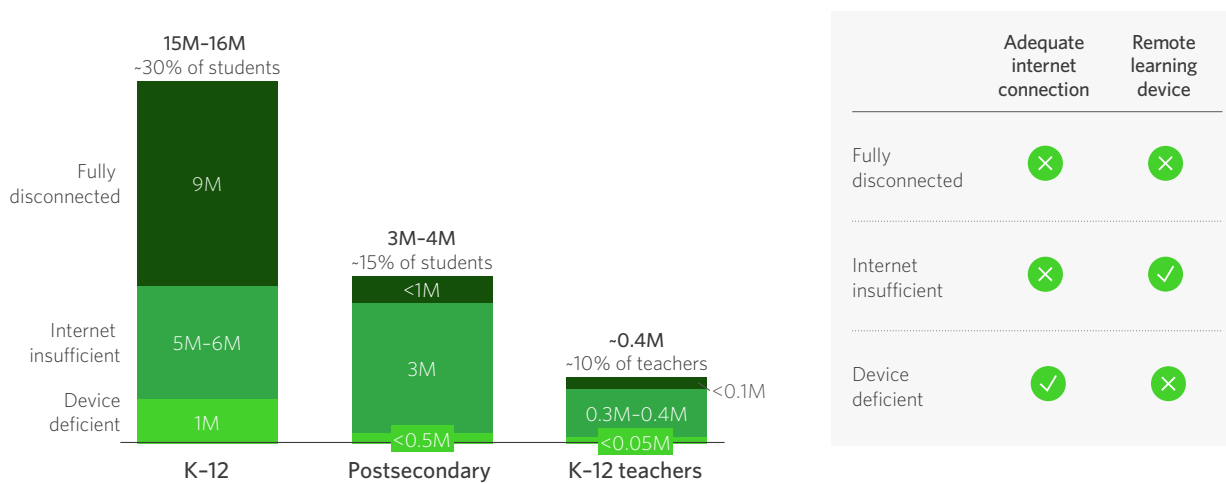
Supporting exhibits and maps

Understanding the structural divide

Figures 1-8 break down the structural digital divide. The structural digital divide represents the number of students affected by the digital divide before the pandemic began. All permanent, long-term solutions must address the needs of these students.

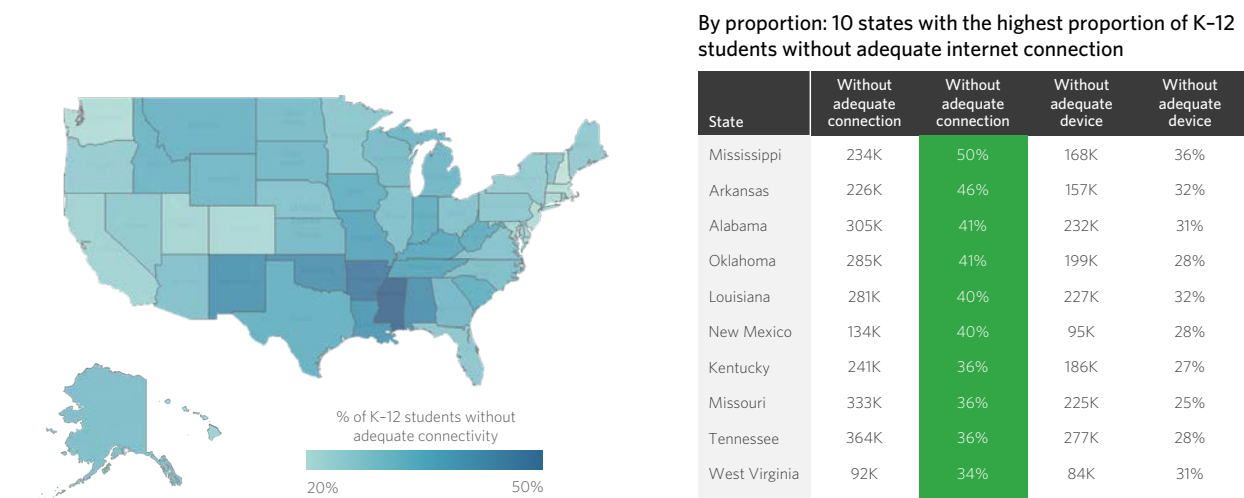
Figure 1: Size of the long-term, structural digital divide for K-12 students, postsecondary students, and K-12 teachers, based on 2018 ACS data

Estimate of the digital divide includes students who lack access to an adequate internet connection, a remote learning device, or both



Note: Distance learning devices are considered to be laptops and tablets (exclude a cellular device alone). Adequate connectivity is defined as DSL/ADSL, cable, fiber, or satellite. Cellular connection alone is not considered adequate, but can be with the right supplements. Numbers rounded and bars not to scale. Sources: ACS one-year survey compiled by U.S. Census Bureau-aggregated at household level, NCES, BCG analysis.

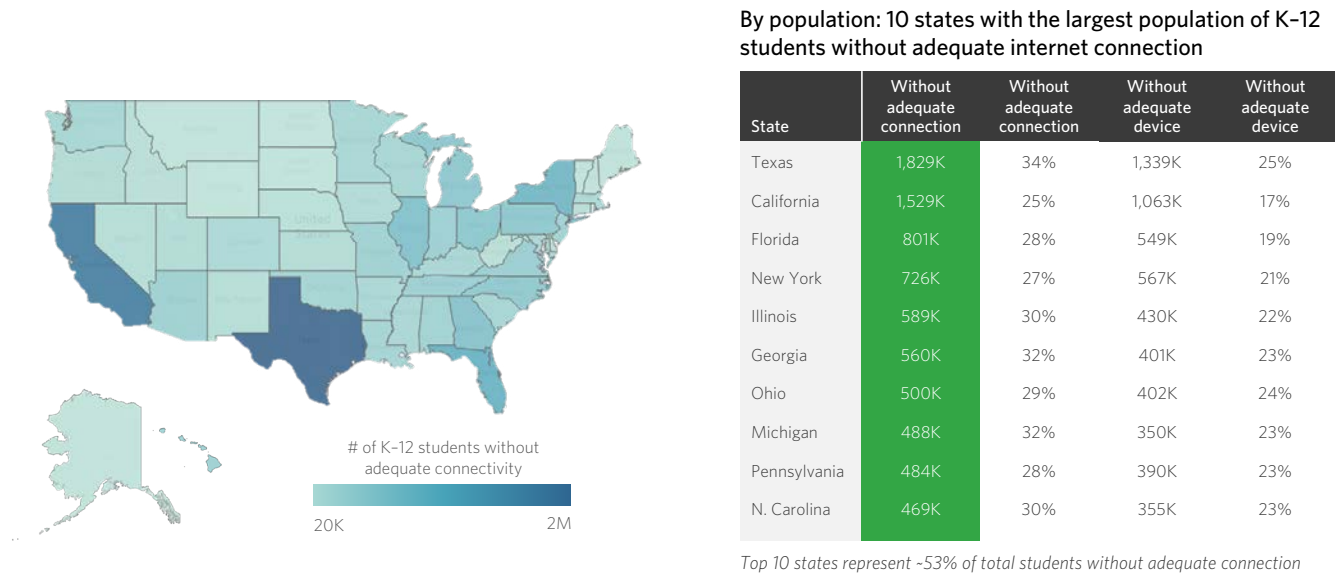
Figure 2: Percentage of K-12 students without adequate internet connection by state, based on 2018 ACS data



Note: Numbers are rounded. Sources: ACS one-year survey compiled by U.S. Census Bureau-aggregated at household level, NCES, BCG analysis.

Supporting exhibits and maps

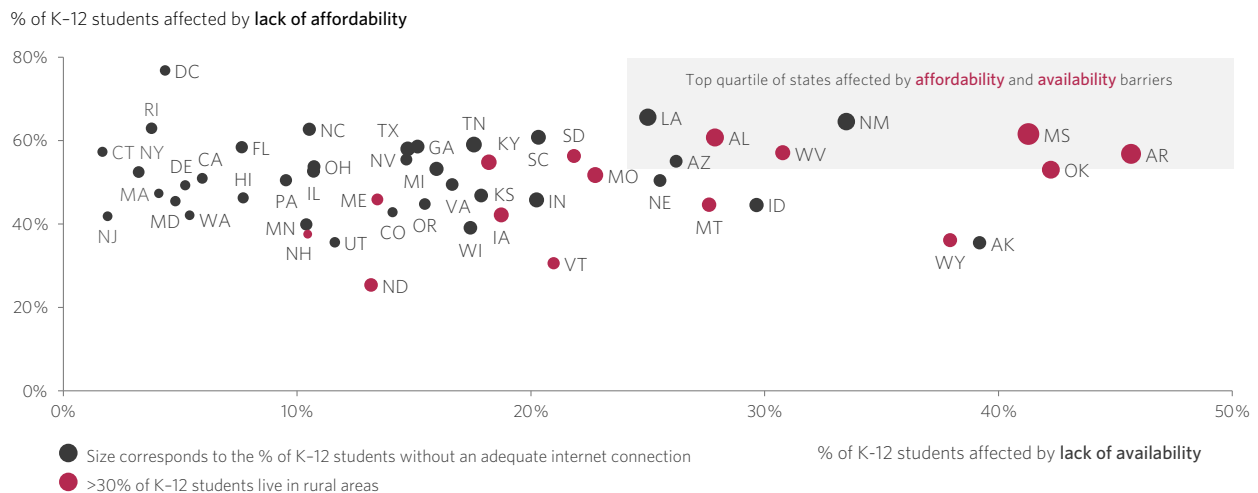
Figure 3: Number of K-12 students without adequate internet connection by state, based on 2018 ACS data



Note: Numbers are rounded.
Sources: ACS one-year survey compiled by U.S. Census Bureau—aggregated at household level, NCES, BCG analysis.

Figure 4: Percentage of K-12 students affected by lack of affordability and availability by state, based on 2018 ACS data and 2020 BroadbandNow data

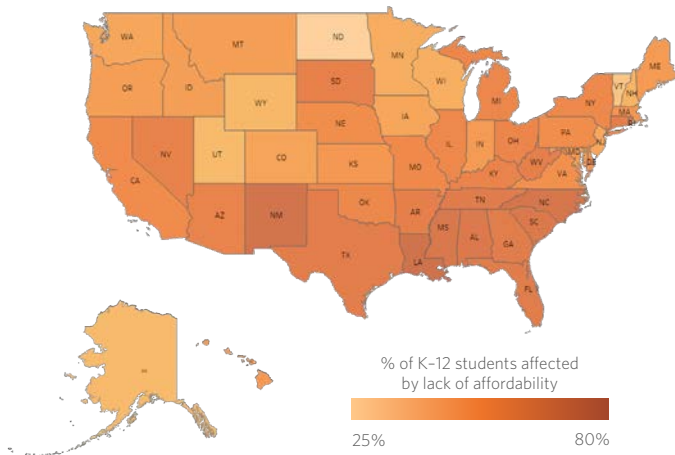
Lack of affordability is defined as students' lacking the ability to pay for reliable broadband connectivity. Lack of availability is defined as students' living in households where there is insufficient wired or wireless broadband coverage, or where there is poor service quality (e.g., speed and reliability).



Note: Students are identified as unable to pay for e-learning devices and/or reliable broadband connection if they live in households with less than \$50K of annual income. Household availability data is based on FCC Form 477 data consolidated at the county level and adjusted by BroadbandNow to account for shortfalls in Census Block ISP methodology. FCC data includes wired and fixed wireless broadband in its estimates. The denominator for both statistics is the number of K-12 students without access to an adequate internet connection.
Sources: ACS one-year survey compiled by U.S. Census Bureau—aggregated at household level, NCES, BCG analysis.

Supporting exhibits and maps

Figure 5: Percentage of K-12 students affected by lack of affordability by state, based on 2018 ACS data



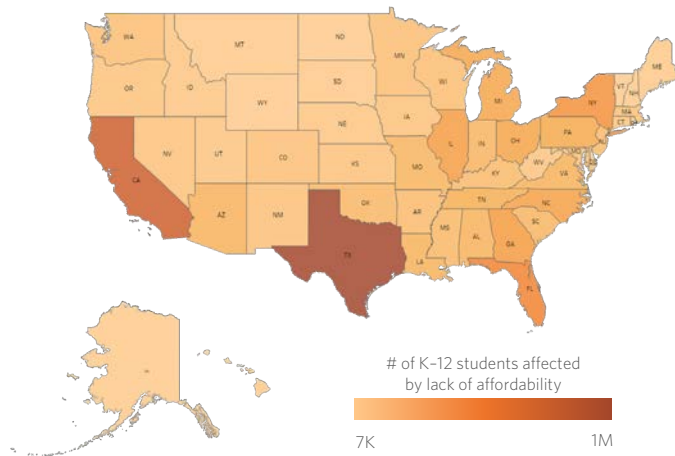
By proportion: 10 states with the highest proportion of K-12 students affected by lack of affordability

State	Students without adequate connection	Students without affordable broadband	% of students without affordable broadband
D.C.	21K	16K	77%
Louisiana	281K	185K	66%
New Mexico	134K	86K	65%
Rhode Island	38K	24K	63%
N. Carolina	469K	294K	63%
Mississippi	234K	144K	62%
S. Carolina	266K	162K	61%
Alabama	305K	185K	61%
Tennessee	364K	215K	59%
Georgia	560K	328K	59%

Note: "Low-income households (HHDs)" defined as households with less than \$50K of annual income. The denominator is the number of K-12 students without access to an adequate internet connection. Numbers are rounded.

Sources: ACS one-year survey compiled by U.S. Census Bureau-aggregated at household level, NCES, BCG analysis.

Figure 6: Number of K-12 students affected by lack of affordability by state, based on 2018 ACS data



By population: 10 states with the largest population of K-12 students affected by lack of affordability

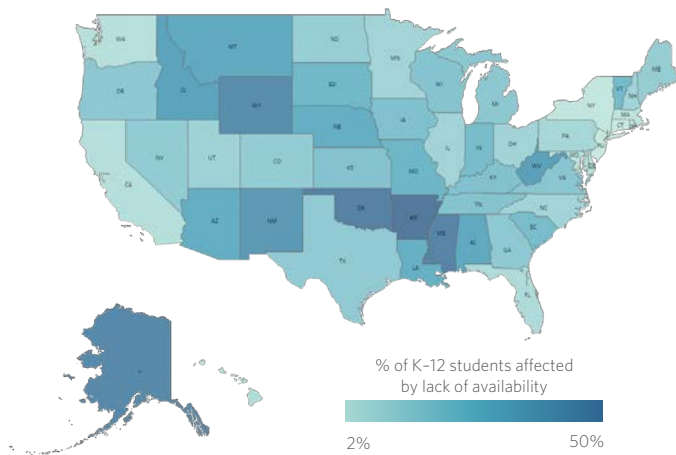
State	Students without adequate connection	Students without affordable broadband	% of students without affordable broadband
Texas	1,829K	1,061K	58%
California	1,529K	779K	51%
Florida	801K	468K	58%
New York	726K	381K	52%
Georgia	560K	328K	59%
Illinois	589K	310K	53%
N. Carolina	469K	294K	63%
Ohio	500K	269K	54%
Michigan	488K	260K	53%
Pennsylvania	484K	244K	51%

Note: "Low-income households (HHDs)" defined as households with less than \$50K of annual income. The denominator is the number of K-12 students without access to an adequate internet connection. Numbers are rounded.

Sources: ACS one-year survey compiled by U.S. Census Bureau-aggregated at household level, NCES, BCG analysis.

Supporting exhibits and maps

Figure 7: Percentage of K-12 students affected by lack of availability by state, based on 2020 BroadbandNow data



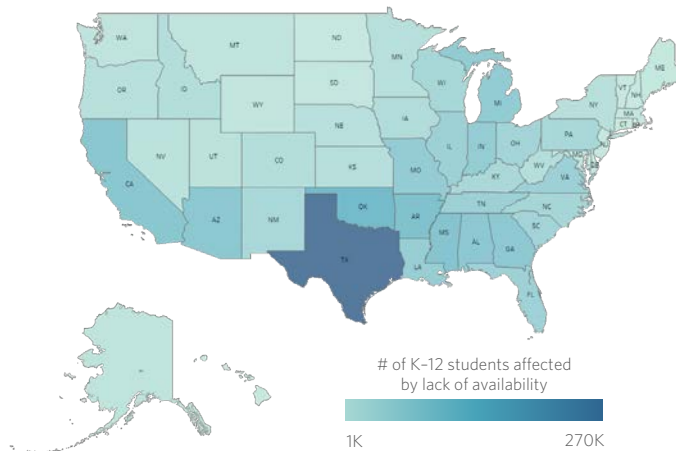
By proportion: 10 states with the highest proportion of K-12 students affected by lack of availability

State	Students without adequate connection	Students without available broadband	% of students without available broadband
Arkansas	226K	103K	46%
Oklahoma	285K	121K	42%
Mississippi	234K	97K	41%
Alaska	40K	16K	39%
Wyoming	30K	12K	38%
New Mexico	134K	45K	33%
West Virginia	92K	28K	31%
Idaho	101K	30K	30%
Alabama	305K	85K	28%
Montana	49K	14K	28%

Note: Household availability data consolidated at county level by FCC Form 477 and adjusted by BroadbandNow to account for shortfalls in Census Block ISP methodology. FCC data includes wired and fixed wireless broadband in its estimates. The denominator is the number of K-12 students without access to adequate internet connection. Numbers are rounded.

Sources: ACS one-year survey compiled by U.S. Census Bureau-aggregated at household level, BroadbandNow, NCES, BCG analysis.

Figure 8: Number of K-12 students affected by lack of availability by state, based on 2020 BroadbandNow data



By population: 10 states with the largest population of K-12 students affected by lack of availability

State	Students without adequate connection	Students without available broadband	% of students without available broadband
Texas	1,829K	270K	15%
Oklahoma	285K	121K	42%
Arkansas	226K	103K	46%
Mississippi	234K	97K	41%
California	1,529K	91K	6%
Arizona	336K	88K	26%
Alabama	305K	85K	28%
Georgia	560K	85K	15%
Michigan	488K	78K	16%
Missouri	333K	76K	23%

Note: Household availability data consolidated at county level by FCC Form 477 and adjusted by BroadbandNow to account for shortfalls in Census Block ISP methodology. FCC data includes wired and fixed wireless broadband in its estimates. The denominator is the number of K-12 students without access to adequate internet connection. Numbers are rounded.

Sources: ACS one-year survey compiled by U.S. Census Bureau-aggregated at household level, BroadbandNow, NCES, BCG analysis.

APPENDIX

State and district examples

Below are brief descriptions of some of the many state and local efforts to close the K-12 digital divide during the pandemic. This list is not intended to be comprehensive but includes additional information and updates from what was published in our October 2020 report.

State or district example	Effort to close the digital divide during the pandemic
Alabama	The Alabama Department of Economic and Community Affairs provided families that qualified for free or reduced-price lunch with vouchers to cover broadband installation and service fees through the calendar year.
Anchorage, Alaska	State's largest school district distributed 7,000 Chromebooks to elementary school students based on a needs assessment survey.
Arizona	State committed \$200 million of CARES funds to cover budget shortfalls that may have resulted from the pandemic/remote learning and committed almost \$40 million of GEER funding toward expanding broadband in rural communities.
Arkansas	Expanded on Arkansas Rural Connect to award \$100 million of CARES funding through grants and to map out broadband speeds through county provide students with 20,000 devices and two years of high-speed internet with unlimited data surveys. The department of education partnered with AT&T and T-Mobile to provide students with 20,000 devices and two years of high-speed internet with unlimited data.
California	The department of education built a state-wide partnership with Apple and T-Mobile to roll out, by year's end, 1 million iPads that will be enabled with LTE data plans for two years. Additionally, private-sector partners (e.g., Google, Twitter) have donated devices and connectivity subsidies, and contributed millions to the California Bridging the Digital Divide Fund.
Los Angeles, California	Los Angeles United School District procured devices and partnered with Verizon to provide hot spots to students by using emergency district funding; established blueprint with Verizon that was used by 40 states.
Colorado	Provided 34,000 students from lower-income families with a free mobile hot spot and 100 GB of data through a partnership with T-Mobile's Project 10Million initiative.
Boulder, Colorado	The district conducted phone outreach to identify students who lacked internet access and then partnered with LiveWireNet to sustainably provide those households with broadband.

State and district examples

Connecticut	State-wide procurement of more than 140,000 e-learning devices to students through the Everybody Learns Initiative and a donation from local philanthropy Partnership for Connecticut. Initiative will include at-home internet access for 60,000 students and the creation of 200 public hot spots.
Delaware	Committed \$20 million in CARES funding to extend broadband access to students in lower-income families through the ConnectDelaware initiative. Accelerated progress by deploying a statewide speed survey, building out broadband infrastructure across the state, and acquiring equipment for families in financial need.
District of Columbia	Launched the Internet for All initiative to bridge the digital divide and provide \$3.3 million in funding to connect 25,000 students in lower-income families in partnership with Comcast Internet Essentials. D.C. Public Schools distributed up to 16,000 devices through the Empowered Learners initiative.
Tallahassee, Florida	Leon County School District committed \$11 million in funding to cover four-year lease agreements for 32,500 Chromebooks and a 5% buffer for repairs and replacement devices.
Georgia	The state allocated funds to support connectivity initiatives like broadband signal extenders from school buildings and mobile Wi-Fi for students who live in multifamily housing.
Atlanta, Georgia	Atlanta Public Schools leveraged a robust communications plan to identify the needs of students who missed class and to partner with Comcast to provide a year of free service.
Clayton County, Georgia	Clayton County accelerated its Extending Learning Beyond the Classroom initiative to lease 38,000 Chromebooks for students for five years using \$37 million in funding.
Hawaii	The department of education allocated funding for devices and connectivity as well as summer learning, special education, training, and support initiatives.
Idaho	Allocated \$48 million in CARES funding to help bridge the digital divide through a grant process for local school districts.
Illinois	The governor administered federal GEER funding to districts to purchase devices such as laptops, tablets, and hot spots, alongside broader statewide initiatives, such as Connect Illinois, that focus on expanding and repairing broadband coverage to communities and schools across the state.

State and district examples

Chicago, Illinois	Chicago Connected, a unique public, private, and philanthropic partnership, was formed to provide 100,000 students with internet access through \$50 million in sustainable funding sources.
Indiana	The state set up a competitive grant program to distribute \$61 million in CARES funding to districts that then led procurement and in some cases accessed additional philanthropic funding.
Montgomery County, Maryland	In partnership with the Children’s Opportunity Fund and the Black and Brown Coalition for Educational Equity and Excellence, Montgomery County Public Schools, Maryland’s largest school district, has established educational equity and enrichment hubs. These hubs provide low-cost, full-day child care and distance learning support with priority given to students from lower-income families, kindergarten through fifth grade students, and students who may not have internet access or adequate adult supervision to ensure successful distance learning.
Michigan	Allocated \$65 million in CARES funding toward the school districts most affected by the coronavirus pandemic with guidance on how to leverage it toward student connectivity and devices.
Detroit, Michigan	Detroit Public Schools received a \$23 million donation from private businesses and philanthropy (e.g., DTE Energy, Quicken Loans) to invest in 51,000 LTE-enabled tablets for students in need.
Minnesota	Established public/private initiative Partnership for a Connected Minnesota, which has awarded \$2 million in nonprofit grants thus far with an ultimate goal of serving 68,000 in-need students across urban and rural communities.
Mississippi	The department of education administered CARES funding to districts to purchase and be reimbursed for devices and hardware, and also ran a grant application for additional funding to expand broadband availability in underserved areas, with schools responsible for negotiating with service providers.
Missouri	The Missouri Department of Elementary and Secondary Education requested that districts submit applications to be reimbursed (using ESSER and GEER funding) for purchasing learning and connectivity devices for students. Allocated \$50 million in CARES funding for broadband expansion, directed at both telehealth and education, through 2027.
New Jersey	The state of New Jersey used CARES funding alongside other emergency, philanthropic, and corporate funding to administer grants to districts that applied for support in purchasing device and connectivity solutions.
New York City, New York	The NYC Department of Education distributed 300,000 internet-enabled iPads, loaned additional school devices, and announced plans to build out broadband for lower-income residents.

State and district examples

North Carolina	Established the North Carolina Student Connect with \$40 million of funding through a public/private partnership that will distribute 100,000 mobile hot spots, set up convenient community Wi-Fi zones, and provide training for parents, students, and teachers.
North Dakota	The Dakota Carrier Network had invested in broadband infrastructure across the rural areas of the state for the past two decades. As a result, they were able to rapidly identify and provide broadband to rural students.
Ohio	The state of Ohio launched a noncompetitive grant program for school districts to apply for CARES Act funding to be used for Wi-Fi hot spots and internet-enabled devices, with a focus on connecting rural districts and students.
Oklahoma	Held a competitive grant process and have awarded 50,000 devices and unlimited LTE data plans to 175 school districts through a partnership with Verizon.
Greenville, Tennessee	Greenville City Schools leveraged their previously implemented registration questionnaire, which included a question on home internet, to quickly identify and provide internet access to students in need.
Hamilton County, Tennessee	The Enterprise Center leveraged existing fiber network infrastructure and brought together private and philanthropic partners to fund HCS EdConnect, which provides about 28,500 Hamilton County students who qualify for free or reduced-price lunch and their families with free access to 10 years of home-based fiber-optic internet service.
Texas	The Texas Education Agency ran a statewide request for proposals for devices and hot spots while providing matching CARES funds to enable districts to purchase devices and connectivity.
Lockhart, Texas	Lockhart teachers and staff led calling campaigns to determine which students were in need and are providing devices and building a private wide area network, a series of telecommunications towers throughout the community, to support families.
Vermont	Established the Line Extension Customer Assistance Program (LECAP), providing \$3,000 per household to offset customer costs of line extensions.
Virginia	The state used a survey to identify and provide students with Chromebooks and connectivity, using creative solutions like meal distribution sites and Wireless on Wheels.

State and district examples

West Virginia	The state, in collaboration with the West Virginia Department of Education and Higher Education Policy Commission, installed wireless access points at over 1,000 sites in all counties, including nearly 700 K-12 schools. The state also distributed CARES funding and administered a grant program for counties for additional assistance in closing the digital divide.
Wisconsin	The Department of Public Instruction set up a replicable and sustainable survey through the districts' student information systems and partnered with ISPs to provide districts with maps that showed the connectivity options available to their students.

Relevant data sources:

- [2018 U.S. Census Bureau American Community Survey \(ACS\)](#): National estimates of K-12 and postsecondary digital divide, by demographic ([microdata site utilized](#)).
- [2020 U.S. Census Bureau Household Pulse Survey](#): Weekly estimate of K-12 digital divide, sampled at the county level with 70,000 to 80,000 weekly respondents (parents with a K-12 student).
- [2018 National Center for Education Common Core of Data \(CCD\)](#): Annual school-level data of student counts by demographic, grade, and key programs (e.g., FRLP, ELL, etc.).
- [March](#) and [June](#) 2020 American Association of School Administrators (AASA) COVID-19 Impact on Public Schools Survey: Survey of about 500 school districts across all 50 states on district COVID-19 responses.
- [BroadbandNow Coverage Report](#): County-level penetration of fixed broadband (wired or wireless) by county, improved from FCC Form 477 census block data ([state summary](#)).
- [Digital Bridge K-12 \(ESH\) State Budget Calculator](#): Estimated unconnected students by state, and estimated cost of wireline solutions and LTE hot spots by state.
- [National Digital Inclusion Alliance \(NDIA\)](#): State and local government COVID-19 digital inclusion response initiatives.
- [National Urban League](#): The Lewis Latimer Plan for Digital Equity and Inclusion details a federal policy approach to closing the digital divide.

List of interviews conducted:

- American Federation of Teachers (AFT)
- Apple Inc.
- Austin Community College District
- Bill and Melinda Gates Foundation
- Business Roundtable
- Brookings Institution
- Cellular Telecommunications and Internet Association
- Chamber of Commerce Foundation
- Chiefs for Change (CFC)
- Clever
- Council of Chief State School Officers (CCSSO)
- Council of the Great City Schools (CGCS)
- Dallas College
- Education Commission of the States (ECS)
- Education Trust
- EducationSuperHighway
- human-I-T
- New America
- Spring Initiative
- Universal Service Administrative Company (USAC)
- Verizon Wireless
- Walton Family Foundation



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