



July 2019

# WIRELESS INTERNET

## FCC Should Assess Making Off-School- Premises Access Eligible for Additional Federal Support

Accessible Version

# GAO Highlights

Highlights of [GAO-19-564](#), a report to congressional committees

## Why GAO Did This Study

School-age children without internet access may have difficulty in completing homework. Those without in-home fixed access may go online wirelessly outside the home to do homework. A provision was included in statute for GAO to review wireless internet access for school-age children in lower-income households.

This report examines (1) challenges lower-income school-age children who lack in-home fixed internet face in doing homework involving internet access, and (2) selected school district efforts to expand wireless access for students and the federal role in those efforts. GAO analyzed 2017 CPS data; reviewed six local projects that were selected based in part on education industry stakeholders' recommendations, that included a range of geographic locations, and that took steps to address the homework gap; compared FCC efforts to federal standards for internal controls and pilot-program design best practices; reviewed FCC and Department of Education documents; and interviewed 17 stakeholders, including school districts.

## What GAO Recommends

GAO recommends that FCC take steps to assess and publish the potential benefits, costs, and challenges of making off-premises wireless access eligible for E-rate support.

FCC agreed with GAO's recommendation.

View [GAO-19-564](#). For more information, contact Andrew Von Ah at (202) 512-2834 or [vonaha@gao.gov](mailto:vonaha@gao.gov).

July 2019

## WIRELESS INTERNET

### FCC Should Assess Making Off-School-Premises Access Eligible for Additional Federal Support

## What GAO Found

According to GAO's analysis of 2017 Census Bureau Current Population Survey (CPS) data, children ages 6 to 17 in lower-income households are more likely than peers in higher-income households to lack high-speed in-home internet and rely on mobile wireless service. GAO found that students who use mobile wireless for homework may face challenges, including slower speeds and limitations smartphones present in completing tasks like typing papers. These "underconnected" students may seek out ways to access wireless internet outside of the home to do homework; however, these methods also pose challenges (see figure). The inequity in internet access—and therefore in the ease of doing homework involving access—between students of varying income levels is known as the "homework gap."

**Challenges to Methods School-Aged Children (6–17) May Use to Access Wireless Internet outside the Home to Do Homework**

Potential options for accessing fixed wireless internet outside of the home	Challenges						
	May require transportation to/from home	May not be safe	Public Wi-Fi may pose cybersecurity threats	May have limited hours	Location may offer computer/device, but they may not be available	May require student making purchase	May be outside, exposed to weather
Library	✓	✓	✓	✓	✓		
Community center	✓	✓	✓	✓	✓		
Business such as coffee shop	✓	✓	✓	✓		✓	
Use school's Wi-Fi after hours outside of building	✓	✓					✓

Source: GAO analysis of literature and interviews with education industry stakeholders. | GAO-19-564

Efforts by six selected projects involving seven school districts expanding wireless access for students who may lack it at home varied. According to officials with most school district projects GAO reviewed, rules for the Federal Communications Commission's (FCC) E-rate program, which allows schools to purchase discounted internet equipment, may limit schools' ability to provide wireless access off-premises. Specifically, off-premises access is not eligible for E-rate support, and schools that provide such access using existing services supported by E-rate must reduce their E-rate discounts. FCC conducted a pilot project in 2011 and 2012 to help decide whether to make wireless off-premises access eligible for E-rate support, but FCC did not determine and execute a methodology to assess the potential costs, benefits, and challenges of doing so. In 2016, FCC received two requests from school districts seeking waivers of rules to allow them to use E-rate program support to provide off-premises access, but FCC has not made a decision on the waivers. Determining and executing a methodology to analyze data about the potential benefits, costs, and challenges of easing E-rate rules on off-premises use and publishing the results could provide transparency to stakeholders such as school districts. This step could also help FCC act on pending and future waiver-of-rule requests and broader changes to rules that may help schools address the homework gap.

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**Abbreviations**

CPS	Current Population Survey
EBS	Educational Broadband Service
FCC	Federal Communications Commission
NTIA	National Telecommunications and Information Administration

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July 29, 2019

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

The Honorable Frank Pallone, Jr.  
Chairman  
The Honorable Greg Walden  
Ranking Member  
Committee on Energy and Commerce  
House of Representatives

Internet access is crucial for communication, economic activity, and education, including for students at the elementary and secondary school levels. According to the National Telecommunications and Information Administration (NTIA), part of the Department of Commerce, the internet has taken on an increasingly prominent role in schools, and students who lack access are at risk of missing opportunities to advance their education.<sup>1</sup> Internet access is crucial not only inside the classroom—where it enables teachers to provide a richer learning experience—but also outside the classroom, because access is frequently necessary for doing homework. “Underconnected” students—those with limited or no access at home—may have difficulty doing homework, putting them at risk of falling behind better-connected peers, a condition known as the “homework gap.”

School-age children from lower-income households are more likely to be underconnected and therefore to face the homework gap.<sup>2</sup> According to an analysis of 2015 survey data, lower-income households with school-

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<sup>1</sup>NTIA, *Digital Divide Among School-Age Children Narrows, but Millions Still Lack Internet Connections* (Dec. 11, 2018), accessed March 8, 2019, <https://www.ntia.gov/data/blogs>.

<sup>2</sup>Given the lack of a consistent definition for “lower-income” in data sources we reviewed for this work, we do not set a definition of “lower-income” for the purposes of this report; instead, we refer to definitions used by each source.

age children are more likely to lack a high-speed internet connection at home than higher-income households with school-age children.<sup>3</sup> School-age children without in-home high-speed internet may use other means of accessing the internet—such as mobile wireless or public Wi-Fi at libraries or coffee shops—to do homework.<sup>4</sup> However, these alternative methods may pose challenges to students using them to do homework. As a result, some schools have begun to take steps to address the homework gap by providing internet access to underconnected students.

The Consolidated Appropriations Act, 2018 included a provision for us to review wireless internet for low-income school-age children.<sup>5</sup> This report examines:

- challenges lower-income school-age children who lack in-home fixed internet face in doing homework that involves internet access, and
- what selected school districts are doing to expand wireless internet access for their students, and the federal role in such efforts.

To examine challenges lower-income school-age children who lack in-home fixed internet face in doing homework that involves internet access, we analyzed data on internet access and use from the Census Bureau's November 2017 *Current Population Survey (CPS): Computer and Internet Use Supplement*, sponsored by NTIA.<sup>6</sup> Specifically, we used data on the ages of all household members to determine if the household had one or more school-age children and analyzed data on the use of in-home fixed

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<sup>3</sup>Pew Research Center *Nearly One-in-Five Teens Can't Always Finish Their Homework Because of the Digital Divide* (Oct. 26, 2018). Pew analyzed American Community Survey data from 2015. Specifically, this research found that an estimated 35 percent of households with school-age children with a household income of under \$30,000 did not have a high-speed internet connection at home, compared to only 6 percent of such households with incomes of \$75,000 or more.

<sup>4</sup>In-home fixed internet service is generally provided by cable television or telephone companies. Users can connect a variety of internet-enabled devices, including desktop computers, laptops, and tablets, to in-home fixed service through a wired or Wi-Fi connection.

<sup>5</sup>Pub. L. No. 115-141, div. P, title VI, § 615 (2018).

<sup>6</sup>NTIA first commissioned the U.S. Census Bureau to collect data on Americans' use of computers in November 1994. Since that time, NTIA has periodically sponsored data collections on internet use and the devices Americans use to go online as a supplement to the Current Population Survey. Interviews were conducted from November 12 through 18, 2017. The probability sample selected to represent the universe consisted of approximately 56,000 households.

and mobile wireless internet and use of various computing devices.<sup>7</sup> We included variables on household income to report results based on different income ranges. To determine the reliability of these data, we reviewed technical documentation on the survey, interviewed NTIA officials, and compared our estimates of certain variables with estimates presented by NTIA on its website. We found these data were sufficiently reliable for assessing household internet use and access by income.

We also conducted a literature search for studies published between 2013 and 2018, and used relevant publications to support data we collected from other sources, including interviews. We interviewed officials with the Department of Education (Education), the Federal Communications Commission (FCC), and NTIA. We also interviewed eight education or technology-industry associations or advocacy organizations, one education researcher, one technology industry researcher, and one technology company that provides internet services and products to schools. Finally, we reviewed a non-generalizable sample of six projects through which seven school districts provide wireless internet access outside of school to students who may lack internet access at home. We selected those projects that were frequently cited in the press or by others we interviewed and to cover a variety of geographic locations, including those in both urban and rural areas, and to include a variety of approaches to addressing the homework gap. Specifically, we interviewed officials from five school districts and one technology company working with two school districts.<sup>8</sup> We conducted semi-structured interviews with these 17 stakeholders, including the industry associations, researchers, and school districts detailed above, and analyzed the content of the interviews to identify key challenges. The results of these interviews are not generalizable.

To examine what selected school districts are doing to expand wireless internet access for students and the federal role in such efforts, we

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<sup>7</sup>We considered a household to have school-age children if it had any children between the ages of 6 and 17.

<sup>8</sup>We conducted in-person interviews as part of site visits to Coachella Valley Unified School District (California) and Desert Sands Unified School District (California), and telephone interviews with Albemarle County Public Schools (Virginia), Boulder Valley School District (Colorado), and Green Bay Area Public School District (Wisconsin). We also interviewed a technology company—Microsoft—given its involvement in a project involving two Virginia school districts—Charlotte County Public Schools and Halifax County Public Schools.

conducted semi-structured interviews with officials at the five school districts and one technology company mentioned above regarding relevant efforts. We reviewed documentation from FCC and Education regarding relevant federal efforts, including rulemaking documents and documents about FCC's Schools and Libraries Universal Service Support Mechanism (also known as the E-rate program), which provides schools with discounts on telecommunications and internet services. We also interviewed officials with Education and FCC about their efforts related to school initiatives to expand wireless access for students. We compared FCC efforts to federal internal control standards related to using quality information and communicating externally and pilot-program design best practices.<sup>9</sup> For a more detailed description of our scope and methodology, see appendix I.

We conducted this performance audit from May 2018 to July 2019 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.

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## Background

School-age children can access the internet in a number of ways. Their households may subscribe to in-home fixed internet, which is generally provided by cable television or telephone companies. School-age children, and other users, can connect a variety of devices to in-home fixed service through a wired connection or a Wi-Fi connection.<sup>10</sup> They may also access the internet through mobile wireless service, which is provided through cell towers, with data transmitted over radio frequency spectrum.<sup>11</sup> Mobile service providers usually sell internet access as an

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<sup>9</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 10, 2014) and *Data Act: Section 5 Pilot Design Issues Need to Be Addressed to Meet Goal of Reducing Recipient Reporting Burden*, [GAO-16-438](#) (Washington, D.C.: April 19, 2016).

<sup>10</sup>Not all in-home fixed internet service—such as dial-up—is considered high-speed.

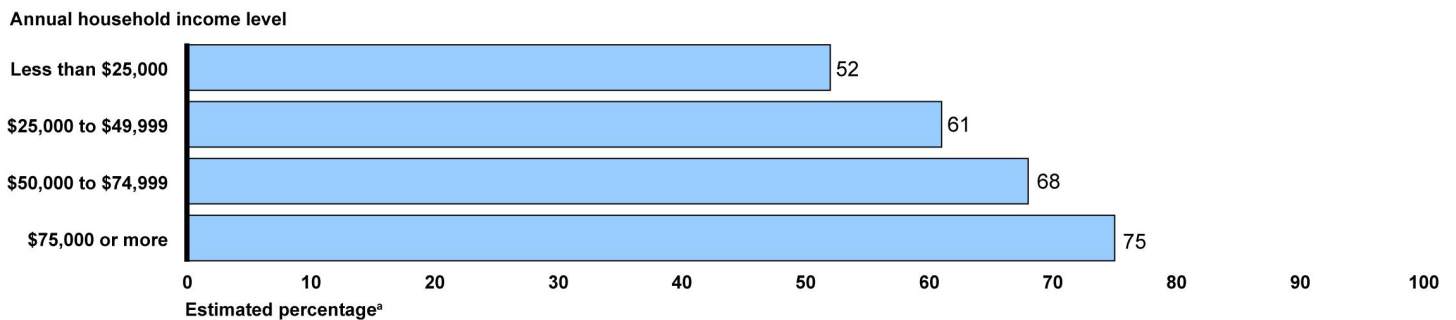
<sup>11</sup>Radio frequency spectrum is a portion of the electromagnetic radiation suitable for communications with frequencies ranging from 3 kilohertz and 300 gigahertz.



option in mobile telephone-service plans. A number of devices may connect to mobile wireless, such as smart phones, tablets, and mobile devices that enable laptops to connect to mobile wireless service. Finally, school-age children and others may access the internet outside the home through other ways, including publicly available Wi-Fi access at places such as libraries and coffee shops.

FCC has found that Americans in lower-income areas are less likely to have access to both in-home fixed and mobile wireless internet than those in higher-income areas.<sup>12</sup> Similarly, according to our analysis of data from the November 2017 *CPS: Computer and Internet Use Supplement*, among all school-age children, those in lower-income households are less likely to use the internet at home than those in higher-income households (see fig. 1).<sup>13</sup>

**Figure 1: Estimated Percentage of School-Age Children (6-17) Using Internet at Home, by Annual Household Income**



Source: GAO analysis of November 2017 Census Bureau Current Population Survey: Computer and Internet use Supplement. | GAO-19-564

Note: The survey specifically asked “(Do you/Does anyone in this household, including you,) use the Internet at home?” and “Who uses the Internet at home?” As it does not specify what type of internet service is used, respondents could use in-home fixed internet service or mobile wireless service.

<sup>a</sup>Margin of error at the 95 percent confidence level of plus or minus 7 percentage points or less.

A number of factors explain the digital divide, or the varying levels of access among different populations. For example, as we have reported in the past, rural areas tend to have conditions such as low population

<sup>12</sup>Specifically, FCC found that Americans that live in lower-median income counties have lower rates of access than those living in higher-median income counties. *In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, 2018 Broadband Deployment Report, 33 FCC Rcd 1660, 1689-1693, paras. 60-63, 1699-1700, para. 74 (2018).

<sup>13</sup>All percentage estimates from our analysis of the Census Bureau’s November 2017 *CPS: Computer and Internet Use Supplement* have margins of error at the 95 percent confidence level of plus or minus 7 percentage points or less, unless otherwise noted.

density or difficult terrain that can increase the costs for internet providers to deploy and maintain internet networks.<sup>14</sup> Furthermore, lower-income households with access to the necessary infrastructure for internet service may not be able to afford it. (See fig. 2.) While some in-home fixed internet providers offer low-cost service for lower-income households with school-age children,<sup>15</sup> according to a 2016 survey, an estimated 5 percent of households with school-age children ages 6 to 13 and incomes at or below the federal poverty guidelines had ever signed up for such programs.<sup>16</sup>

**Figure 2: Estimated Distribution of the Most Important Reasons for Not Using Internet at Home for Households with School Age Children (6–17), by Annual Household Income**

Reason	Annual household income level <sup>a</sup>			
	Less than \$25,000	\$25,000 to \$49,999	\$50,000 to \$74,999	\$75,000 or more
Can't afford	48%	34%	20%	17%
Don't need or not interested	31%	46%	57%	47%
Not available in area	4%	2%	3%	5%
No or inadequate computing device	3%	4%	3%	6%
Not worth the cost	1%	4%	3%	3%
Some other reason	12%	9%	14%	22%

Source: GAO analysis of November 2017 Census Bureau Current Population Survey: Computer and Internet use Supplement. | GAO-19-564

Note: The survey specifically asked “Of the reasons you just listed for not going online at home, which (do you/does your household) consider to be the most “important?” The estimates might not sum up to 100 percent due to rounding.

<sup>a</sup>Margin of error at the 95 percent confidence level of plus or minus 7 percentage points or less.

<sup>14</sup>GAO, *Broadband: Additional Stakeholder Input Could Inform FCC Actions to Promote Competition*, GAO-17-742 (Washington, D.C.: Sept. 19, 2017).

<sup>15</sup>The households that are considered “lower-income,” and therefore eligible for such low-cost service, varies based on the individual service provider. Furthermore, these low-cost services may not be limited to households with school-age children. For example, people over 62 years old that receive federal or state public assistance may be eligible for low-cost service through Comcast’s Internet Essentials program.

<sup>16</sup>V. J. Rideout and V.S. Katz, The Joan Ganz Cooney Center at Sesame Workshop *Opportunity for all: Technology and Learning in Lower-Income Families. A Report of the Families and Media Project*. (New York, N.Y.: 2016). This study did not include any information about why many households eligible for such services have not enrolled.

Lower rates of internet access by lower-income households may make it more difficult for school-age children in those households to do homework. According to a 2018 Pew Research Center survey, a higher percentage of surveyed teens in lower-income households said that the lack of a dependable computer or internet connection sometimes prevents them from finishing their homework compared to teens in higher-income households.<sup>17</sup> In addition, according to the Consortium for School Networking, the lack of in-home access makes it more difficult for parents to support their children academically. Specifically, as much communication between schools and parents has moved online, the lack of access may make it difficult for parents to stay connected to teachers and be informed about school notices, homework assignments, and other important information.<sup>18</sup>

FCC, which regulates commercial and other nonfederal spectrum, conducts activities that affect the ability of schools to address the homework gap. Specifically, it plays a role in expanding internet access by assigning licenses for Educational Broadband Service (EBS) spectrum, which permits schools and other eligible entities to transmit educational materials electronically. Currently, EBS license holders are allowed to lease excess capacity to others, including commercial wireless providers, for up to 30 years as long as the license holder has 20 hours of educational use per week per licensed channel and reserve the right to access 5 percent of the capacity for educational use. Schools that have such leases may need to wait years to regain full use of their EBS license.<sup>19</sup> Furthermore, the last opportunity for school districts to apply for new EBS licenses was in 1995, and according to FCC, EBS licenses cover about half the geographic area of the United States, with rural areas west of the Mississippi River generally lacking licenses. However,

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<sup>17</sup>Pew Research Center, *Nearly One-In-Five Teens Can't Always Finish Their Homework Because Of The Digital Divide* (Oct. 2018). Specifically, 24 percent of surveyed teens ages 13 to 17 in households with annual incomes under \$30,000 said the lack of a dependable computer or internet connection often or sometimes prevented them from finishing homework, compared to 9 percent in households with incomes of \$75,000 or more. This Pew Research Center survey was conducted with 743 teenagers during March and April 2018.

<sup>18</sup>Consortium for School Networking, *Digital Equity: Supporting Students & Families in Out-of-School Learning* (Washington, D.C.: June 2018). The Consortium for School Networking is a professional association for school system technology leaders.

<sup>19</sup>Commercial providers that lease EBS spectrum from licensed entities do not have to use it for educational purposes.

FCC recently adopted a Report and Order with rules that, once effective, will change the eligibility requirements for EBS licenses, among other things.<sup>20</sup>

In addition, FCC supports internet investments at schools through the E-rate program, which provides discounts on telecommunications and internet access services, internal connections, and basic maintenance of internal connections.<sup>21</sup> This program provides schools with higher percentages of lower-income students greater discounts on these services; for example, the most disadvantaged schools, where at least 75 percent of students are eligible for free or reduced price school lunch, receive a 90 percent discount.<sup>22</sup> All services supported by the E-rate program must be used primarily for “educational purposes,” which FCC has defined as meaning “activities that are integral, immediate, and proximate to the education of students.”<sup>23</sup>

Education’s Office of Educational Technology also plays a role related to internet access for students by developing national educational-technology policies and providing guidance to schools and school districts on technology use in schools. For example, in January 2017 the office issued a letter to schools and school districts about Education grant funds that could be used to support the use of technology to improve instruction

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<sup>20</sup>*In the Matter of Transforming the 2.5 GHz Band*, Report and Order, FCC 19-62, WT Docket No. 18-120 (2019). According to the Report and Order, the rules will be effective six months after their publication.

<sup>21</sup>FCC created the E-rate program in 1997 after it was authorized as part of the Telecommunications Act of 1996, Pub. L. No. 104-104, title. I, subtit A, § 101, 110 Stat. 56, 74 (1996) codified as 47 U.S.C. § 254(h)(B). The act requires FCC to establish competitively neutral rules “to enhance, to the extent technically feasible and economically reasonable, access to advance telecommunications and information services for . . . school classrooms.” 47 U.S.C. § 254(h).

<sup>22</sup>In the National School Lunch Program, students are generally eligible for free meals if their families have incomes at or below 130 percent of the federal poverty guidelines and reduced-price meals if their families have incomes between 130 and 185 percent of the federal poverty guidelines. Students who are not eligible for free or reduced-price meals generally pay the full price for the meal. Individual students can be certified as eligible for free or reduced price meals either through household application or direct certification, a process in which students who receive benefits from other programs for low-income households, such as the Supplemental Nutrition Assistance Program, are deemed categorically eligible. Alternatively, schools can use certain program provisions, such as the community eligibility provision, to serve meals at no charge to all students.

<sup>23</sup>*Universal Service First Report and Order*, 12 FCC Rcd 8776, 9076, para. 570 (1997).

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and student outcomes.<sup>24</sup> It also issued a report in 2017 on the use of technology in schools; the report provided guidance on how to modernize the technology needed for digital learning, such as schools' internet networks and internet-enabled devices.<sup>25</sup>

Education also collects, analyzes, and reports on a range of data from schools and school districts. For example, every year from 1994 to 2005 (except 2004 due to a lack of funding according to Education officials), the department collected data on internet access in schools and classrooms. In 2008, Education conducted three similar surveys at the district, school, and teacher levels on the availability and use of a range of educational technology resources, such as networks, computers, devices that enhance the capabilities of computers for instruction, and computer software.<sup>26</sup> Due to a lack of funding, Education did not conduct additional similar surveys. However, the department recently finished administering a different survey effort, funded from different sources, that we discuss later in this report.

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<sup>24</sup>United States Department of Education Office of Educational Technology, *Dear Colleague Letter* (Jan. 18, 2017).

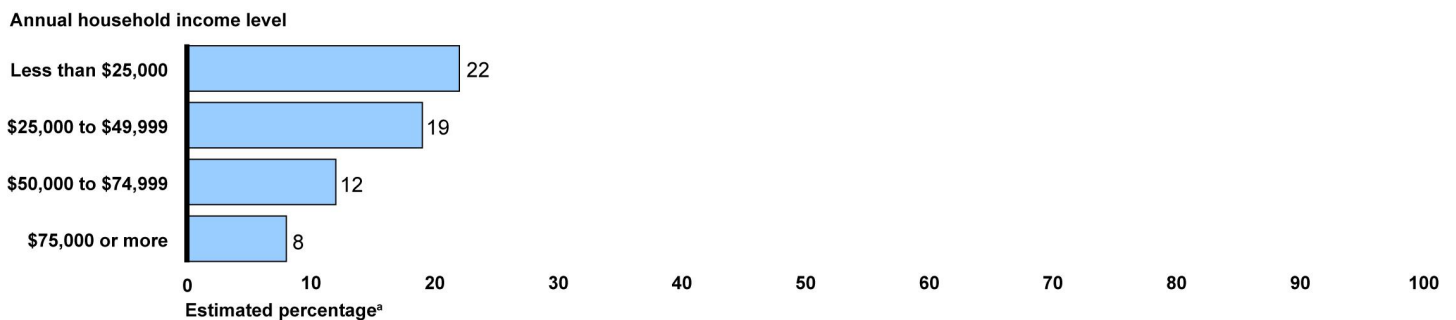
<sup>25</sup>United States Department of Education Office of Educational Technology, *Building Technology Infrastructure for Learning* (Washington, D.C.: June 2017).

<sup>26</sup>United States Department of Education National Center for Education Statistics, *Educational Technology in U.S. Public Schools: Fall 2008*, NCES 2010-034 (Washington, D.C.: April 2010); *Teachers' Use of Educational Technology in U.S. Public Schools, 2009*, NCES 2010-040 (Washington, D.C.: May 2010); *Educational Technology in Public School Districts: Fall 2008*, NCES 2010-003 (Washington, D.C.: Dec. 2009).

## School-Age Children in Lower-Income Households Face Challenges in Doing Homework Involving Internet Access and May Be More Likely to Rely on Mobile Wireless

According to our analysis of November 2017 *CPS: Computer and Internet Use Supplement* data, lower-income households with school-age children may be more likely than those in higher-income households to be reliant on mobile wireless service, such as through smart phones, for internet access. As seen in figure 3, among all households with school-age children, an estimated 22 percent with incomes of less than \$25,000 per year use mobile wireless to access the internet but not in-home fixed high-speed internet service, in contrast to 8 percent with incomes of \$75,000 or more per year.

**Figure 3: Estimated Percentage of Households with School-Age Children (6-17) That Access the Internet Using Mobile Wireless but Not In-home High-Speed Service, by Annual Household Income**



Source: GAO analysis of November 2017 Census Bureau Current Population Survey: Computer and Internet use Supplement. | GAO-19-564

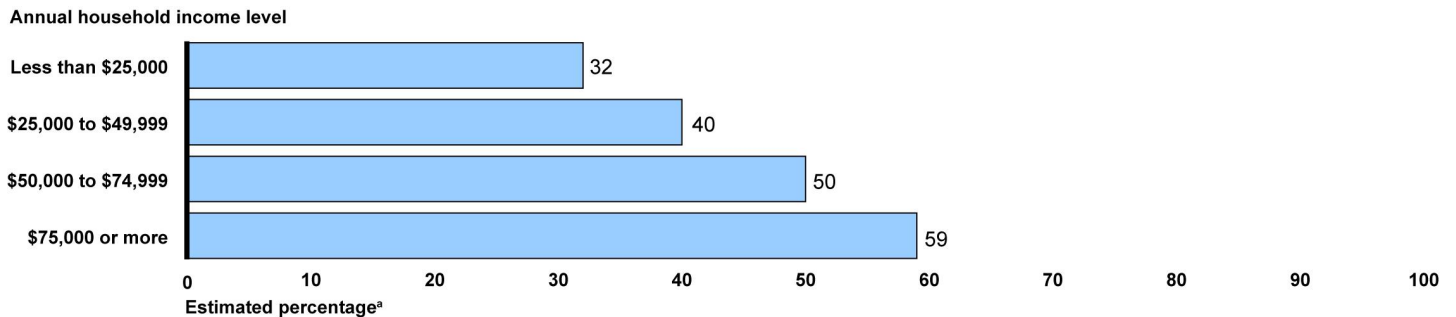
Note: The survey specifically asked “(Do you/Does anyone in this household) access the Internet using a data plan for a cell phone, smartphone, tablet, mobile hotspot, or other device? This type of Internet service is provided by a wireless carrier, and may be part of a package that also includes voice calls from a cell phone or smartphone.” and “I am going to read a list of ways that people access the Internet from their homes, other than a mobile data plan. At home, (do you/does anyone in this household) access the Internet using: High-speed Internet service installed at home, such as cable, DSL, or fiber optic service?”

<sup>a</sup>Margin of error at the 95 percent confidence level of plus or minus 7 percentage points or less.

School-age children whose households only have mobile wireless internet access may face challenges in using it for homework, including:<sup>27</sup>

- Device limitations.** Students in mobile wireless-only households may have to rely on devices like smartphones that may not be well suited for academic tasks. A recent Pew survey found that an estimated 45 percent of teenagers in lower-income households say they sometimes have to do homework on a smartphone.<sup>28</sup> However, most of the stakeholders we interviewed told us that smartphones are not adequate for doing homework for various reasons, including that they are too small for typing papers and that not all educational websites are compatible with smartphones.<sup>29</sup> According to these stakeholders, other devices such as desktops or laptops are better suited for homework; however, among all school-age children, those in lower-income households are less likely than those in higher-income households to use these devices (see fig. 4).

**Figure 4: Estimated Percentage of School-Age Children (6-17) Using a Desktop, Laptop, or Notebook Computer, by Annual Household Income**



Source: GAO analysis of November 2017 Census Bureau Current Population Survey: Computer and Internet use Supplement. | GAO-19-564

Note: The survey specifically asked: “(Do you/Does anyone in this household, including you,) use a desktop computer?” “Who uses a desktop computer?” “(Do you/Does anyone in this household) use a laptop or notebook computer?” “Who uses a laptop or notebook computer?”

<sup>a</sup>Margin of error at the 95 percent confidence level of plus or minus 7 percentage points or less.

<sup>27</sup>While these challenges will affect any school-age child with only mobile wireless access, regardless of household income, as discussed earlier such children are more likely to be in lower-income households.

<sup>28</sup>Pew Research Center, *Nearly One-In-Five Teens Can’t Always Finish Their Homework Because Of The Digital Divide* (Oct. 2018). Pew found that an estimated 35 percent of all teenagers and 45 percent of those with a household income under \$30,000 a year, sometimes have to do homework on a smartphone. This Pew Research Center survey was conducted with 743 teenagers during March and April 2018.

<sup>29</sup>As we interviewed 17 stakeholders, we consider at least nine to be “most” in this report.

- **Data limitations.** A majority of the stakeholders we interviewed said that wireless plans' data caps—a limitation on the amount of data the subscriber can download and upload per month—could make it difficult for school-age children to do homework, because, for example, once the data cap is reached, the provider may decrease connection speeds or impose additional costs for further data use, which could hinder completion of homework.<sup>30</sup> A 2016 survey found that an estimated 39 percent of lower-income households with school-age children—in this case those with incomes less than the federal poverty guidelines—had reached a data cap, compared to 25 percent of higher-income households.<sup>31</sup>

**Varying service quality.** Mobile wireless may be less reliable and slower than in-home fixed service, which can make doing homework more challenging. In 2018, FCC concluded that mobile wireless services are not full substitutes for in-home fixed service, because mobile wireless quality can be affected by user location, indoor obstructions, outdoor foliage, and weather, among other factors.<sup>32</sup> In addition, we reported in 2015 that the availability and quality of mobile wireless service connections vary based on location and terrain.<sup>33</sup> For example, according to officials with Albemarle County Public Schools in Virginia, while most students who participated in a recent survey indicate that they have mobile wireless internet access at home, that access may only offer poor quality connections and slow speeds due to mountainous terrain. As a result, mobile wireless access may have limited usefulness for homework purposes.

A 2018 survey by the Pew Research Center found that about 20 percent of teens from lower-income households say that they sometimes have to use public Wi-Fi for homework given a lack of access at home.<sup>34</sup> As

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<sup>30</sup>As we interviewed 17 stakeholders, we consider at least 10 to be a “majority” in this report.

<sup>31</sup>V. J. Rideout and V.S. Katz (2016).

<sup>32</sup>*In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, 2018 Broadband Deployment Report, 33 FCC Rcd 1660 (2018).


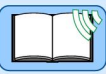



<sup>33</sup>GAO, *Broadband Performance: Additional Actions Could Help FCC Evaluate Its Efforts to Inform Consumers*, [GAO-15-363](#) (Washington, D.C.: Apr. 17, 2015).

<sup>34</sup>Specifically, an estimated 12 percent of teenagers, and 21 percent from households with an annual income of under \$30,000 make that claim.



shown in figure 5, stakeholders we interviewed and literature we reviewed identified a number of potential challenges students may encounter in using methods to access the internet outside the home to do their homework.

**Figure 5: Potential Challenges Posed by the Methods School-Age Children (6-17) May Use to Access the Internet outside the Home to Do Homework**

Potential options for accessing fixed wireless internet outside of the home		Challenges						
		May require transportation to/from home	May not be safe	Public Wi-Fi may pose cybersecurity threats	May have limited hours	Location may offer computer/device, but they may not be available	May require student making purchase	May be outside, exposed to weather
 Potential options for accessing fixed wireless internet outside of the home	 Library	✓	✓	✓	✓	✓		
	 Community center	✓	✓	✓	✓	✓		
	 Business such as coffee shop	✓	✓	✓	✓		✓	
	 Use school's Wi-Fi after hours outside of building	✓	✓					✓

Source: GAO analysis of literature and interviews with education industry stakeholders. | GAO-19-564

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## Efforts by Selected School Districts to Increase Wireless Internet Access for Underconnected Students Varied, with Limited Federal Involvement

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### School Districts, with Limited Federal Involvement, Have Taken Various Steps to Increase Wireless Internet Access for Underconnected Students

The six selected school district projects we reviewed have taken various approaches to address the homework gap by providing wireless internet service to students who may lack access at home. Most of these projects provide wireless internet access to students who lack in-home fixed internet and do not necessarily limit it to students in lower-income households. In addition, all but one of these projects provide filtered access, meaning that students using these services are subject to the same usage restrictions as if they were on-site in school.<sup>35</sup> Approaches included:

- **Provide wireless hot-spot devices.** The Green Bay Area Public School District in Wisconsin loans out mobile wireless hot-spot devices to students throughout the district who do not have access at home, providing them filtered internet access in their homes or elsewhere in the community. The hot-spot devices are available on loan from school libraries to any student who claims a need for one regardless of household income. Students may use district-issued Chromebooks or other internet-enabled devices, which then connect to the district's internet resources via the hot-spot device using service provided by a commercial mobile-wireless provider.
- **Build or use a private network.** Some districts have built new or expanded existing networks to provide internet access to students using a variety of approaches. Albemarle County Public Schools in Virginia uses EBS spectrum to provide access to students in community centers in mobile home parks in this mountainous district where, according to school district officials, many students lack

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<sup>35</sup>Content filtering is the ability to screen content traveling over the network in real time and restrict access. For example, according to Education almost all schools filter access to websites known to contain inappropriate content.

service at home. The district also plans to install wireless receiver devices in selected students' homes through which those students will be able to connect internet-enabled devices via Wi-Fi. Desert Sands Unified School District in California also built out an EBS network to provide internet access to students who lack service at home. According to officials with that district, the benefit of this approach is that it involved only a one-time cost to build the network, rather than recurring annual payments to a commercial mobile-wireless provider for service.

Two rural, low-income school districts in Virginia—Charlotte County Public Schools and Halifax County Public Schools—partnered with Microsoft to provide service through unlicensed white space devices (which operate on frequencies not being used by television broadcasters or 600 MHz wireless providers) to students who lack access at home, regardless of income.<sup>36</sup> According to Microsoft, the use of unlicensed white space devices is a good solution to providing wireless access in rural areas where other technologies may be uneconomical and such frequencies tend to be available. Students who use this service receive a device that is installed in their home that wirelessly connects to the district's network and transmits to other devices in the home via Wi-Fi.

The Boulder Valley School District in Colorado allowed a local wireless provider to build antennas on some school buildings in order to serve its customers in exchange for providing free service to lower-income students, determined based on student eligibility for free or reduced price lunch. According to a school district official, the provider has installed antennas at three schools, providing access to students living within a 3-mile radius, and plans to install antennas at most

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<sup>36</sup>With unlicensed spectrum, users are able to use wireless equipment certified by FCC to operate simultaneously in the same frequency bands without the need for an individual license. However, as we have reported in the past, if multiple users are operating simultaneously on the same frequency band, the transmissions may be susceptible to interference, which reduces the quality of service. See GAO, *Tribal Broadband: FCC Should Undertake Efforts to Better Promote Tribal Access to Spectrum*, [GAO-19-75](#) (Washington, D.C.: Nov. 14, 2018). In 2015, FCC made revisions to its rules to provide greater flexibility for unlicensed white space device operations in the bands that continued to be available for broadcasting following the television broadcast incentive auction, as well as to permit unlicensed white space devices to operate in spectrum not being used by new 600 MHz wireless providers (who operate on former TV band spectrum). See *In the Matter of Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37*, Report and Order, 30 FCC Rcd 9551 (2015). See also *Amendment of Part 15 of the Commission's Rules for Unlicensed White Space Devices*, Report and Order and Order on Reconsideration, 34 FCC Rcd 1827, (2019).

remaining schools in the district. That official told us that this model may not work in many other school districts, as there may not be sufficient population density to make it economically beneficial for a commercial provider to agree to provide such service.

- **Equip school buses with Wi-Fi.** The Coachella Valley Unified School District, which covers a large geographic area in California where many students lack in-home fixed access, equipped its fleet of about 100 school buses with Wi-Fi in 2014, enabling students to do homework during long bus rides.<sup>37</sup> A commercial mobile-wireless provider connected the Wi-Fi router on the bus to the district's network. In order to access Wi-Fi on the buses, students had to use district-issued devices that they were allowed to bring home after school. The district also parked Wi-Fi-equipped school buses and other district vehicles overnight in neighborhoods with a high proportion of students who brought district-issued tablets home in order to provide access to students who likely lacked internet at home. However, the district stopped this initiative in 2017 due to limited funding and is now seeking out alternative funding sources to reactivate the program.

While none of the projects described above used any funding from Education, the department has identified six existing grants that schools and districts could use under certain conditions to support internet investments, although not necessarily wireless investments specifically.<sup>38</sup> While the purpose of each of these grant programs isn't specific to internet investments, Education identified specific types of internet investments that these grant funds can be used for.<sup>39</sup> We did not make a determination as to whether any of the grant funds could have supported

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<sup>37</sup>According to school district officials, bus rides may be as long as 2 hours each way for some students.

<sup>38</sup>Education has conducted this work through the Broadband Interagency Working Group, which is a federal interagency group co-chaired by NTIA and the Rural Utilities Service of the U.S. Department of Agriculture. The over 25 member agencies of the group aim to improve coordination across programs, reduce regulatory barriers to broadband deployment, promote awareness of the importance of federal support for broadband investment and digital inclusion programs, and collect and share information with communities about available federal resources for broadband deployment and digital inclusion.

<sup>39</sup>For example, schools and districts can use Education's Title I, Part A grant, whose overall purpose is to support school districts with high numbers of low-income families, to fund internet investments and related devices if the costs are reasonable and support the academic achievement of low-income students.

the efforts we reviewed. Representatives of two of the school districts we met with stated that they would like to see additional information on Education grants that could be used to support internet investments. Education officials said the department has taken the first step to developing a strategy to share information about these grants by developing a coordinated communications strategy through its Office of Rural Engagement. They added that the department will then continue to build a broader strategy.

Education is also finalizing data collection on a survey that will collect some data regarding the homework gap. As mentioned earlier, until 2008 Education collected survey data over a number of years about information technology and internet access in schools and classrooms. According to Education officials, the department stopped collecting such data due to a lack of funding. However, the department is now finalizing a survey that is collecting nationally representative data about public school teachers' use of computers and the internet, and their knowledge of students' access to computers and the internet outside the classroom.<sup>40</sup> The survey is collecting data that pertain to the homework gap, including the extent to which schools provide wireless hot-spot devices to students to take home; the extent to which teachers think students access the internet outside of school, such as at home, libraries, or businesses; and the extent to which teachers think smartphones are useful for doing homework. According to Education, the department finished administering the survey in June 2019 and plans to release the results in April 2020. The survey data may provide Education and others, including FCC and Congress, with useful information that can inform policy and other decisions related to the homework gap, such as how best to support schools' efforts to expand wireless access for underconnected students.

FCC had a minor role in some of the school district projects by having previously granted EBS licenses to some districts that use EBS spectrum to provide wireless access. However, according to FCC documentation, many schools and school districts do not have EBS licenses—such as those in rural areas in the western United States—and some that have obtained a license now lease their capacity out on a long-term basis to

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<sup>40</sup>According to Education documentation on this survey, the department is conducting it in response to the requirement in the Every Student Succeeds Act for Education's Institute of Education Sciences to provide information about the educational impact of access to digital learning resources outside of the classroom. Pub. L. No. 114-95, § 9210, 129 Stat. 1802, 2150 (2015).

commercial providers. As a result, school districts may be limited in using EBS to provide wireless access to students or have to take additional steps to use EBS. Desert Sands Unified School District officials said that the district did not have an EBS license and that the local license holder had leased it out to a commercial provider, so the district worked with that provider to build out its EBS network. Albemarle County Public Schools had leased out its EBS license to a commercial provider years ago, but because that provider was not utilizing that spectrum, the school district was able to reclaim it.

FCC has taken recent steps that may affect the extent to which school districts are able to use EBS to provide wireless access. In May 2018, FCC issued a Notice of Proposed Rulemaking seeking comment on proposed changes to how it manages EBS to encourage and facilitate its efficient use.<sup>41</sup> In July 2019, FCC adopted a Report and Order that makes a number of changes to the EBS spectrum and its use. Specifically, once effective, these rules will eliminate eligibility restrictions for EBS licenses and eliminate the educational use requirement of the spectrum.<sup>42</sup>

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<sup>41</sup>*In the Matter of Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands*, Notice of Proposed Rulemaking, 33 FCC Rcd 4687 (2018).

<sup>42</sup>*In the Matter of Transforming the 2.5 GHz Band*, Report and Order, FCC 19-62, WT Docket No. 18-120(2019). Previously, the educational use requirements of EBS spectrum required license holders to use the spectrum to further the educational mission of accredited schools.

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## FCC Has Not Fully Evaluated the Possibility of Expanding the E-Rate Program to Include Off-Premises Wireless Access

While FCC's E-rate program supports schools' connectivity by providing discounts for eligible services, program rules may limit the ability of schools and school districts to address the homework gap. Specifically, program rules specify that off-premises use of such services is not eligible for E-rate support and require that any off-premises traffic must be cost allocated out of school districts' E-rate discounts.<sup>43</sup> For example, any off-premises traffic supported by existing E-rate-supported products or services requires a reduction in the E-rate discount for those existing E-rate supported products and services. This reduction may increase costs for school districts as they would no longer receive all their potential E-rate discounts. Officials representing all six of the school district projects we reviewed suggested that program rules limiting eligibility for off-premises use and requiring cost-allocation may inhibit the ability of school districts to expand off-premises wireless access, and thus address the homework gap.<sup>44</sup>

For districts that do provide wireless access off-premises, E-rate program restrictions may still pose challenges. For example, according to an official with Desert Sands Unified School District, the district had to buy a separate line of internet access to avoid having that off-premises traffic travel through the district's existing E-rate-supported network, which would have required cost-allocation and a reduction of the E-rate discount for that existing E-rate supported network. According to officials with Microsoft, Charlotte County Public Schools and Halifax County Public Schools had to separate their off-premises unlicensed white space device

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<sup>43</sup>47 C.F.R § 54.504(e). The cost allocation rule requires that "[i]f a product or service contains ineligible components, costs must be allocated to the extent that a clear delineation can be made between the eligible and ineligible components." 47 C.F.R § 54.504(e)(1). For example, if 20 percent of internet traffic for a school district is off-premises, the district would need to cost allocate out 20 percent of its E-rate discount. The E-rate Eligible Services List specifically requires that off-premises use be cost allocated out of a funding request. See, e.g., *Modernizing the E-rate Program for Schools and Libraries*, WC Docket No. 13-184, 30 FCC Rcd 9923, 9936 (2015) and *Modernizing the E-rate Program for Schools and Libraries*, WC Docket No. 13-184, Notice of Proposed Rulemaking, 28 FCC Rcd 11304, 11398, para. 321 (2013).

<sup>44</sup>As discussed earlier, one district we reviewed provided Wi-Fi access on school buses. A bill introduced in the Senate would, if enacted, require FCC to make the provision of Wi-Fi access on school buses eligible for E-rate support. S. 738. 116<sup>th</sup> Cong. (2019).

traffic from internet traffic that passed through E-rate-discounted access in the schools. An official with Boulder Valley School District said that the district had to terminate an earlier effort to extend access to students in a housing development after being told that it could not provide off-premises access with program-discounted equipment without cost-allocation.

In September 2016, FCC issued a Public Notice requesting public comment on two petitions filed with the agency seeking to allow the petitioning school districts to use existing E-rate-program-supported services and equipment for off-premises access without having to cost-allocate that traffic out of their existing E-rate discounts.<sup>45</sup> Cost allocating out that traffic would result in reduced E-rate discounts for school districts, and therefore higher costs, for existing services and equipment supported by E-rate. FCC rules allow parties to petition for waivers of rules if they can demonstrate that special circumstances warrant deviation from the existing rules and doing so serves the public interest.<sup>46</sup> According to FCC officials, the petitions are pending and the agency has not yet taken further formal action on this Public Notice. The petitions are described in more detail below.

- In May 2016, the Boulder Valley School District filed a petition requesting a waiver of the cost allocation rules in order to use its E-rate-program-supported network to provide internet access to students at public housing facilities after school hours.<sup>47</sup> In the petition, the district argued that because traffic on its E-rate program-supported network dramatically decreased after school hours, using that network to provide access during that time would not impose any additional costs on the E-rate program.
- Microsoft and others—including the school districts in Charlotte and Halifax counties—filed a petition in 2016 to obtain clarification that those school districts could provide wireless access to students' homes for educational purposes by extending the districts' existing E-rate-supported services using the districts' unlicensed white space

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<sup>45</sup>FCC, *Wireline Competition Bureau Seeks Comment on Petitions Regarding Off-Campus Use of Existing E-rate Supported Connectivity*, 31 FCC Rcd 10510 (2016).

<sup>46</sup>47 C.F.R. § 1.3.

<sup>47</sup>*Petition for Waiver of Samuelson-Glushko Technology Law & Policy Clinic on Behalf of Boulder Valley School District*, WC Docket Nos. 13-184, 10-90 (Mar. 16, 2016).



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device network without cost allocating that traffic from the existing E-rate discounts.<sup>48</sup> The petition stated that the infrastructure to provide service to unlicensed white space devices would not be funded with E-rate program funds, and that these districts were not well served by commercial internet providers. In comments filed with FCC, Microsoft argued that projects covered by both petitions would provide in-home access for students without imposing any additional costs to the E-rate program and that the projects would increase the productivity of E-rate by using existing resources more efficiently.<sup>49</sup>

Previously, FCC explored the possibility of making wireless off-premises access an allowable E-rate program expense—which would eliminate the requirement to cost-allocate such traffic—in a 2011 to 2012 pilot program.<sup>50</sup> When establishing this pilot program, FCC noted commenter concerns regarding the potential administrative, legal, technological, and procedural challenges of expanding E-rate funding to off-campus premises.<sup>51</sup> The pilot program provided funding from July 2011 to June 2012 and sought to “investigate the merits and challenges of wireless off-premises connectivity services” and to “gain a better understanding of operation and administrative issues associated with off-premises use and connectivity, as well as the financial impact on the E-rate program overall.” Furthermore, the pilot program sought to help FCC determine whether off-premises connectivity services “should ultimately be eligible for E-rate support.”

FCC provided a total of \$9 million in grants to 20 pilot-program participants—19 schools or school districts and one community library system—to implement projects enabling innovation in learning outside the boundaries of school buildings and the traditional school day, including

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<sup>48</sup>*Joint Petition for Clarification or, in the Alternative, Waiver of Microsoft Corporation, Mid-Atlantic Broadband Communities Corporation, Charlotte County Public Schools, Halifax County Public Schools, GCR Company, and Kinex Telecom*, WC Docket No. 13-184 (July 7, 2016). According to FCC, because this petition seeks a clarification to the rules (with a waiver as an alternative), if FCC were to act on the petition for clarification, it could affect other entities that receive E-Rate discounts.

<sup>49</sup>*In the Matter of Schools and Libraries Universal Support Mechanism Connect America Fund Modernizing the E-rate Program for Schools and Libraries Reply Comments of Microsoft Corporation*, WC Docket No. 13-184 (Dec. 5, 2016).

<sup>50</sup>*In the Matter of Schools and Libraries Universal Service Support Mechanism A National Broadband Plan For Our Future, Sixth Report and Order*, 25 FCC Rcd 18762 (2010).

<sup>51</sup>*Sixth Report and Order*, 25 FCC Rcd 18762, 18784, para. 43.

those that provided off-premises wireless access and wireless devices to students. Recipients were not required to cost allocate the off-premises traffic as part of the pilot.

FCC required all pilot participants to file interim and final reports that included information about project benefits, such as the extent to which students provided with wireless devices used them and the effect of increased internet access on academic outcomes; project costs; the effectiveness of measures to prevent project waste, fraud, and abuse, to filter content, and to ensure that students only used the devices for educational purposes; and lessons learned. According to FCC, those reports would allow it to assess the impact of selected pilot projects on the schools and to gather lessons learned that would help others implement similar projects in the future. In addition, FCC said it would evaluate the effectiveness of the pilot program to determine whether off-premises wireless access should be eligible for E-rate program support.

While FCC received interim and final reports from most pilot participants, it did not determine a methodology for evaluating the data provided in those reports.<sup>52</sup> Furthermore, FCC did not publish a report evaluating the effectiveness of the pilot program, including the potential costs, benefits, and challenges of off-premises wireless access to make a determination regarding whether off-premises access should be eligible for E-rate program support. Although the order establishing the pilot did not require FCC to determine an evaluation methodology and publish a formal analysis, according to FCC officials, staff reviewed the interim and final reports prior to the Commission adopting a 2013 Notice of Proposed Rulemaking that sought input on ways to modernize the E-rate program, including input on using E-rate-supported wireless hot-spots for community use.<sup>53</sup>

In two subsequent E-rate program modernization orders in 2014, the Commission did not expand the E-rate program's support for off-premises

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<sup>52</sup>According to FCC officials, 16 of the 20 participants filed reports with FCC. One participant ended its pilot program before submitting any reports. Officials did not know why the other three participants did not file reports.

<sup>53</sup>See *In the Matter of Modernizing the E-rate Program for Schools and Libraries*, Notice of Proposed Rulemaking, 28 FCC Rcd 11304, 11397-99, paras. 319-23 (2013).

access.<sup>54</sup> FCC officials explained that given the changes in technology, costs, and student learning in recent years, the data collected from the pilot may have some limitations. FCC has not announced any plans to conduct another pilot program, and aside from its consideration of the petitions previously mentioned, FCC has not announced an intention to revisit whether off-premises wireless access should be eligible for E-rate support.

Federal internal control standards state that agencies should use quality information to make decisions and communicate information to external parties.<sup>55</sup> Specifically, agencies should collect data from reliable sources in a timely manner, process these data into quality information, and use that information to make informed decisions. Agencies should also communicate such information to external parties that can help the agencies achieve their objectives. Furthermore, in previous work we identified as pilot-program design best practices:

- determining a methodology for gathering and evaluating data,
- evaluating pilot results to make conclusions on whether to integrate pilot activities into broader efforts, and
- communicating with stakeholders—such as by publishing results.<sup>56</sup>

As discussed earlier, school districts we met with said that existing E-rate program rules that require cost-allocation of off-premises access to E-rate discounts limit their ability to address the homework gap and providing off-premises access remains a challenge for schools and school districts. Determining and executing a methodology for collecting and analyzing data on the potential costs, benefits, and challenges of making schools' efforts to expand off-premises wireless access eligible for program funding could help inform FCC decisions regarding the two pending petitions and any future petitions. As petitions may only cover petitioning

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<sup>54</sup>In 2014, FCC adopted E-rate program modernization orders that made a number of changes to the program. These orders took steps to focus the program on providing high-speed broadband to schools and libraries and to increase access to the internal connections that provide Wi-Fi within schools and libraries. See *In the Matter of Modernizing the E-rate Program for Schools and Libraries* Report and Order, 29 FCC Rcd 8870 (2014) and *In the Matter of Modernizing the E-Rate Program for Schools and Libraries*, Second Report and Order, 29 FCC Rcd 15538 (2014).

<sup>55</sup>[GAO-14-704G](#).

<sup>56</sup>[GAO-16-438](#).

entities, determining and executing such a methodology could also help inform more widespread changes to E-rate rules regarding off-premises access that would affect all E-rate program recipients. FCC could collect such data through another pilot program or from school districts now providing off-premises wireless access. Publishing the results of this analysis could help FCC ensure that such information will be accessible to inform future related efforts and provide transparency to external stakeholders, including school districts.

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## Conclusions

The differences in internet access—and therefore in the ease of doing homework—between school-age children in lower-income households and those in higher-income households that are more likely to be well connected has resulted in a “homework gap” that could inhibit the academic success of underconnected students. While school districts have made efforts to address the homework gap, such efforts may be inhibited by existing restrictions in FCC’s E-rate program. Although FCC explored the possibility of making wireless off-premises access an allowable E-rate program expense in a 2011 to 2012 pilot program, FCC’s lack of an analysis of the data it collected at the time or since then means that it may not have sufficient and relevant information to make a decision on pending petitions from local school districts regarding off-premises access. Determining the best way to collect and analyze data on the potential benefits, costs, and challenges of making off-premises wireless access eligible for E-rate program support; conducting such analysis; and publishing the results could provide relevant information and transparency to external stakeholders. Doing so could also enable FCC to make a determination on whether it would be appropriate to ease restrictions on off-premises access, a step that may give school districts more flexibility in addressing the homework gap.

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## Recommendation

We are making the following recommendation to FCC:

The Chairman of the Federal Communications Commission should determine and execute a methodology for collecting and analyzing data—such as conducting a new pilot program regarding off-premises wireless access or analyzing other data—to assess the potential benefits, costs, and challenges of making off-premises wireless access eligible for E-rate

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program support, and publish the results of this analysis.  
(Recommendation 1)

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## Agency Comments

We provided a draft of this report to FCC, Education, and the Department of Commerce for review and comment. FCC provided written comments, which are reproduced in appendix II. In these written comments, FCC stated that it agreed with our recommendation and noted steps it plans to take to assess the potential benefits, costs, and challenges of making off-premises broadband access eligible for E-Rate program support. FCC also provided technical comments, which we incorporated as appropriate. Education provided written comments, which are reproduced in appendix III and also provided technical comments that we incorporated as appropriate. The Department of Commerce reviewed our report and told us it did not have any comments.

We are sending copies of this report to interested congressional committees, the Chairman of the FCC, the Secretary of Commerce, and the Secretary of Education. In addition, the report will be available at no charge on the GAO website at <http://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](mailto: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 IV.



Andrew Von Ah,  
Director,  
Physical Infrastructure Issues

# Appendix I: Scope and Methodology

Our objectives for this report were to examine: (1) challenges lower-income school-age children who lack in-home fixed internet face in doing homework that involves internet access and (2) what selected school districts are doing to expand wireless internet access for their students, and the federal role in such efforts.

To examine challenges lower-income school-age children who lack in-home fixed internet face in doing homework that involves internet access, we analyzed data from the Census Bureau's *November 2017 Current Population Survey: Computer and Internet Use Supplement*, which is sponsored by the National Telecommunications and Information Administration (NTIA).<sup>1</sup> The *Computer and Internet Use Supplement* collected household information from all eligible Current Population Survey households, as well as personal information from household members age 3 and older. The supplement provided data about households' computer and internet use, and about each household member's use of the internet from any location during the previous six months. One member of a household was generally interviewed and answered questions on behalf of every other member. Interviews were conducted from November 12–18, 2017. The probability sample selected to represent the universe consisted of approximately 56,000 households.

We included variables on ages of household members to determine if the household had one or more school-age children. We considered a household to have school-age children if it had any children between the ages of 6 and 17, an age range used in other analyses of internet use by school-age children, such as analyses by NTIA and Pew Research Center. We analyzed data on the use of in-home fixed and mobile-wireless internet, as well as of various computing devices. In our analysis we also included variables on household income, to allow us to report results based on different income ranges. When analyzing responses by

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<sup>1</sup>NTIA first commissioned the U.S. Census Bureau to collect data on Americans' use of computers in November 1994. Since that time, NTIA has periodically sponsored data collections on Internet use and the devices Americans use to go online as a supplement to the Current Population Survey.

household income, we grouped household income into similar ranges that NTIA publishes on its Data Explorer website, but we consolidated the top two ranges used by NTIA into one range.<sup>2</sup> To determine the reliability of these data, we reviewed NTIA technical documentation on the survey, interviewed NTIA officials, and compared our estimates of selected variables with estimates presented by NTIA on its website. We found these data were sufficiently reliable for reporting on data on internet and computing device use by household income levels.

In addition, we conducted a literature search to review challenges lower-income school-age children who lack in-home internet face in doing homework that involves internet access. We searched multidisciplinary databases using relevant terms such as “low-income,” “wireless,” “internet,” and “school-age children.” We searched for scholarly articles, including working and conference papers, government reports, think tank publications, and trade publications published between 2013 and 2018. We reviewed the abstracts of results from the search for publications most relevant to our work and fully reviewed publications that, based on their abstract, were most suited to this engagement. We used relevant publications to support findings we collected from other sources, including interviews.

We also conducted semi-structured interviews with a range of stakeholders, including education industry associations, researchers, and advocacy organizations we selected based on literature, internet searches, and recommendations from those we interviewed. Specifically, we interviewed eight education or technology industry associations or advocacy organizations, one education researcher, one technology industry researcher, and representatives of one technology company that provides internet services and products to schools. In addition, we interviewed officials with the Federal Communications Commission (FCC) and Department of Education (Education).

We also reviewed a non-generalizable sample of six projects involving seven local school districts taking steps to provide wireless internet access outside of school for students who may lack internet at home. We

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<sup>2</sup>NTIA uses the following income ranges on its website: less than \$25,000, \$25,000 to \$49,000, \$50,000 to \$74,000, \$75,000 to \$99,000, and \$100,000 and greater. We confirmed with NTIA staff that these numbers are typos. For example, “\$25,000 to \$49,000” is in actuality “\$25,000 to \$49,999.” For ease of analysis and presentation, we consolidated the top two ranges into one of \$75,000 and greater.



identified these projects based on keyword searches and recommendations from other interviewed associations and researchers, as well as officials with FCC, NTIA, and Education. From this list, we then selected those projects that were frequently cited in the press or by others we interviewed; that covered a variety of geographic locations, including those in both urban and rural areas; and that included a variety of approaches to addressing the homework gap.<sup>3</sup> During these interviews, we asked interviewees about a range of topics, including the extent to which school-age children have access to in-home and wireless internet and challenges faced by students who may only have mobile wireless access. In total we interviewed 17 stakeholders, including the industry associations, researchers, and school districts detailed above. We analyzed the content of the interviews to identify key challenges identified by stakeholders.<sup>4</sup> These interviews did not provide a complete list of all challenges, and the results of these interviews are not generalizable but do provide insight into a range of issues.

To determine what selected school districts are doing to expand wireless internet access for their students and the federal role in such efforts, we conducted semi-structured interviews with officials at the school districts listed above and officials at Microsoft regarding its efforts to expand wireless access for students who may lack internet at home. During these interviews, we asked the districts about what steps they are taking to expand wireless access, the goals and challenges of the relevant project, and the federal role in the effort. We analyzed the content of the interviews to identify key themes.

We also interviewed officials with FCC and Education to determine and review federal efforts related to school initiatives to expand wireless access for students. We reviewed documentation from FCC and Education regarding relevant federal efforts including rulemaking documents such as FCC's 2018 Notice of Proposed Rulemaking and

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<sup>3</sup>Specifically, we conducted in-person interviews as part of site visits to Coachella Valley Unified School District (California) and Desert Sands Unified School District (California), and we conducted telephone interviews with Albemarle County Public Schools (Virginia), Boulder Valley School District (Colorado), and Green Bay Area Public School District (Wisconsin). We also interviewed officials with a technology company—Microsoft—given its role in a project with two Virginia school districts—Charlotte County Public Schools and Halifax County Public Schools.

<sup>4</sup>All interview questions were open ended, and due to time constraints, we did not necessarily discuss all questions with all interviewees.

2019 Report and Order regarding Educational Broadcast Service spectrum.<sup>5</sup> We reviewed other relevant FCC documents related to the Schools and Libraries Universal Service Support Mechanism (also known as the E-rate program), which provides schools with discounts on telecommunications and internet services. E-rate documents we reviewed included reports related the 2011 E-rate pilot program exploring off-premises wireless access. We compared FCC efforts to federal internal control standards related to using quality information and communicating externally and pilot program design best practices.<sup>6</sup> We reviewed information, provided to us by department officials, on existing Education grant programs that can be used by schools and school districts to support internet investments. We also reviewed information on Education's relevant survey efforts.

We conducted this performance audit from May 2018 to July 2019 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.

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<sup>5</sup>*In the Matter of Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands*, Notice of Proposed Rulemaking, 33 FCC Rcd 4687 (2018). *In the Matter of Transforming the 2.5 GHz Band*, Report and Order, FCC 19-62, WT Docket No, 18-120 (2019).

<sup>6</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 10, 2014) and *Data Act: Section 5 Pilot Design Issues Need to Be Addressed to Meet Goal of Recipient Reporting Burden*, [GAO-16-438](#) (Washington, D.C.: Apr. 19, 2016).

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# Appendix II: Comments from the Federal Communications Commission

**Appendix II: Comments from the Federal  
Communications Commission**



Federal Communications Commission  
Washington, DC 20554

July 15, 2019

Andrew Von Ah  
Director, Physical Infrastructure Issues  
Government Accountability Office  
441 G Street, NW  
Washington, DC 20548

Dear Mr. Von Ah:

Thank you for the opportunity to review the Government Accountability Office's draft report, "Wireless Internet: FCC Should Assess Making Off-School Premises Access Eligible for Additional Federal Support." Closing the digital divide is the Commission's top priority. Its Universal Service Fund supports several programs designed to close that divide, whether to families living in high-cost, rural areas (the Connect America Fund and upcoming Rural Digital Opportunity Fund), to low-income families (the Lifeline program), or to health care providers (the Rural Health Care program). The focus of GAO's current report, the E-Rate program, is a vital source of support for high-speed broadband connectivity to and within America's schools and libraries.

We agree with GAO's recommendation that the FCC should "assess the potential benefits, costs, and challenges of making off-premises wireless access eligible for E-Rate program support, and publish the results of its analysis." Notably, the FCC voted to establish a new Office of Economics and Analytics in early 2018,<sup>1</sup> an office that became operational earlier this year.<sup>2</sup> One of the Office's roles is to offer data-backed analysis of policy questions confronted by the agency. Accordingly, the Chairman has tasked the Office, in consultation with the Wireline Competition Bureau, to assess the potential benefits, costs, and challenges of making off-premises wireless broadband access eligible for E-Rate program support.

The Office and the Bureau will start that task by publishing a report that evaluates the results of the 2011-2012 E-Rate pilot program, which made off-premises wireless broadband access eligible for support. Although we recognize that changes in technology, costs, and student learning over the past eight years may limit the utility of the results of the 2011-2012 pilot, we believe that we should evaluate such data for any lessons learned before taking any further steps, such as conducting another pilot program (one with better designed parameters, including a methodology for evaluating the effectiveness of any such pilot program), to determine whether off-premises wireless broadband access should be eligible for E-Rate support.

It is also worth pointing out that the Commission recently proposed a pilot program to examine the use of Universal Service Fund support for off-hospital or off-clinic premises broadband access for low-income Americans and veterans seeking to benefit from telehealth services and applications.<sup>3</sup> We expect that some of the lessons learned from this Connected Care pilot program may apply to the idea of using E-Rate support for off-school premises wireless broadband access—for example, the cost-effectiveness of programs such as these that indirectly connect consumers through anchor institutions vis-à-vis those programs designed to directly connect low-income consumers and those living in high-cost, rural areas.

Finally, as we assess whether off-campus connectivity should be eligible for E-Rate support, the FCC must be mindful of the limits on our authority within the Communications Act. Specifically, the E-Rate program is largely rooted in Section 254(h)(1)(B) of the Communications Act, which requires

<sup>1</sup> *Establishment of the Office of Economics and Analytics*, Order, 33 FCC Rcd 1539 (2018).

<sup>2</sup> FCC, News Release, FCC Opens Office of Economics and Analytics (Dec. 11, 2018), <https://docs.fcc.gov/public/attachments/DOC-355488A1.pdf>.

<sup>3</sup> *Promoting Telehealth for Low-Income Consumers*, Notice of Proposed Rulemaking, FCC 19-64 (rel. July 11, 2019).

“telecommunications carriers” to provide discounts to schools for services provided for “educational purposes,”<sup>4</sup> and Section 254(h)(2), which requires the Commission to establish competitively neutral rules “to enhance, to the extent technically feasible and economically reasonable, access to advanced telecommunications and information services for . . . *school classrooms*.”<sup>5</sup>

Thank you once again for the opportunity to review GAO’s recommendation. We look forward to working with GAO in the future.

Sincerely,



Kris Anne Monteith  
Chief, Wireline Competition Bureau

<sup>4</sup> 47 U.S.C. § 254(h)(1)(B).

<sup>5</sup> 47 U.S.C. § 254(h)(2) (emphasis added).

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# Appendix III: Comments from the Department of Education



UNITED STATES DEPARTMENT OF EDUCATION  
OFFICE OF PLANNING, EVALUATION AND POLICY DEVELOPMENT

July 3, 2019

Mr. Andrew Von Ah  
Director, Physical Infrastructure Issues  
Government Accountability Office  
Washington, DC 20548

Dear Mr. Von Ah:

Thank you for the opportunity to review the Government Accountability Office (GAO) draft report, *Wireless Internet: FCC Should Assess Making Off-Premises School Access Eligible for Additional Federal Support* (GAO-19-564). While the U.S. Department of Education (Department) has provided technical comments in the enclosure, we also write to underscore the importance of home internet access for low-income students.

As the draft GAO report notes, children from lower-income households are more likely than their peers in higher-income households to lack high-speed in-home internet, and as a result rely upon mobile wireless service—often requiring these “underconnected” students to seek out access to wireless internet outside of their homes. A 2018 study by the Department’s Institute of Education Sciences (IES) found that students without home internet access had lower assessment scores in reading, mathematics, and science, further highlighting the potential educational implications of the homework gap.<sup>1</sup> This “homework gap” is of particular concern to the Department because of its outsized impact on low-income students, a population that is traditionally underserved.

Historically, a student’s educational opportunities have been limited by the resources found within the walls of a school. However, with a high-speed internet connection, students can access resources and expertise anywhere in the world—expanding opportunities for students who might otherwise have limited options. For example, students interested in learning computer science can take such a course online if their school lacks either the budget to offer such a course or faculty members with the appropriate skills to teach the course.

The Department remains committed to working with our Federal, state, and local partners to identify and implement solutions to improve internet access by all students to reduce the homework gap.

<sup>1</sup> U.S. Department of Education, National Center for Education Statistics. (2018). *Student Access to Digital Learning Resources Outside of the Classroom (NCES 2017-098), Executive Summary*. Achievement gaps between those who reported using a computer at home or having access to the internet at home, and those who did not, could be influenced by other factors including socioeconomic characteristics such as parents’ educational attainment and family income.

400 MARYLAND AVE. S.W., WASHINGTON, DC 20202  
www.ed.gov

*The Department of Education’s mission is to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access.*

We thank you for the opportunity to review this draft GAO report.

Sincerely,



Jim Blew

Assistant Secretary for Planning,  
Evaluation, and Policy Development

Enclosure – Technical Comments



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# Appendix IV: GAO Contact and Staff Acknowledgments

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## GAO Contact

Andrew Von Ah at (202) 512-2834 or [vonaha@gao.gov](mailto:vonaha@gao.gov).

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## Staff Acknowledgments

In addition to the contact above, Mark Goldstein (Director); Derrick Collins (Assistant Director); Matthew Rosenberg (Analyst in Charge); Dwayne Curry; Sherri Doughty; Rachel Frisk; Hayden Huang; Gina Hoover; Dan Luo; Josh Ormond; Cheryl Peterson; Matt Ray; Hai Tran; and Laurel Voloder made key contributions to this report.

# Appendix V: Accessible Data

## Data Tables

**Accessible Data for Figure 1: Estimated Percentage of School-Age Children (6-17) Using Internet at Home, by Annual Household Income**

Annual income level	Estimated percentage
Less than \$25,000	52
\$25,000 to \$49,999	61
\$50,000 to \$74,999	68
\$75,000 or more	75

**Accessible Data for Figure 2: Estimated Distribution of the Most Important Reasons for Not Using Internet at Home for Households with School Age Children (6-17), by Annual Household Income**

Category	Less than \$25,000	\$25,000 to \$49,999	\$50,000 to \$74,999	\$75,000 or more
Can't afford	48	34	20	17
Don't need or not interested	31	46	57	47
Not available in area	4	2	3	5
No or inadequate computing device	3	4	3	6
Not worth the cost	1	4	3	3
Some other reason	12	9	14	22

**Accessible Data for Figure 3: Estimated Percentage of Households with School-Age Children (6-17) That Access the Internet Using Mobile Wireless but Not In-home High-Speed Service, by Annual Household Income**

Annual household income level	Estimated percentage
Less than \$25,000	22
\$25,000 to \$49,999	19
\$50,000 to \$74,999	12
\$75,000 or more	8

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**Accessible Data for Figure 4: Estimated Percentage of School-Age Children (6-17) Using a Desktop, Laptop, or Notebook Computer, by Annual Household Income**

<b>Annual household income level</b>	<b>Estimated percentage</b>
Less than \$25,000	32
\$25,000 to \$49,999	40
\$50,000 to \$74,999	50
\$75,000 or more	59

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## Agency Comment Letters

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### Accessible Text for Appendix II: Comments from the Federal Communications Commission

Page 1

July 15, 2019

Andrew Von Ah

Director, Physical Infrastructure Issues

Government Accountability Office

441 G Street, NW

Washington, DC 20548

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<sup>1</sup> Establishment of the Office of Economics and Analytics, Order, 33 FCC Red 1539 (2018).

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## Page 2

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Thank you once again for the opportunity to review GAO's recommendation. We look forward to working with GAO in the future.

Sincerely,

Kris Anne Monteith

Chief, Wireline Competition Bureau

<sup>4</sup> 47 U.S.C. § 254(h)(1)(B).

<sup>5</sup> 47 U.S.C. § 254(h)(2) (emphasis added).

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## Accessible Text for Appendix III: Comments from the Department of Education

### Page 1

July 3, 2019

Mr. Andrew Von Ah

Director, Physical Infrastructure Issues

Government Accountability Office

Washington, DC 20548

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The Department remains committed to working with our Federal, state, and local partners to identify and implement solutions to improve internet access by all students to reduce the homework gap.

<sup>1</sup> U.S. Department of Education, National Center for Education Statistics. (2018). *Student Access to Digital Learning Resources Outside of the Classroom* (NCES 2017-098), Executive Summary. Achievement gaps between those who reported using a computer at home or having access to the internet at home, and those who did not, could be influenced by other factors including socioeconomic characteristics such as parents' educational attainment and family income.

## Page 2

We thank you for the opportunity to review this draft GAO report.

Sincerely,

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Jim Blew

Assistant Secretary for Planning, Evaluation, and Policy Development

Enclosure - Technical Comments

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