



June 2020

BROADBAND

Observations on Past and Ongoing Efforts to Expand Access and Improve Mapping Data

Accessible Version

GAO Highlights

Highlights of [GAO-20-535](#), a report to congressional requesters

June 2020

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Why GAO Did This Study

Broadband is critical for economic, educational, and personal uses. Industry and federal investments have made broadband available to the vast majority of Americans. For example, FCC's high-cost program provides funding to broadband providers to deploy broadband in rural, insular, and high-cost areas. However, some rural areas continue to lack access due, in part, to challenges with providing service to areas where deployment costs are high and returns on investment are low.

GAO was asked to examine the current state of broadband investment and deployment. This report examines (1) industry and federal investments to deploy broadband in the United States since 2009, and (2) efforts federal agencies are making to address deployment challenges.

GAO analyzed industry and federal government data from 2009 through 2017 or 2018 (the most recent year of available data) on broadband investments and deployment; reviewed statutes and regulations, rulemaking proceedings, and FCC, RUS, and NTIA program information; interviewed federal officials; and obtained information about deployment challenges from interviews with 32 industry, academic, and consumer stakeholders, including 16 broadband providers selected to represent a range of provider sizes and types of technologies.

What GAO Recommends

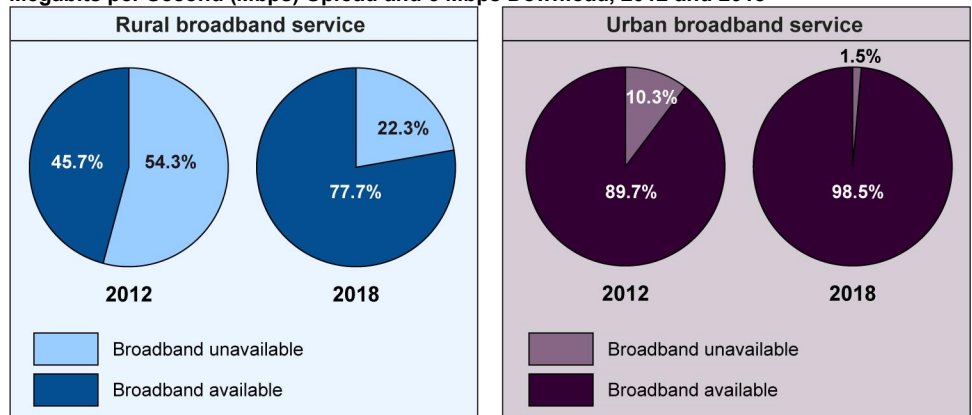
In prior work, GAO recommended that FCC improve its mapping data and RUS better manage its broadband programs. The agencies have addressed some, but not all, of the recommendations. FCC and RUS reviewed a draft of this report and provided technical comments.

View [GAO-20-535](#). For more information, contact Andrew Von Ah at (202) 512-2834 or vonaha@gao.gov.

What GAO Found

Telecommunications industry and federal government investments have expanded access to broadband in the United States. From 2009 through 2017, the industry made capital investments of about \$795 billion, including investments in broadband infrastructure, according to U.S. Census Bureau survey data. Federal investments totaled about \$47.3 billion to target broadband infrastructure for rural areas over the same time, according to data from the Federal Communications Commission (FCC), the Rural Utilities Service (RUS), and the National Telecommunications and Information Administration (NTIA). FCC's Universal Service Fund high-cost program expanded service to about 2.3 million residential and small business locations, mostly from 2015 through 2017, according to data FCC collects from providers. FCC reported that fixed broadband service was available to 94.4 percent of the U.S. population in 2018, up from 81.2 percent in 2012, although affordability and digital literacy remain barriers to adoption and use. While service availability for people in rural areas increased from 45.7 percent in 2012 to 77.7 percent in 2018, service in rural areas continues to lag behind urban areas, according to FCC's broadband availability report (see figure).

Comparison of Fixed Broadband Availability in Rural and Urban Areas at the Speed of 25 Megabits per Second (Mbps) Upload and 3 Mbps Download, 2012 and 2018



Source: Federal Communications Commission (FCC) broadband report, February 2, 2018, and April 24, 2020. | GAO-20-535

Data Table for Comparison of Fixed Broadband Availability in Rural and Urban Areas at the Speed of 25 Megabits per Second (Mbps) Upload and 3 Mbps Download, 2012 and 2018

Year	Rural broadband service		Urban broadband service	
	Broadband unavailable	Broadband available	Broadband unavailable	Broadband available
2012	54.3%	45.7%	10.3%	89.7%
2018	22.3%	77.7%	1.5%	98.5%

FCC and RUS have taken actions to address deployment challenges, such as taking steps to improve their ability to pinpoint where gaps in broadband deployment still exist. In August 2019, FCC proposed an initiative to change how

United States Government Accountability Office

it collects broadband deployment data, with the goal of using a new methodology to improve data accuracy and FCC's ability to target funds to locations that lack access. FCC and RUS have also coordinated on broadband deployment issues. For example, to avoid funding areas where broadband service is already deployed, agency officials regularly communicate on information about where their broadband deployment programs are funding new deployments. Continued communication and coordination on topics such as collecting and using improved data will be especially important in assuring that federal dollars are effectively targeted as agencies' efforts to improve mapping and target resources progress.

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Abbreviations

ETC	eligible telecommunications carrier
FCC	Federal Communications Commission
NTIA	National Telecommunications and Information Administration
Recovery Act	American Recovery and Reinvestment Act of 2009
RUS	Rural Utilities Service

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June 25, 2020

The Honorable Maria Cantwell
Ranking Member
Committee on Commerce, Science, and Transportation
United States Senate

The Honorable Brian Schatz
Ranking Member
Subcommittee on Communications, Technology, Innovation
and the Internet
Committee on Commerce, Science, and Transportation
United States Senate

The recent outbreak of the Coronavirus Disease 2019 (COVID-19), a fatal and highly communicable disease caused by the coronavirus, across the United States and the resulting limitation of large gatherings have reinforced the importance of access to broadband.¹ Many health care systems, government entities, businesses, educational institutions, restaurants, and other merchants have transitioned some or all operations online to minimize interpersonal contact and help slow the spread of the disease. Lack of access to broadband poses challenges to accessing telemedicine, telework, remote instruction, and resources for home schooling, as well as e-commerce. Because broadband has become increasingly critical to economic opportunity, jobs, education, and civic engagement, those without access are unable to enjoy the social and economic benefits of broadband. As we have reported—and media reports continue to highlight—people in unserved and underserved areas, low income families, some minority groups, and tribal communities are disproportionately affected by this lack of broadband access, often referred to as “the digital divide.” The pandemic, in particular, highlights this divide between those who have access to broadband to more readily access essential goods and services and those who do not have such access.

Over the years, the federal government has invested resources to increase broadband access. The American Recovery and Reinvestment

¹Broadband commonly refers to internet service with speeds generally faster than dial-up connections. In this report, unless we are discussing FCC’s broadband availability data, we are using “broadband” generically to refer to high-speed internet.

Act of 2009 (Recovery Act) provided funding through grants and loans for broadband infrastructure in order to expand access to broadband internet service, among other things.² Since the passage of the Recovery Act, private industry has made significant investments in broadband infrastructure in order to expand broadband services in unserved and underserved urban and rural areas. The federal government administers programs to invest federal funds that target rural unserved and underserved areas through the Federal Communications Commission (FCC), the Department of Agriculture's Rural Utilities Service (RUS), and the Department of Commerce's National Telecommunications and Information Administration (NTIA).³ Among these agencies' programs, the largest is FCC's Universal Service Fund high-cost program that supports broadband deployment in rural, insular, and high-cost areas and collects data to track where broadband is available. In the past 10 years, we have reported on these agencies' programs and other aspects of broadband deployment. However, despite over a decade of industry and federal investments, about 1 in 4 people living in rural and tribal areas continue to lack access to fixed broadband, according to FCC's latest deployment report.⁴

Congress has expressed concern about the effectiveness of efforts to close this gap, even as the gap has been a priority of FCC and other federal agencies, as well as the subject of our prior work. For example, in 2014, we examined FCC's efforts to increase broadband deployment in unserved and underserved areas and we identified challenges to providing this service, such as low returns on investment.⁵ You asked us to review investment in broadband infrastructure and describe ongoing federal efforts to improve broadband deployment in rural areas. This report examines:

²American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 6001(k)(1), 123 Stat. 115, 515-16 (2009) (Recovery Act).

³Rural areas encompass all populations not within an urban area. In general, the U.S. Census Bureau identifies urban areas as areas of 50,000 or more people. Unserved areas are those where households do not have broadband. Underserved areas are those where households have internet access, but at slower speeds than broadband.

⁴*In re Inquiry Concerning Deployment of Advanced Telecommunications Capability to all Americans in a Reasonable and Timely Fashion*, 2020 WL 2013309, *11 ¶¶36, FCC 20-50 (2020) (2020 Broadband Deployment Report).

⁵GAO, *Telecommunications: Projects and Policies Related to Deploying Broadband in Unserved and Underserved Areas*, [GAO-14-409](#) (Washington, D.C.: Apr. 23, 2014).

1. what is known about industry and federal investments to deploy broadband in the United States since 2009, and
2. efforts by federal agencies to address broadband deployment challenges.

To determine what is known about industry and federal investments, we analyzed data from the U.S. Census Bureau's Annual Capital Expenditures Survey from 2009 through 2017, representing telecommunications providers' investments in structures and equipment.⁶ Each year, the Census Bureau conducts a survey of a sufficiently large sample of telecommunications providers that offer broadband service using different technologies. We analyzed survey data from 2009—the year of the Recovery Act's enactment—through 2017, the most recent year for which survey results were available at the time of our analysis.⁷ We also analyzed disbursement data for FCC's high-cost program, grants and loans awarded by RUS, and grants awarded by NTIA for broadband infrastructure over the same time. Throughout this report, investment estimates are inflation-adjusted to 2018 dollars using gross domestic price indices. We assessed the reliability of these data by reviewing supporting documentation; interviewing knowledgeable Census Bureau, FCC, RUS, and NTIA officials; and comparing data against other analyses. We found the data to be sufficiently reliable for the purposes of estimating industry and federal investments over time. We also reviewed our prior reports calling on agencies to improve the information used in measuring the impact of federal broadband programs; examined steps that agencies took to improve such information; and reviewed information from agencies showing the impact of federal spending.

To determine broadband deployment in urban and rural areas, we reviewed FCC's Broadband Deployment Reports showing broadband availability, beginning in 2012. We omitted other available government data prior to 2012 because they were not compatible with data presented in FCC's broadband reports spanning 2012 to 2018, the most recent year for which FCC has available data. We also reviewed our prior reports on broadband availability data to understand the difficulties in measuring

⁶See appendix 1 for another source and estimate of capital expenditures prepared by a broadband industry association using a different scope and methodology than the Census Bureau.

⁷In January 2020, the Census Bureau released its preliminary survey results for 2018. Census makes final data available about 2 years after a survey, following the bureau's data reliability assessment.

actual deployment using such data. We acknowledge that FCC's broadband data overstate fixed broadband availability by counting an entire census block as served by providers that serve some, but not necessarily all, of that block. This limitation could be particularly problematic in areas with large census blocks. Despite this limitation, we believe these data represent the best snapshot of fixed broadband availability. In response to our July 2014 report,⁸ FCC began collecting additional deployment data on new broadband service locations funded by the high-cost program, data that we analyzed to provide information on how that investment supports deployment. We reviewed the reliability of the FCC broadband deployment and high-cost deployment data by reviewing documentation about the collection and interviewing FCC officials. We determined that the data were sufficiently reliable for the purposes of reporting information about broadband deployment and the impact of high-cost funds on broadband deployment.

To describe efforts by federal agencies to address broadband deployment challenges, we reviewed relevant statutes and regulations; FCC rulemaking proceedings; agency broadband reports; and supporting documentation on FCC, RUS, and NTIA broadband programs. To describe ongoing efforts to help close deployment gaps, we examined FCC's and RUS's funding and mapping initiatives aimed at closing broadband gaps. We also examined existing agreements among FCC, RUS, and NTIA as well as administrative documentation on how they coordinate to operate their programs. For both objectives, we interviewed program officials from FCC, RUS, and NTIA as well as selected stakeholders to understand challenges and efforts to close deployment gaps. Specifically, we interviewed 32 stakeholders from the private and nonprofit sectors to obtain their views on this issue. Stakeholders include 16 broadband providers we selected to represent a mix of companies based on company size and location, including some of the largest broadband providers as well as regional carriers located in rural areas, and the type of broadband technologies (such as fiber, cable, mobile, satellite, and fixed-wireless) to ensure we covered all relevant delivery methods. We also interviewed eight associations representing industry or state public service commissioners, six research entities, and two consumer groups. Views from these stakeholders are not generalizable but are included to illustrate various perspectives on these issues.

⁸GAO, *Telecommunications: FCC Should Improve the Accountability and Transparency of High-Cost Program Funding*, [GAO-14-587](#) (Washington, D.C.: July 22, 2014).

We conducted this performance audit from November 2018 to May 2020 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Internet Service Types and Technologies

Consumers receive broadband service from telephone, cable, mobile, satellite, and utility companies that own and operate the telecommunications infrastructure.⁹ Fixed technologies, like cable or fiber, can provide broadband to single locations like customers' homes or businesses. Mobile technologies provide internet access wherever a customer has access to a signal. Customers connect to a mobile wireless network through a mobile device, such as a smartphone. Internet service that is high speed and provides an "always-on" connection, so users do not have to reestablish a connection each time they access the internet, is commonly referred to as "broadband." FCC's benchmark speed for what constitutes "advanced telecommunications capability," a subset of broadband, has increased over time as consumers use the internet for an expanding range of purposes that requires faster speeds.¹⁰ In 2015, FCC set a benchmark speed for fixed advanced telecommunications capability to 25 megabits per second when downloading and 3 megabits per second when uploading (25 Mbps/3 Mbps).¹¹ Internet service at various speeds allows for a variety of online activities, such as those shown in figure 1. In addition to fixed providers, satellite providers have begun meeting this benchmark, and FCC has recognized them as a viable source of

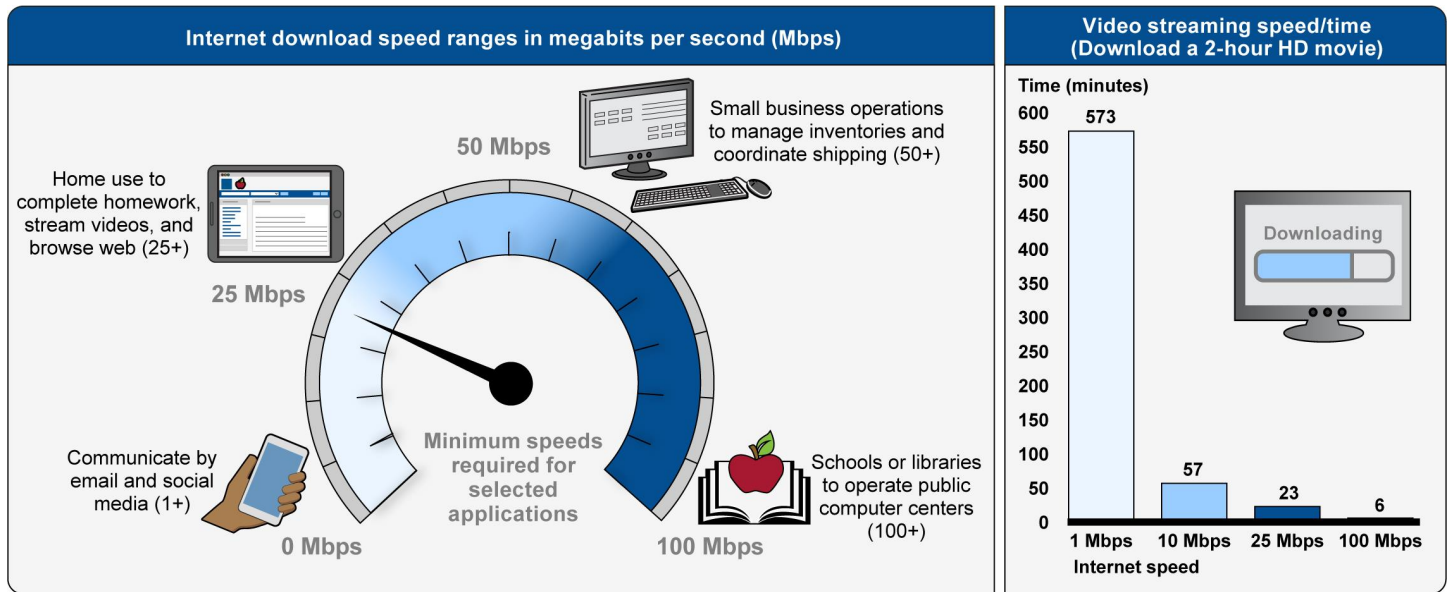
⁹Types of broadband connections, as described by FCC. Accessed January 30, 2020. <https://www.fcc.gov/general/types-broadband-connections>.

¹⁰Pursuant to section 706 of the Telecommunications Act of 1996, 47 U.S.C. § 1302, FCC is required to annually determine whether "advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion."

¹¹Megabits per second is a measure of the network's data transfer rate (speed) and refers to the number of bits per second that travel to a user's device (the download speed) and from a user's device (the upload speed).

advanced telecommunications capability. FCC has not set a similar benchmark for mobile services.¹²

Figure 1: Examples of Applications Performing at Various Internet Speeds



Sources: GAO analysis of National Telecommunications and Information Administration and Federal Communications Commission information; Allconnect.com. | GAO-20-535

Data table for Figure 1: Examples of Applications Performing at Various Internet Speeds

Internet download speed ranges in megabits per second (Mbps)			
Communicate by email and social media (1+)	Home use to complete homework, stream videos, and browse web (25+)	Small business operations to manage inventories and coordinate shipping (50+)	Schools or libraries to operate public computer centers (100+)

Video streaming speed/time (Download a 2-hour HD movie)	
Internet speed	Time (minutes)
1 Mbps	573
10 Mbps	57
25 Mbps	23
100 Mbps	6

¹²2020 Broadband Deployment Report, 2020 WL 2013309 at *5-6 ¶¶16-17.

Note: Although upload speeds are omitted, we recognize that they can be important for some applications.

The Federal Role in Rural Broadband Access

The federal government has emphasized the importance of ensuring Americans have access to broadband, and a number of agencies provide funding to subsidize broadband deployment in areas, such as rural areas, in which the return on investment has not attracted private investment. As we have previously reported, rural areas may have features that increase costs of deploying and maintaining broadband networks.¹³ For instance, low population density, low broadband adoption rates, or mountainous or rugged terrain can make it especially costly for fixed and mobile providers to deploy infrastructure to rural areas with an expectation of getting a return on their investment. The Communications Act of 1934, as amended by the Telecommunications Act of 1996, specifies that consumers in “rural, insular, and high-cost areas” should have access to telecommunications and information services at rates that are “reasonably comparable” to rates charged for similar services in urban areas.¹⁴ Consequently, federal programs exist to support investment in broadband deployment for high-cost areas through federal grants, loans, and other subsidies.

The largest share of federal support comes from FCC’s Universal Service Fund, which includes four component programs designed to ensure access to affordable communications for schools, libraries, rural health care providers, low-income consumers, and those in rural and high-cost areas. The largest component of the Universal Service Fund is the high-cost program—which includes the Connect America Fund and the Rural Digital Opportunity Fund—that targets financial support to rural high-cost areas for the deployment and maintenance of voice and broadband-capable networks.¹⁵ Table 1 shows selected federal programs funding the deployment of broadband infrastructure.

¹³See, for example, GAO, *Broadband: Additional Stakeholder Input Could Inform FCC Actions to Promote Competition*, [GAO-17-742](#) (Washington, D.C.: Sept. 19, 2017).

¹⁴47 U.S.C. § 254(b)(3).

¹⁵In addition to the high-cost program, the Universal Service Fund includes programs to serve schools and libraries (E-Rate), low-income households (Lifeline), and healthcare providers (Rural Health Care).

Table 1: Selected Federal Programs Funding Broadband Infrastructure Deployment

Agency	Program and Description
Federal Communications Commission (FCC)	<ul style="list-style-type: none"> • High-cost program includes, among other components, the <ul style="list-style-type: none"> ○ Connect America Fund. This fund subsidizes service providers building new network infrastructure; performing network upgrades to areas lacking voice and broadband service; or maintaining service. ○ Mobility Fund. This fund supports mobile voice and broadband coverage to primarily rural areas that lack unsubsidized service. ○ Rural Digital Opportunity Fund. This fund—established on January 30, 2020, under the high-cost program—is to support broadband service to consumers in rural areas that lack service or where speeds are less than 25 megabits per second (Mbps) download and 3 Mbps upload.
Department of Agriculture’s Rural Utilities Service	<ul style="list-style-type: none"> • Community Connect Grant Program. This program funds broadband deployment in rural communities where such service does not currently exist. • Rural Broadband Access Loan and Loan Guarantee Program. This program furnishes loans and loan guarantees to provide funds for the costs of construction, improvement, or acquisition of facilities and equipment needed to provide broadband service in eligible rural areas. • Telecommunications Infrastructure Loans and Loan Guarantees Program. This program provides financing for the construction, improvement and expansion of telephone service and broadband in rural areas. • Rural eConnectivity Pilot Program (ReConnect). This program—established by the Consolidated Appropriations Act of 2018,¹⁶ offers federal financing and funding options—loans, grants, and loan/grant combinations—to facilitate broadband deployment in areas of rural America that do not currently have sufficient access to broadband, defined as 10 Mbps download and 1 Mbps upload. • Broadband Initiatives Program. This program, which was part of the American Recovery and Reinvestment Act of 2009, provided grants and loans for infrastructure support. This program is inactive.
Department of Commerce’s National Telecommunications and Information Administration (NTIA)	<ul style="list-style-type: none"> • Broadband Technology Opportunities Program. This program was funded by the American Recovery and Reinvestment Act of 2009. Among other things, the Comprehensive Community Infrastructure component funded connections between providers and public institutions, such as libraries, universities, and public safety and healthcare entities. As of June 30, 2019, only two infrastructure projects remain in active status. All other projects are completed. NTIA no longer has funding available for this program.

Source: GAO analyses of FCC, Rural Utilities Service, and NTIA information. | GAO-20-535

Note: The U.S. Departments of Education, Housing and Urban Development, and Transportation as well as the Appalachian Regional Commission, the Delta Regional Authority, and the National Science Foundation also support aspects of broadband, but these agencies are not included in this report.

FCC has other roles and responsibilities in regulating nationwide communications activities in addition to those identified above. FCC collects deployment data twice a year from broadband providers in order

¹⁶Pub. L. No. 115-141, 132 Stat. 348, 371-72 (2018).

to better identify areas where broadband service is available.¹⁷ FCC, RUS, and NTIA have used and continue to use these data to inform their broadband programs. Furthermore, FCC and NTIA jointly determine the amount of spectrum—a finite natural resource that makes a variety of wireless communications possible—allocated for federal, nonfederal, and shared use. FCC also regulates the use of licensed and unlicensed spectrum through its regulatory process.¹⁸

GAO Reports on Broadband Programs

This report's broad view of a decade of federal efforts to advance broadband access builds on our prior work.

- **FCC Universal Service Fund.** In 2014, we examined FCC efforts to increase broadband deployment in unserved areas and identified legal, policy, and economic concerns—for example, low returns on investment—in deploying broadband in unserved and underserved areas.¹⁹ We also examined varying approaches for financing broadband deployment in high-cost areas, including local funding sources and a variety of ownership structures over the infrastructure.
- **FCC deployment data.** In 2014, we examined FCC's efforts to reform its high-cost program and the extent to which FCC was collecting data to determine the effectiveness of these reforms, among other

¹⁷Section 706 of the Telecommunications Act of 1996, as amended by the Broadband Data Improvement Act of 2008, Pub. L. No. 110-385, 122 Stat. 4096, 4096-97 (2008), requires FCC to determine whether advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion, and regularly thereafter. 47 U.S.C. § 1302(b).

¹⁸FCC's regulatory process includes rulemaking under the Administrative Procedure Act (APA). Pub. L. No. 404, ch. 324, §§ 1-12, 60 Stat. 237 (1946) (codified by Pub. L. No. 89-554 (1966) at 5 U.S.C. §§ 551-559, 701-706, 1305, 3344, 5372, 7521). The APA establishes the procedures that federal administrative agencies, such as the FCC, use for "rulemaking." Rulemaking is the process of "formulating, amending, or repealing a rule." 5 U.S.C. § 551(5). "Rule," refers broadly to "statement[s] of general or particular applicability and future effect" that are designed to "implement, interpret, or prescribe law or policy." 5 U.S.C. § 551(4).

¹⁹GAO, *Telecommunications: Projects and Policies Related to Deploying Broadband in Unserved and Underserved Areas*, [GAO-14-409](#) (Washington, D.C.: Apr. 23, 2014). More recently, we also examined fraud risks in the high-cost program and recommended that FCC implement an anti-fraud strategy for the program, among other things, see GAO, *Telecommunications: FCC Should Take Additional Action to Manage Fraud Risks in Its Program to Support Broadband Service in High-Cost Areas*, [GAO-20-27](#) (Washington, D.C.: Oct. 23, 2019).

objectives.²⁰ We identified gaps in FCC's data analysis and reporting, including a lack of transparency and accountability of spending. We recommended that FCC analyze how it uses its high-cost program funding and make that analysis publicly available at least annually. FCC has taken action to implement our recommendation to address the lack of transparency and accountability of spending. In 2018, we reviewed data that FCC collected from providers to describe the locations of existing broadband infrastructure and help federal programs identify unserved and underserved areas to target for federal funding. We found that these data overstated broadband access, especially in tribal lands, and recommended that FCC take actions to improve these data.²¹ FCC concurred with the recommendations and has begun taking action, but the agency has not yet fully implemented any of the report's three recommendations.

- **Broadband adoption.** In 2015, we stated that adopting broadband at home can provide a number of benefits, including access to employment opportunities (searching for and applying to jobs); education (research, web-based learning, and homework); and services for economic and social gain (such as telemedicine and entertainment). We reviewed federal efforts to address broadband adoption barriers that consumers face and recommended that FCC revise its strategic plan to more clearly state if broadband adoption is a priority, and if so, what outcomes FCC intends to achieve, action that the agency took the following year.²² We also recommended that NTIA include performance metrics for the agency's broadband adoption efforts in its annual performance plan. Both FCC and NTIA implemented these recommendations.

²⁰GAO, *Telecommunications: FCC Should Improve the Accountability and Transparency of High-Cost Program Funding*, [GAO-14-587](#) (Washington, D.C.: July 22, 2014).

²¹GAO, *Broadband Internet: FCC's Data Overstate Access on Tribal Lands*, [GAO-18-630](#) (Washington, D.C.: Sept. 7, 2018). We made three recommendations to FCC in this report: (1) develop and implement methods for collecting and reporting accurate and complete data on broadband access specific to tribal lands, (2) develop a formal process to obtain tribal input on the accuracy of provider-submitted broadband data that includes outreach and technical assistance to help tribes participate in the process, and (3) obtain feedback from tribal stakeholders and providers on the effectiveness of a statement FCC made to providers in 2012 on how to fulfill their tribal engagement requirements to determine whether FCC needs to clarify the agency's tribal engagement statement.

²²GAO, *Broadband: Intended Outcomes and Effectiveness of Efforts to Address Adoption Barriers Are Unclear*, [GAO-15-473](#) (Washington, D.C.: June 2, 2015).

- **RUS grant and loan programs.** In 2017, we assessed whether RUS's procedures and activities related to its broadband grant and loan programs are consistent with leading management practices. We found that its activities and procedures were consistent with four leading practices and partially consistent with six leading practices. We made five recommendations to RUS to improve management practices for specific programs, like the Community Connect Program.²³ In response, RUS implemented two of the recommendations to develop and document clear goals and performance measures for its broadband loan and grant programs and to establish and implement procedures to conduct a risk assessment of each program. RUS agreed with, but has not yet implemented, the report's other three recommendations to: (1) conduct periodic evaluations of completed grant projects to determine the outcomes associated with these projects; (2) establish a timeline for implementing a centralized internal data system for staff to use in managing and monitoring loans and grant awards; and (3) develop, update, and maintain complete written policies and procedures for RUS's programs as a way to retain and communicate organizational knowledge internally among agency staff.
- **Broadband competition.** In 2017, we found that infrastructure costs and other factors can affect competition among broadband providers. Such costs can limit competition in urban areas but more significantly limit competition in non-urban and less populated areas. We made two recommendations to FCC to solicit and report on the views of stakeholders regarding: (1) how well FCC's programs promote broadband competition and (2) how varying levels of broadband deployment affect broadband prices and service quality.²⁴ In response, FCC implemented these recommendations by soliciting public comments in July 2018 to seek feedback on the effectiveness of its actions addressing competition among broadband providers and on how varying levels of broadband deployment affect prices and service quality. In December 2018, FCC reported comments that it had received from this solicitation in the first version of a biennial report on the broadband market. In May 2019, FCC also reported stakeholder comments related to the agency's broadband deployment data, including service quality data.

²³GAO, *Rural Broadband Deployment: Improved Consistency with Leading Practices Could Enhance Management of Loan and Grant Programs*, [GAO-17-301](#) (Washington, D.C.: Apr. 13, 2017).

²⁴GAO, *Broadband: Additional Stakeholder Input Could Inform FCC Actions to Promote Competition*, [GAO-17-742](#) (Washington, D.C.: Sept. 19, 2017).

- **Tribal broadband access.** In 2018, we examined challenges that tribes face in accessing broadband services, focusing on two particular areas: (1) tribes' ability to obtain and access spectrum for providing broadband and (2) tribes' partnerships with private sector companies and others, and the ability to obtain funding to deploy broadband infrastructure on tribal lands. We found that tribes cited a number of barriers to obtaining licenses for spectrum. We also found that although tribes said partnerships with the private sector improved access to broadband, there are few such partnerships, and that tribes face regulatory barriers in applying for funding from RUS grant programs.²⁵ We made three recommendations to FCC to collect data on tribal access to spectrum, analyze unused spectrum over tribal areas, and make information about available spectrum more accessible. We also made one recommendation to RUS to identify and address any regulatory barriers that may impede efforts by tribes to obtain RUS funding. FCC agreed with the recommendations, and RUS neither agreed nor disagreed with its recommendation. The agencies have not yet implemented these recommendations.

Industry and Federal Investments Have Reduced Broadband Deployment Gaps and Improved How Progress Is Measured, Although Some Challenges Persist

Industry Invested Billions of Dollars in Broadband

According to the U.S. Census Bureau's Annual Capital Expenditures Survey data, the telecommunications industry that provides various types of broadband services—fixed, mobile, or satellite (and other)—spent an estimated \$795 billion (2018 dollars) in total capital expenditures from

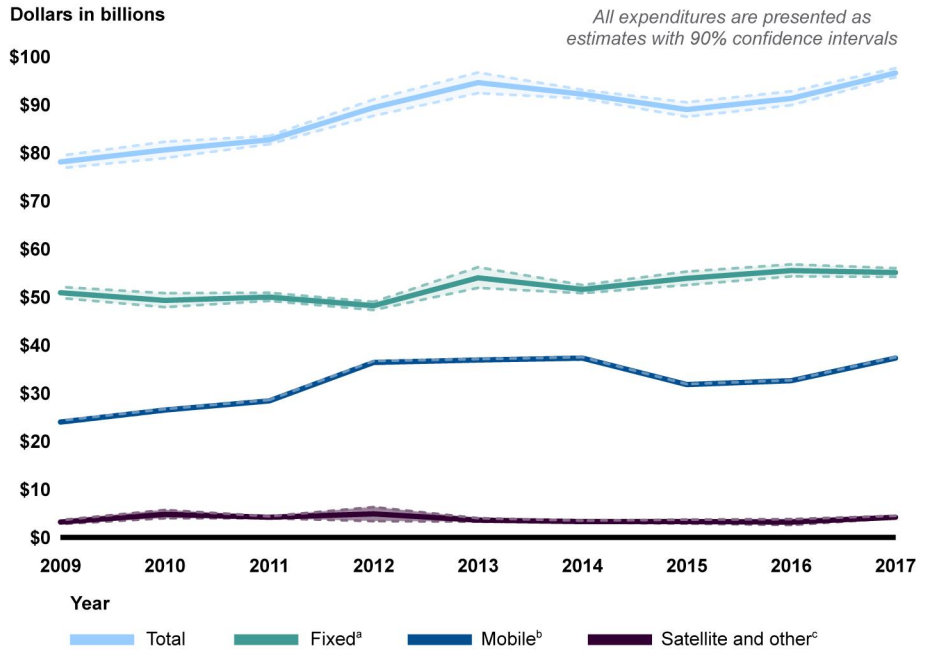
²⁵GAO, *Tribal Broadband: FCC Should Undertake Efforts to Better Promote Tribal Access to Spectrum*, [GAO-19-75](#) (Washington, D.C.: Nov. 14, 2018) and *Tribal Broadband: Few Partnerships Exist and the Rural Utilities Service Needs to Identify and Address Any Funding Barriers Tribes Face*, [GAO-18-682](#) (Washington, D.C.: Sept. 28, 2018). The agencies had not yet taken actions to implement the recommendations from both of these reports, as of January 2020.

2009 through 2017.²⁶ Selected broadband providers that we contacted stated that they used the majority of their capital expenditures to improve the capability and reliability of their existing broadband infrastructure or expand infrastructure into new areas. For instance, one provider said it expanded wireless broadband service in Iowa and another provider constructed new towers to transmit fixed-wireless broadband signals across parts of Oklahoma. Some providers we contacted said that their capital expenditures may include funds from federal broadband programs or other items not related to broadband, such as the purchase of real or personal property or the acquisition of other broadband companies. Providers that we contacted offered few, if any, details about their investments. Instead, they said that their detailed expenditures were proprietary or they referred us to their annual reports, which contain limited information on capital expenditures. Census data showed that annual total capital expenditures increased from about \$78 billion in 2009 to about \$97 billion in 2017 (an increase of about 24 percent), with an average annual growth rate of about 2.8 percent.²⁷ See figure 2. Industry capital expenditures for specific telecommunications sectors varied. For example, estimated expenditures for fixed services consistently exceeded estimated expenditures for mobile services, although mobile services experienced a greater increase—55 percent compared to an 8 percent increase in estimated expenditures for fixed services from 2009 through 2017.

²⁶Each year, the U.S. Census Bureau surveys the telecommunications industry—an industry sector engaged in operating and/or providing access to facilities for the transmission of voice, data, text, sound, and video—about its capital expenditures. Companies in this industry are grouped into three subgroups—wired (broadband internet service providers through cable, DSL, and telephone carriers), wireless (cellular phone service and wireless internet service providers), and other (satellite internet service providers and resellers who purchase access and capacity from owners and operators of telecommunication networks). For the purposes of this report, we use the categories of fixed for wired; mobile for wireless; and satellite and other for other.

²⁷All estimates from surveys are subject to sampling error. At a 90% confidence level, we estimate that the industry total capital expenditure has a maximum margin of error of ±\$2.165 billion in 2013. The margin of error at a particular confidence level is a measure of the possible difference between the sample estimate and the population value.

Figure 2: Estimated Capital Expenditures by Telecommunications Industry Sector from 2009 through 2017 (2018 dollars)



Source: GAO analysis of U.S. Census Bureau data. | GAO-20-535

Data Table for Figure 2: Estimated Capital Expenditures by Telecommunications Industry Sector from 2009 through 2017 (2018 dollars in billions)

Year	Total			Fixed			Mobile			Satellite		
	Upper	Median	Lower	Upper	Median	Lower	Upper	Median	Lower	Upper	Median	Lower
2009	79.4	78.1	76.8	52.1	50.9	49.8	24.3	24	23.7	3.6	3.2	2.8
2010	82.3	80.6	78.9	50.8	49.3	47.9	26.7	26.5	26.2	5.7	4.8	4
2011	83.5	82.7	81.8	50.9	50	49.2	28.6	28.4	28.3	4.4	4.2	4
2012	91.1	89.4	87.7	49	48.2	47.3	36.7	36.4	36.1	6.3	4.9	3.4
2013	96.7	94.6	92.4	56.2	54	51.9	37.1	36.9	36.7	4	3.6	3.3
2014	93.1	92.2	91.3	52.5	51.6	50.8	37.5	37.3	37	3.5	3.3	3.1
2015	90.5	89	87.5	55.3	53.9	52.5	31.9	31.8	31.6	3.7	3.3	2.9
2016	92.8	91.3	89.9	56.8	55.5	54.3	32.7	32.6	32.5	3.8	3.2	2.6
2017	97.6	96.6	95.7	56	55.1	54.2	37.5	37.3	37.1	4.5	4.2	4

Note: The survey estimates are presented along with their margins of error at the 90% confidence level.

^aFixed technologies can provide broadband to single locations like customers' homes or businesses.

^bMobile technologies provide internet access wherever a customer has access to a cell tower.

^cSatellite technologies provide broadband to wide swaths of the country to customers with a service subscription.

Federal Agencies Targeted Investment for Rural Deployment and Improved Their Ability to Measure Impact

In comparison to industry spending, federal investment is much smaller, representing about 6 percent of total industry capital expenditures. However, this investment is critical to supporting deployment of broadband in rural areas where industry might not otherwise invest, due to potentially higher costs and lower investment returns. According to FCC, RUS, and NTIA data, federal program investments totaled about \$47.3 billion (2018 dollars) to target broadband infrastructure in unserved or underserved areas from 2009 through 2017.²⁸ Of these three federal agencies, FCC provided the largest share of support through the Universal Service Fund's high-cost program—which is an ongoing program. A second agency, RUS, offered loans and grants.²⁹ And NTIA primarily funded broadband deployment through the Recovery Act,³⁰ which provided one-time funding for projects that are largely complete and are no longer active. To illustrate:

- **FCC's high-cost program.** The high-cost program disbursed about \$41.7 billion (2018 dollars) in support of both deployment and maintenance of voice and broadband-capable networks from 2009 through 2017.³¹
- **RUS's programs.** RUS provided grants or loans, or a combination of both, through a variety of funding programs. The Broadband Initiatives Program—a Recovery Act program—awarded about \$2.2 billion (2018 dollars) in grants to industry for infrastructure projects in fiscal year 2010. RUS's Community Connect Grant Program—a grant

²⁸For the purposes of this report, we did not examine support for broadband adoption, emergency communications, or mapping activities. The total includes amounts in calendar year (for FCC data) and fiscal years (for RUS and NTIA data) and is an approximation.

²⁹Recovery Act, Pub. L. No. 111-5, 123 Stat. at 128.

³⁰Recovery Act, Pub. L. No. 111-5, 123 Stat. at 118.

³¹FCC's Universal Service Fund's high-cost program receives monies from mandatory payments from companies providing telecommunications services. In turn, these companies typically pass the payment on as fees to their customers. Disbursements are by calendar year.

program designed to fund broadband deployment in rural areas where such service did not exist—awarded \$95 million (2018 dollars) in grants from fiscal year 2009 through fiscal year 2017. In addition to these grants, RUS provided infrastructure loans that recipients must repay to the government with interest. Specifically, RUS provided about \$4.0 billion (2018 dollars) in loans to private providers through the Broadband Initiatives Program, the Telecommunications Infrastructure Loan Program, and the Broadband Loan Program.³²

- **NTIA’s Broadband Technology Opportunities Program, Comprehensive Community Infrastructure projects.** This Recovery Act program awarded a one-time \$3.3 billion in competitive grants to states, municipalities, and non-profit and commercial organizations in fiscal year 2010. Nearly all of the 116 broadband infrastructure projects have been completed.

All three programs have used metrics to show progress in closing deployment gaps. Specifically, FCC has a metric for locations served, whereas RUS and NTIA measure miles of fiber-optic cable deployed, in addition to having metrics that count particular types of locations served or reported number of new subscribers.

- FCC collects data from providers about new locations to which they deployed broadband using high-cost program support.³³ Deployment data submitted by providers that receive support from FCC’s high-cost program showed that they used those funds to make broadband available to about 2.3-million new residential and small business

³²Additionally, RUS has begun awarding funding through its ReConnect Program, and officials expect to obligate over \$725 million in loans and grants to serve over 600,000 rural Americans.

³³In 2014, we found that FCC collected and reported a range of data and information on high-cost program funding, but gaps in its data analysis and reporting limited its ability to demonstrate the program’s effectiveness. We recommended that FCC demonstrate how participants used high-cost funds to improve broadband availability. In response, FCC made changes to high-cost program participant data reporting that provided additional insights into new locations funded by the program. See GAO, *Telecommunications: FCC Should Improve the Accountability and Transparency of High-Cost Program Funding*, [GAO-14-587](#) (Washington, D.C.: July 22, 2014).

locations, mostly from 2015 through 2017.³⁴ In commenting on a draft of this report, FCC stated that this figure has increased to about 4.2-million new locations. This updated figure is based on data through 2019 that are not yet publicly available; they are expected to be released later in 2020. Providers report these data to FCC, which are subject to verification by the Universal Service Administrative Company—the not-for-profit corporation designated by the FCC as the administrator of the Universal Service Fund, including the high-cost program.³⁵ As of May 2020, FCC officials said that FCC has authorized Connect America Fund Phase II support to deploy broadband at 25 Mbps/3 Mbps or higher to more than 631,000 locations by 2025 or sooner.³⁶

- In December 2016, RUS released the final Broadband Initiatives Program progress report, which noted that the program deployed 66,521 miles of fiber-optic cable, added 5,468 wireless access points, and resulted in 334,830 subscribers receiving new or improved broadband.³⁷
- In December 2016, NTIA reported that the Broadband Technology Opportunities Program resulted in the deployment of 117,072 miles of new or upgraded broadband infrastructure. NTIA also reported that

³⁴FCC began collecting location deployment data in 2016 from providers that received funds for broadband from the Alaska Plan, Rural Broadband Experiments, Connect America Fund Phase II, Alternative Loop Connect America Cost Model, or Broadband Loop Support. FCC requires providers to report deployments in prior years as counting toward their deployment obligation, depending on the type of funding received; however, such deployments comprise a small percentage of the reported locations. A “location” is generally a single consumer or small-business address, but a house or an apartment building—with multiple locations—is reported as a multi-dwelling unit with the number of units at that location.

³⁵We have ongoing work examining the performance metrics of the FCC high-cost program.

³⁶FCC Public Notice, Connect America Fund Phase II Auction Support Authorized for 77 Winning Bids, 2020 WL 2537615, FCC 20-514 (2020).

³⁷In 2012, we found limitations with performance data on broadband programs funded by the Recovery Act. We recommended that RUS take steps to improve the quality of reporting for the number of miles of fiber and wireless access points deployed. RUS implemented our recommendation in 2013 by providing guidance to its field staff for validating the number of miles of fiber and access points reported by providers. In addition, RUS officials said that they were in constant contact with providers to validate the accuracy of the reporting. See GAO, *Recovery Act: Broadband Programs Are Ongoing, and Agencies’ Efforts Would Benefit from Improved Data Quality*, [GAO-12-937](#) (Washington, D.C.: Sept. 14, 2012).

awardees connected nearly 26,000 community anchor institutions—such as schools, libraries, and hospitals—to broadband and provided access to nearly 14,149 homes and businesses.

Although the agencies used metrics to show progress, the metrics used were not always the same, making it difficult to draw comparisons among programs.

The impact of these federal programs goes beyond the number of miles of fiber or the number of subscribers. Although these programs promoted the availability and use of broadband throughout the country, our prior work found that they also stimulated economic development and created new jobs. For example, we reported in 2012 that NTIA's and RUS's Recovery Act programs had created about 9,000 full-time jobs.³⁸ Recovery Act grantees we interviewed for our prior work gave examples of the types of economic development broadband enabled, such as tourism-oriented businesses being better able to provide web sites and online reservation systems. They also reported that broadband infrastructure improved broadband speed for schools, community colleges, and health care providers.

Several studies have attempted to measure the economic benefits of broadband. A 2006 study prepared for the Department of Commerce claimed to be the first attempt to quantify the impact of broadband on economic growth.³⁹ The study found that, between 1998 and 2002, communities in which broadband was available experienced more rapid growth in employment, the number of businesses, and businesses in information technology sectors, relative to comparable communities without broadband. Subsequently, other studies have attempted to assess the economic impact of broadband.⁴⁰ For example, a 2016 study from the Hudson Institute found that rural broadband providers directly and indirectly added \$24.1 billion to the U.S. economy and the rural broadband industry supported about 70,000 jobs in 2015, both through its own employment and the employment that its purchases of goods and

³⁸GAO, *Recovery Act: Broadband Programs Are Ongoing, and Agencies' Efforts Would Benefit From Improved Data Quality*, [GAO-12-937](#) (Washington, D.C.: Sept. 14, 2012).

³⁹Sharon E. Gillett, Massachusetts Institute of Technology, *Measuring Broadband's Economic Impact*, report prepared for the Economic Development Administration, U.S. Department of Commerce (February 28, 2006) p. 4.

⁴⁰Congressional Research Service, *Broadband Internet Access and the Digital Divide: Federal Assistance Programs*, (Oct. 4, 2018).

services generated.⁴¹ About the same time, a 2016 broadband forum sponsored by the National Science Foundation and NTIA concluded that during the past decade, research has deepened the understanding of the potential impacts of broadband on the economy and society. The study made clear the need for more research on the impact of broadband.⁴² On December 11, 2018, FCC opened the new Office of Economics and Analytics, consisting of economists, attorneys, and data professionals to, among other things, provide economic analysis, including cost-benefit analysis, for FCC proceedings.

Broadband Availability Has Increased, but Measuring Deployment Has Limitations

FCC's annual *Broadband Deployment Report*, which reports on broadband deployment generally and not just deployments made with FCC funding, states that broadband availability has increased both nationally and for specific segments of the population, as shown in figure 3.⁴³

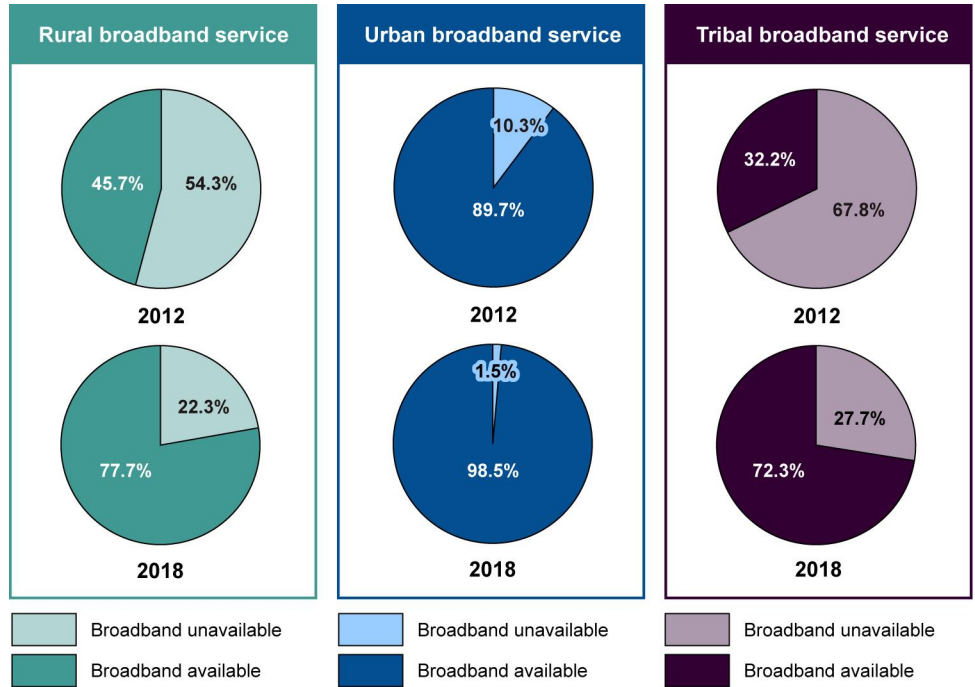
- National: About 94.4 percent of the U.S. population had fixed broadband service available at customer premises, such as residences, with minimum speed of 25 Mbps/3 Mbps in 2018, up from 81.2 percent of the population in 2012.
- Rural: About 77.7 percent of the rural population had fixed broadband service available with minimum speed of 25 Mbps/3 Mbps in 2018, up from 45.7 percent of the rural population in 2012.
- Tribal: About 72.3 percent of tribal lands had fixed broadband service available at the same speeds in 2018, up from 32.2 percent of the tribal population in 2012.

⁴¹This study did not assess broadband specifically, but assessed the contribution of rural broadband providers that offer a range of services, such as broadband, cable television, and data storage.

⁴²*Broadband 2021*, a Report of the Interdisciplinary Workshop on the Development of a National Broadband Research Agenda (July 25, 2016).

⁴³The *Broadband Deployment Report*, mandated by Congress, and codified in 47 U.S.C. § 1302(b), documents the progress made each year to deploy broadband to all Americans in a reasonable and timely fashion.

Figure 3: Comparison of Fixed Broadband Availability in Rural, Urban, and Tribal Areas at the Speed of 25 Megabits per Second (Mbps) Upload and 3 Mbps Download, 2012 and 2018, according to FCC's Reports



Source: Federal Communications Commission (FCC) broadband report, February 2, 2018, and April 24, 2020. | GAO-20-535

Data table for Figure 3: Comparison of Fixed Broadband Availability in Rural, Urban, and Tribal Areas at the Speed of 25 Megabits per Second (Mbps) Upload and 3 Mbps Download, 2012 and 2018, according to FCC's Reports

Year	Rural broadband service		Urban broadband service		Tribal broadband service	
	Broadband unavailable	Broadband available	Broadband unavailable	Broadband available	Broadband unavailable	Broadband available
2012	54.3%	45.7%	10.3%	89.7%	67.8%	32.2%
2018	22.3%	77.7%	1.5%	98.5%	27.7%	72.3%

Note: For the 2012 estimate, FCC relied on data from the National Telecommunications and Information Administration (NTIA).

Although these data show broadband availability increasing in a variety of ways, the data also demonstrate that fixed broadband is still much more readily available to urban consumers than it is available to consumers in rural areas. FCC's *Broadband Deployment Report* shows that as of 2018, about 22.3 percent of the rural population and 27.7 percent of tribal population did not have fixed broadband service available with minimum

speed of 25 Mbps/3 Mbps; whereas, only about 1.5 percent of the urban population did not have fixed broadband service available at the same speed. As we will discuss later in this report, limitations with how FCC collects and uses deployment data from providers to measure broadband access overstate the extent to which broadband is available, a weakness we have pointed out and that FCC has taken steps to address.

As the availability of broadband service has increased over time, some segments of the population continue to lag behind others in adopting broadband, even if it is available, and therefore are unable to benefit from it. Our prior work has shown that several factors have been, and continue to be, barriers to broadband adoption—specifically, affordability, lack of perceived relevance, and lack of computer skills. FCC identified these barriers in its *National Broadband Plan* of 2010, and our more recent work in 2015 showed that these three barriers persist.⁴⁴ We found that:

- the cost of a subscription for internet service and the purchase of computer equipment was the most frequently identified barrier;
- the perception that broadband does not provide enough utility relative to its cost acted as another barrier; and
- the lack of exposure to or knowledge about computers, such as by those aged 65 or older and those with low levels of income and education, was another barrier.

Compounding the effect of these adoption barriers is the lack of competition. FCC has reported that competition could result in lower prices and higher quality services from broadband providers. However, our prior work from 2017 found that 51 percent of the U.S. population had only one fixed broadband provider offering minimum speed of 25 Mbps/3 Mbps.⁴⁵ According to the FCC's 2018 Communications Marketplace Report, that percentage has decreased to about 27 percent of the U.S. population who had only one fixed terrestrial broadband provider offering minimum speed of 25 Mbps/3 Mbps.⁴⁶ In addition, FCC's report stated that 68 percent of the population had at least two providers and

⁴⁴GAO, *Broadband: Intended Outcomes and Effectiveness of Efforts to Address Adoption Barriers Are Unclear*, [GAO-15-473](#) (Washington, D.C.: June 2, 2015).

⁴⁵GAO, *Broadband: Additional Stakeholder Input Could Inform FCC Actions to Promote Competition*, [GAO-17-742](#) (Washington, D.C.: Sept. 19, 2017).

⁴⁶FCC Public Notice, Communications Marketplace Report, 2020 WL 868081, FCC 20-177 (Feb. 19, 2020); FCC Public Notice, Communications Marketplace Report, 2018 WL 6839365, FCC 18-181 (Dec. 26, 2018).

approximately 95 percent had at least one provider. Competition in rural areas can be particularly challenging as rural areas generally do not have enough demand to support multiple carriers.

Federal Agencies Have Taken Action to Help Close Broadband Gaps by Modifying Funding Programs and Reforming Deployment Data

Federal Agencies Have Modified Programs to Increase Broadband Support

Over time, the types of technologies that provide access to broadband have evolved. Federal agencies have responded by making changes to their programs that support broadband. Specifically, FCC and RUS have expanded which types of broadband providers are eligible to receive support from their programs, allowing increased participation by satellite and wireless broadband providers. Satellite and mobile broadband may be able to overcome some impediments to access faced by other services, such as high deployment costs and geographical barriers that pose challenges for deploying broadband over fixed networks using fiber or cable. In turn, this expansion of eligibility corresponds with the shrinking gap in broadband deployment discussed previously.

In the case of FCC, the agency has taken action since the 1990s to address technological changes related to broadband deployment. For example, changes in communications technology and competition in the communications marketplace led FCC to reform the high-cost program for purposes beyond maintaining telephone service, including supporting broadband deployment. In 2011, FCC adopted new rules that fundamentally changed the high-cost program and expanded the program to support broadband capable networks. Under these rules, FCC established new funding streams within the high-cost program, such as the Connect America Fund, which addresses fixed broadband availability gaps in underserved and unserved areas, and the Mobility Fund, which supports deployment of wireless networks to provide mobile broadband.

FCC also updated its regulatory framework to recognize changes in existing technology and potential technologies in delivery of broadband. For example, in 2016, FCC deemed geostationary satellites eligible to

participate in the second phase of the Connect America Fund.⁴⁷ Additionally, since 2017, FCC also recognized low and medium earth orbiting satellites as broadband-capable technologies that may be eligible to participate in programs after deployment. According to FCC officials, prior to these changes, they did not consider satellite as broadband-capable due to its high signal latency⁴⁸ and internet speeds that were below the FCC benchmark speed, issues that recent technological advances have improved.⁴⁹ Similar to FCC, RUS funding programs used to focus funding on telephone service but over time, RUS has reformed them to provide funding for broadband infrastructure and deployment. For example, according to RUS officials, since 1995 the RUS Telecommunications program has only funded systems that were capable of providing high-speed internet and now supports broadband services.

In addition to past program transformation efforts, both FCC and RUS have proposed actions to further reform or expand their programs that provide funding for broadband deployment. For example, in August 2019, FCC started the rulemaking process for the new Rural Digital Opportunity Fund. In January 2020, FCC adopted a Report and Order establishing a framework for the fund, providing up to \$20.4 billion through two funding rounds, each providing support over overlapping 10-year periods.⁵⁰ This fund is the next iteration of the high-cost program, and it continues the overarching goals of prior high-cost programs to expand service into rural areas. The Rural Digital Opportunity Fund will focus its first round of funding on census blocks that FCC deployment data have marked as completely unserved, and per the FCC order will incentivize parties participating in the program to serve tribal census blocks.⁵¹ Similarly, in

⁴⁷*In re Connect America Fund*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 5949, 5960, 5962 ¶¶ 29, 30, & 33 (2016).

⁴⁸Latency refers to the amount of time it takes for data to travel from a computer to a server and back again. The higher the latency the more likely there will be delays, which can affect the performance of some services.

⁴⁹Given the relatively recent development of satellite providers offering 25 Mbps/3 Mbps service, satellite broadband service was not included in FCC deployment data or maps prior to the 2018 *Broadband Deployment Report*.

⁵⁰*In re Rural Digital Opportunity Fund Connect America Fund*, Notice of Proposed Rulemaking, 2019 WL 3605128, FCC 19-77 (2019); *In re Rural Digital Opportunity Fund Connect America Fund, Report and Order*, 2020 WL 756001, FCC 20-5 (2020).

⁵¹FCC plans for there to be at least two rounds of funding through the Rural Digital Opportunity Fund, similar to the structure of the Connect America Fund.

April 2020, FCC initiated a rulemaking to establish the 5G Fund—which would replace the Universal Service Mobility Fund Phase II—and make up to \$9 billion available to carriers to aid in deployment of advanced 5G mobile wireless services in rural America.⁵² In addition to FCC’s actions, RUS officials said they are planning for future funding rounds for the ReConnect Program after they have awarded the initial phase of funding. As of April 15, 2020, RUS had closed the application phase for a second round of funding under the program.

Despite federal efforts to address broadband gaps, there are still limits on participation in some programs. For example, RUS’s ReConnect Program offers a mix of grants and loans to incentivize broadband infrastructure in areas not currently served by existing service providers. However, the ReConnect Program limits eligibility to fixed and satellite broadband providers, with mobile wireless networks ineligible for funding. In order to participate in FCC’s high-cost program, a provider must meet FCC’s definition of an eligible telecommunication carrier (ETC).⁵³ However, our prior work and stakeholders we interviewed for this review identified barriers to attaining ETC status. As we previously reported, tribal entities cited the statutory requirements applicable to ETC designation⁵⁴ as a primary barrier to accessing federal funds. Additionally, cable providers we spoke with for this review also said they viewed the ETC designation as a potential barrier to entry into the high-cost program. At present, FCC and states have complementary authority to make ETC designation

⁵²*Establishing a 5G Fund for Rural America*, Notice of Proposed Rulemaking, 2020 WL 1977100, FCC 20-52 (2020). 5G stands for the fifth generation of mobile communications. This next generation of technology promises consumers faster data rates with lower latency in transmitting data.

⁵³ETCs are designated primarily by states, or, in some cases, by the FCC, and have requirements that they must meet including demonstrating that they will satisfy applicable consumer protection and service quality standards, and the ability to operate during emergencies, among others. 47 C.F.R. § 54.201 and 47 C.F.R. § 54.202.

⁵⁴47 U.S.C. § 214(e).

decisions.⁵⁵ During our 2018 review of barriers that tribes face in supporting broadband investment, FCC officials said that most of the carriers that were eligible for ETC designation at that time were the telephone companies that were in existence when the 1996 Act was enacted into law. Further, FCC officials said they determined that the statute is clear that only ETCs may receive program support, and therefore the agency does not have the authority to allow non-ETCs to receive high-cost support payments.⁵⁶ More recently, greater numbers of companies that are not traditional telephone companies have received ETC designation, particularly in connection with the Connect America Fund Phase II.

In addition to the ETC designation matter described above, industry stakeholders highlighted several other issues that can affect access to federal support, noting that these issues may require further action by relevant federal agencies or possible legislative action. The issues cited included:

- **Technology Neutral Federal Programs:** Most federal broadband programs focused on fixed technology over other technologies, but as described above, there have been reforms to broaden eligibility to other providers. Even with those reforms, industry stakeholders representing satellite and mobile service providers noted that there are program requirements that affect one technology more than another technology. For example, satellite providers that sought funding through FCC's Connect America Fund said that, after they sought funding in 2018, FCC changed how it planned to measure latency, a change affecting only satellite providers.

⁵⁵47 U.S.C. § 214(e)(2). State designations would also have state-imposed eligibility requirements that could vary depending on which state is making the designation. Recently, the U.S. Court of Appeals for the Eighth Circuit affirmed a lower court ruling, holding that Voice over Internet Protocol (VoIP), which is voice service transmitted over the internet—and the type of voice service that most cable companies provide—is an information service under the Telecommunications Act and thus not subject to state regulation. *Charter Adv. Svcs LLC v. Lange*, 903 F.3d 715, 718-20 (8th Cir. 2018). Accordingly, the court held that the VoIP service provider was not subject to state regulation. Because Telecommunications Act of 1996 grants primary authority to states to make ETC designations subject to fulfillment of eligibility requirements, the appellate court's opinion may have an impact on ETC designations by the seven states that comprise the Eighth Circuit. FCC officials noted that this case has not had an effect on ETC designations.

⁵⁶GAO, *Tribal Broadband: FCC's Data Overstate Access, and Tribes Face Barriers Accessing Funding*, [GAO-19-134T](#) (Washington, D.C.: Oct. 3, 2018).

- **Spectrum Availability:** Availability of adequate spectrum was cited by a range of stakeholder groups we spoke with as an issue that could affect providers' ability to deploy services. Spectrum availability affects many broadband services. For example, in addition to satellite and mobile providers, fixed-wireless—a point-to-point or point-to-multipoint broadband service delivery option—is a type of fixed broadband service often utilized in rural areas that needs spectrum to deliver service. In its comments, FCC noted that the changes it made to the exact testing conditions were in response to requests by satellite providers and that the agency balanced changing expectations with the benefits of minimizing unnecessary burdens on carriers and their customers imposed by the testing regime.
- **Federal Funding Mechanisms:** Some industry stakeholders we spoke with noted that the programs' funding requirements and the type of federal funding mechanism utilized—such as grants, loans, or hybrids of grants and loans—could affect a provider's ability to access federal funds. For example, RUS awards its Reconnect Program funding through grants, loans, or both. Providers we spoke with noted that for all of the funding options, the Reconnect Program requires a lien on the funded assets. For some providers, allowing a lien against an asset would violate stockholder agreements or other aspects of their business. Additionally, representatives from an association representing state public service commissions we spoke with also stated that the FCC high-cost fund and its various funding programs should be reviewed periodically to ensure that both the contributions and funding outcomes are in the best interests of consumers and providers.

Although agencies have modified their broadband funding programs to keep up with changes in broadband services, other changes that could be beneficial to the public would require statutory changes. The last major overhaul to telecommunications law occurred under the 1996 Act, which established many of the telecommunications programs that now fund broadband deployment and established statutory constructs like ETCs, which, as discussed above, can affect provider eligibility. Given the significant and ongoing changes in how Americans use the internet and the technologies that provide access to it, members of Congress have proposed legislative actions in recent years to sustain progress in closing the broadband deployment gap.⁵⁷ Among the proposals were a range of

⁵⁷Congressional Research Service, *Broadband Internet Access and the Digital Divide: Federal Assistance Program* (Washington, D.C.: Updated Oct. 25, 2019).

federal funding and incentives aimed at improving funding to rural areas and addressing issues related to deployment.

FCC Has Proposed Mapping Data Reforms Aimed at Improving Federal Broadband Program Administration

As we previously reported, FCC's definition of broadband availability can lead to overstatements of fixed broadband availability.⁵⁸ For instance, in 2013 FCC began collecting broadband availability data by census blocks. The agency counts an entire census block as served if a provider reports that it does offer—or could offer without an extraordinary commitment of resources—service some, but not necessarily all, of the locations in the census block.⁵⁹ FCC has recognized that by measuring availability at the census block level, not every person may have access to broadband in a block that the data show as served. FCC has noted that census blocks in rural areas tend to cover larger geographic areas than in urban areas and providers may only deploy service to a portion of the census block.⁶⁰ Deployment reporting in this manner does not allow FCC to answer with certainty questions like how many Americans have broadband available to their homes or where it needs to target its resources. Several selected providers and industry associations we contacted also expressed concerns about how deployment is measured, and said the measurement approach could make it difficult for them to make informed investment and deployment decisions. In 2013, FCC declined to gather fixed broadband data at a level more granular than the census block—such as address-level data—because the agency concluded that the complexity and filing burden on the industry would outweigh the benefit.⁶¹ In 2018, we recommended, among other things, that FCC develop and implement methods—such as a targeted data collection—for collecting and reporting accurate and complete data on broadband access specific to tribal

⁵⁸GAO, *Broadband Internet: FCC's Data Overstate Access on Tribal Lands*, [GAO-18-630](#) (Washington, D.C.: Sept. 7, 2018).

⁵⁹Many census blocks correspond to individual city blocks bounded by streets, but blocks—especially in rural areas—may include many square miles.

⁶⁰*In re Modernizing the FCC Form 477 Data Program*, Further Notice of Proposed Rulemaking, 32 FCC Rcd 6329 (2017).

⁶¹*In re Modernizing the FCC Form 477 Data Program*, Report and Order, 28 FCC Rcd 9887, 9903 ¶ 35 (2013).

lands.⁶² Subsequently in 2019, FCC began to address this recommendation by establishing the Digital Opportunity Data Collection—a more granular, nationwide data broadband deployment collection effort.⁶³

FCC issued a Report and Order, and Second Further Notice of Proposed Rulemaking, on this new initiative to improve the accuracy of broadband deployment mapping data in August 2019. This new initiative requires fixed broadband providers to identify their service areas using free-form geographic shapes called polygons.⁶⁴ The polygons would identify the presence of service with more geographic precision than the current census-block method affords. Officials from FCC and USTelecom stated this new mapping effort was informed in part by a 2019 USTelecom mapping and data-collection pilot project.⁶⁵ According to USTelecom officials, this pilot project combined several data sources to determine “serviceable locations,” which refers to specific locations or structures that could need broadband. With these serviceable locations, USTelecom’s pilot project sought to distinguish between buildings not typically needing broadband service—such as a barn or storage shed—from a primary residence or small business. According to USTelecom representatives, a combination of polygons and serviceable locations data would yield a better picture of where to target new investments in deployment to achieve the greatest increase in access to broadband. FCC officials noted that the impact of the polygon approach may vary depending on the service features of each census block. Figure 4 below shows an example of how the new polygon approach may result in improved data compared to the census block approach currently used by FCC.

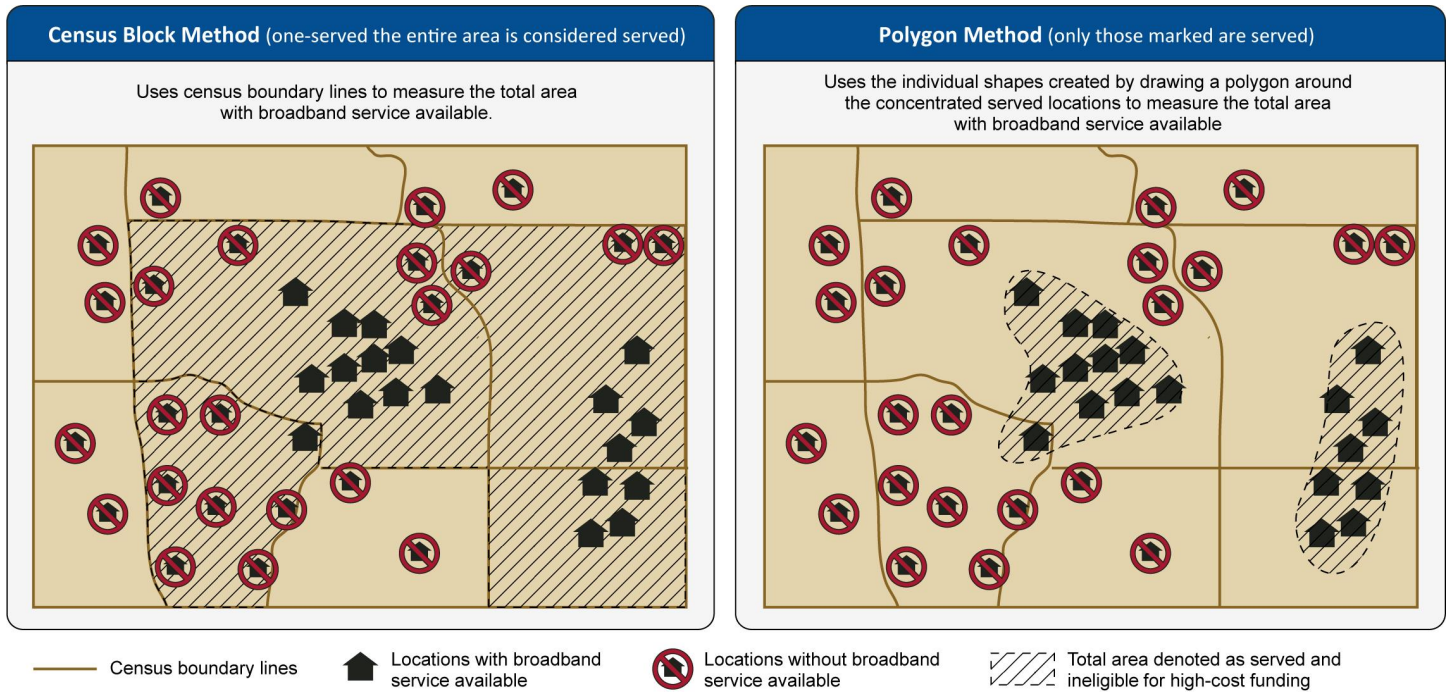
⁶²GAO, *Broadband Internet: FCC’s Data Overstate Access on Tribal Lands*, [GAO-18-630](#) (Washington, D.C.: Sept. 7, 2018).

⁶³*In re Establishing the Digital Opportunity Data Collection; Modernizing the FCC Form 477 Data Program*, Report and Order and Second Further Notice of Proposed Rulemaking, 2019 WL 3716422, 34 FCC Rcd 7505 (2019) (“*Digital Opportunity Data Collection*”).

⁶⁴*Digital Opportunity Data Collection*, 2019 WL 3716422, at *3 ¶8.

⁶⁵USTelecom, an industry association representing broadband service providers, conducted the pilot project in Virginia and Missouri to test this new methodology for deployment data and mapping.

Figure 4: Comparison of the Current Census Block Method to the Proposed Polygon Method for Collecting Broadband Deployment Data



Source: GAO analysis of Federal Communications Commission and USTelecom information. | GAO-20-535

As part of the rulemaking, FCC has requested comments on several issues, including how providers should define their polygons, and the procedures that fixed providers should follow if their polygons are disputed.⁶⁶ At the time it issued the report and order, FCC had ongoing investigations into the coverage maps of some wireless providers, and therefore limited the new data collection obligations to fixed broadband providers while seeking comment on how best to incorporate mobile wireless coverage data into the effort in the future. FCC also proposed the use of public input to help verify the accuracy of the polygons and sought comment on whether it should discontinue the collection of census block data if the polygon-based deployment data prove to be gathering better deployment data once it is established. Additionally, on March 23, 2020, the Broadband Deployment Accuracy and Technological Availability Act was enacted. The act directs FCC to issue final rules on data collection for both fixed and wireless deployment within 180 days.⁶⁷

⁶⁶Digital Opportunity Data Collection, 2019 WL 3716422, at *54 ¶¶6.

⁶⁷Pub .L. No. 116-130, 134 Stat. 228, 229 (2020).

In commenting on a draft of this report, FCC noted that it is in the process of implementing the statute, and that the statute largely affirms rules that FCC adopted in August 2019 but differs in some respects. FCC also noted that, while it is working to implement the requirements of the act, it is unable to comply with all of the requirements without a further appropriation.

This change has the potential to improve how both FCC and RUS target deployment gaps by providing more accurate and granular information that could better identify truly unserved areas and results in better targeting of federal funds to those areas. As we discussed above, our prior work has found that FCC's current deployment data lack accuracy in a manner that overstates where consumers have access to broadband, which, in turn, limits federal agencies' efforts to effectively target their broadband funds. Specifically, our 2018 report noted that overstating access increases the risk that unserved areas remain unserved, since areas that deployment data show as served are not eligible for funding.⁶⁸ Although that report specifically looked at this risk for tribal areas, it is potentially a concern for other unserved areas. FCC officials noted that improved data would help inform future funding under the high-cost program by more accurately targeting unserved areas. RUS officials told us that they use FCC deployment data as a source for RUS mapping and program eligibility requirements for the ReConnect Program. RUS officials also believe that their program would benefit from more accurate deployment data.

FCC and RUS Continue to Provide Funding while Coordinating to Avoid Overlap

While efforts are under way to improve deployment data and mapping efforts, both FCC and RUS are continuing to move forward with their programs for funding broadband infrastructure in underserved and unserved areas. The lack of accurate data regarding locations that are not served by broadband may affect the ability of these agencies' programs to target federal funds. In particular, providers and industry associations noted there was a risk of federal programs subsidizing deployment into areas that already have service, at the expense of an unserved area that does not have any service. Given this risk, FCC and RUS each have "eligible area" validation processes that they use to determine if areas are already being served and therefore ineligible for

⁶⁸[GAO-18-630](#).

federal support. Additionally, FCC and RUS have engaged in interagency coordination efforts to keep each agency's program staff apprised of key dates and issues in an effort to avoid overlap between the programs.

Officials from both FCC and RUS have stated that their programs are complementary and noted that their eligibility validation processes reduced the likelihood of service overlaps. The agencies use different processes to determine which geographic areas are eligible for funding, and they share information about the results of these processes as they are able. According to FCC officials, the agency has used a process for validating unserved areas in connection with its support of the Universal Service high-cost program. This validation process primarily relies on providers verifying the Form 477 data they self-report, and then using that data to create and publish a list of unserved census blocks prior to awarding funding. Results from this process have informed how FCC establishes eligible areas, such as those eligible to receive funds in the Connect America Fund's second phase of awards.⁶⁹ A similar process is under way in connection with the Rural Digital Opportunity Fund.⁷⁰ In an additional step to address concerns regarding program overlap, FCC officials noted that the Rural Digital Opportunity Fund would exclude census blocks that have been awarded funding through the RUS ReConnect Program.

RUS's process to verify eligible areas includes provider participation in the verification, as well as onsite testing and research by field staff, to independently verify eligibility of the geographic areas in each ReConnect grant or loan application.⁷¹ RUS officials said they use the publicly available FCC data on unserved areas as a key factor in eligibility decisions. Specifically, RUS officials said that they focus ReConnect eligibility on areas FCC reported as unserved as of 2015 when the first round of FCC's Connect America Fund program was started. They also noted that throughout the application and funding process, they seek input from providers through public notices and emails to solicit feedback on whether areas selected for proposed funding are already served. After

⁶⁹Public Notice, *Connect America Fund Phase II Auction*, 32 FCC Rcd 10381 (2017).

⁷⁰See *In re Rural Digital Opportunity Fund Auction*, 2020 WL 756001, FCC 20-5 (2020); FCC Public Notice, *Wireline Competition Bureau Releases Preliminary List and Map of Eligible Areas for the Rural Digital Opportunity Fund Phase I Auction*, 2020 WL 1278404, DA 20-275 (2020); FCC Public Notice, *Wireline Competition Bureau Releases List of Eligible Census Blocks for the Connect America Fund Phase II Auction (Auction 903)*, 2017 WL 6514191, 32 FCC Rcd 10381 (2017).

⁷¹Rural Utilities Service, *Service Area Validation Execution Guide* (August 2019).

receiving provider feedback on eligible areas, RUS then deploys field staff to conduct on-location tests and other reviews as necessary to determine if the area was unserved prior to funding.

In addition to their eligibility validation steps, FCC and RUS officials told us they share information about where their broadband deployment programs are funding new deployments, as well as other relevant information related to program activity, such as the timing of program applications and awards. FCC and RUS officials told us that they share program information through participation in interagency meetings and working groups that focus on broadband deployment issues and through posting relevant program information—such as funding decisions—online. For example, the Chief of the FCC’s Wireline Competition Bureau and the RUS Administrator, along with other FCC and RUS staff, met in July 2019, January 2020, and February 2020 to discuss issues related to their respective broadband funding programs, including the roll out of the Rural Digital Opportunity Fund and second round of the ReConnect Program. FCC officials told us that at these meetings agency representatives discussed the anticipated timing of elements of their respective programs and ways in which to maximize coordination and avoid overlap. Officials from both agencies also noted there has been ongoing communication between FCC and RUS at the staff level concerning program status and developments through phone calls and meetings. In addition to this ongoing coordination between RUS and FCC, representatives of FCC and RUS also said they participate in relevant working groups through the American Broadband Initiative, such as the Initiative’s Federal Funding Workstream, which meets bi-weekly to discuss broadband funding and deployment.⁷²

The range of collaboration activities undertaken by RUS and FCC staff is especially important because both agencies have similar goals but different timelines for moving forward with their programs. For example, as of March 2020, FCC had the eligible area validation process under way for the Rural Digital Opportunity Fund. Although some timelines are still to be determined, FCC plans to start bidding on the program’s auction phase in October 2020. At the same time, RUS was in the midst of announcing approved projects for the first funding round of the ReConnect Program, and it had applications open for the second round with applications due by April 15, 2020. FCC officials noted that they plan

⁷²The American Broadband Initiative is an interagency effort with NTIA in a leadership role. This initiative’s goal is to develop strategies for increasing efficiency in government broadband programs and includes more than 25 federal agencies.

to maintain close coordination with RUS to reduce the likelihood of overlap with any areas that may be deemed eligible to receive ReConnect funding in the program's second round. Through prior reforms of their respective broadband programs, FCC and RUS have taken steps to try and effectively target federal dollars to support broadband deployment while avoiding the potential to duplicate funding in an area.⁷³ Continuing to improve collaboration and information sharing regarding eligibility and program timelines will be critical for both agencies to achieve greater efficiency in their program's ability to target funds to unserved areas and thus make progress toward closing the deployment gap.

Agency Comments

We provided a draft of this report to the Federal Communications Commission, the Department of Agriculture's Rural Utilities Service, and the Department of Commerce's National Telecommunications and Information Administration for comment. FCC and RUS provided technical comments, which we incorporated as appropriate. NTIA had no comments.

We are sending copies of this report to the appropriate congressional committees, the Chairman of the Federal Communications Commission, the Secretary of the Department of Agriculture, the Secretary of the Department of Commerce, and other interested parties. In addition, the report is available at no charge on the GAO website at <https://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or vonaha@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix II.



⁷³FCC's Universal Service Fund used to allow funding of multiple carriers in the same area. For example, our 2014 report on the FCC high-cost program described how the Universal Service Fund could be used to provide support for multiple carriers serving the same area or to support a carrier serving the same area as another that did not receive funding. FCC's efforts to transform the Universal Service Fund begun in 2011 changed the program to eliminate these practices, see [GAO-14-587](#).

Letter

Andrew Von Ah
Director, Physical Infrastructure Issues

Appendix I: U.S. Broadband Providers' Capital Expenditures

Another estimate of capital expenditures by USTelecom—a broadband industry association—uses a different scope and methodology than the U.S. Census Bureau's Annual Capital Expenditures Survey. The association reports total capital expenditures for U.S. broadband providers, as shown in table 2.

Table 2: U.S. Broadband Providers' Capital Expenditures from 2009 through 2018

(Dollars in Billions)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
USTelecom	74.9	78.0	76.6	76.8	82.4	83.1	81.7	78.1	78.7	80.0

Source: GAO analysis of USTelecom Research Brief, July 31, 2019 | GAO-20-535

Note: Dollar values each year represented in 2018 dollars

USTelecom's data include expenditures from fixed (wireline), mobile (wireless), and cable companies. Its primary source of data are publicly traded companies' financial statements filed with the Securities and Exchange Commission. USTelecom also makes estimates for companies that do not report financial information publicly. Its data exclude some companies, such as satellite providers, telecommunication resellers, and electric utilities. USTelecom publishes estimates annually for advocacy or research purposes. Its capital expenditures data differ from the Census Bureau's Annual Capital Expenditures Survey estimates for telecommunications industry in scope, methodology, and timing, among other things. For instance, the Census Bureau's survey is broader in scope. Specifically, in addition to the types of companies USTelecom includes in its data, the Census Bureau's survey data include satellite providers, resellers, and other telecommunications providers.

In addition, the Census Bureau collects data through a survey instrument from both publicly traded and privately held companies across the United States. It makes statistical inferences about the capital expenditures for the entire telecommunications industry, whereas USTelecom collects data mainly from financial reports for a defined set of providers and makes estimates for companies that do not report financial information publicly. Moreover, USTelecom typically releases its capital expenditure data within a year after companies release their financial data while

Appendix I: U.S. Broadband Providers' Capital Expenditures

preliminary survey results from the Census Bureau are made public about 2 years after companies report and data reliability assessments occur and the final revised results are made public about 3 years after companies report. In addition to the USTelecom and Census Bureau estimates, investment firms, such as Goldman Sachs and UBS, also estimate or may report industry capital expenditures for selected publicly traded companies providing broadband service.

Appendix II: GAO Contact and Staff Acknowledgments

GAO Contact

Andrew Von Ah, (202) 512-2834 or vonaha@gao.gov

Staff Acknowledgments

In addition to the contact named above, Andrew Huddleston (Assistant Director); Steve Martinez (Analyst in Charge); Oluwaseun Ajayi; Michelle Bacon; Carl Barden; Melissa Bodeau; Hannah Laufe; Dan Luo; Malika Rice; Sandra Sokol; and Betsey Ward-Jenks made key contributions to this report.

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