

Universal Broadband in Illinois: Studying the Costs of Providing Free and Affordable Service for All Residents

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Executive Summary

Broadband internet service has become an essential part of everyday life in America. Access to high-speed internet is a necessity for remote learning, telework, and telehealth, as the COVID-19 pandemic has made abundantly clear. However, not everyone has access to reliable and affordable broadband service at home. The pandemic has heightened national awareness of the “digital divide,” or—for the purposes of this study—the divide between those with and those without affordable access to computers and household broadband internet service. Also, many with internet service at home do not have access at the benchmark speeds adopted by the Federal Communications Commission (FCC) in 2015: 25 Mbps download and 3 Mbps upload (25/3 Mbps).¹

Upon announcing the Connect Illinois broadband grant program, Governor J.B. Pritzker set the goals that by 2024, Illinois homes, businesses, and community anchor institutions throughout the state should have access to basic service of at least 25/3 Mbps, and that by 2028, all should have access to at least one provider offering 100/20 Mbps service. All projects receiving Connect Illinois funding must be scalable to service of at least 100/100 Mbps.²

In order to achieve the goal of universal broadband for everyone in Illinois, broadband must be available and affordable. However, home broadband service is out of reach for many low-income households in Illinois that are unable to afford subscriptions. Therefore, efforts to promote universal broadband should include programs that offer access to affordable broadband service, as well as access to low-cost digital devices and digital literacy training, which have been highlighted as necessary to promote digital inclusion and meaningful broadband adoption.³

This report presents findings from a study of technology and internet adoption in Illinois and includes cost estimates for providing free broadband access as well as the alternative goal of providing affordable broadband access to all residents in the State, including in areas with high poverty levels. This study is unique in that it not only examines what the State needs to do to promote universal broadband infrastructure; it also considers universal broadband affordability and adoption. In other words, this report recognizes that broadband infrastructure is only “one side of the connectivity coin,” as Connect Illinois has identified in its strategic plan.

This study responds to an amendment to SB 2135, Section 25 of Illinois Public Act 101-0640,⁴ enacted June 12, 2020. The purpose of the act is to “expand broadband service to unserved

1 <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2015-broadband-progress-report>

2 <https://www2.illinois.gov/dceo/ConnectIllinois/Documents/Broadband%20Strategic%20Plan%202.5.20.pdf>

3 <https://www.benton.org/sites/default/files/broadbandinclusion.pdf>

4 <https://www.ilga.gov/legislation/publicacts/fulltext.asp?Name=101-0640>

rural and urban areas of [Illinois] and to achieve universal broadband service and internet access for the residents of [Illinois].”

In pursuit of the Pritzker administration’s universal broadband goal to connect everyone in Illinois, this broadband access and affordability study (1) establishes a baseline against which future initiatives can be measured and (2) provides recommendations for next steps to be taken in response to SB 2135. It reflects the General Assembly’s interest in universal broadband, as evident in both the legislation and the historic \$420 million Connect Illinois funding commitment.

Definitions

Broadband: In this report, we use the terms “broadband” and “high-speed” internet service interchangeably. By broadband, we refer to the FCC’s benchmark speeds of 25 Mbps download and 3 Mbps upload (25/3 Mbps).⁵ We also embrace the Connect Illinois Broadband Strategic Plan, which explains that “broadband isn’t just about speed; even basic broadband should match sufficient speed with adequate capacity, affordable pricing, appropriate reliability, and acceptable latency.”⁶

Wireline: We use the term “wireline” internet access to refer to internet connections that use cables or wires to provide internet service to homes, businesses, and community anchor institutions in Illinois. There are three main types of wired broadband connections for consumer or residential use: DSL (telephone lines), coaxial cable (mainly via cable TV networks), and fiber.

Wireless: We use the term “wireless” in this report to refer to internet connections that do not use cables or wires to provide internet service to homes, businesses, and community anchor institutions in Illinois.

Fixed wireless: The term “fixed wireless” is used in this report to refer to wireless internet access used to connect two fixed locations without a cable. Fixed wireless access is often available in rural areas where wireline internet access is not available.

Unserved areas: We refer to the following definition of “unserved areas” provided by Connect Illinois: “If a home, business, or community anchor institution lacks access to basic broadband, it is unserved. Connect Illinois considers those areas falling below this threshold, currently set at 25/3 Mbps, to be unserved areas.”⁷

Underserved areas: We refer to the following definition of “underserved” provided by Connect Illinois: “Recognizing that bandwidth needs are rapidly changing, Connect Illinois considers any

5 <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2015-broadband-progress-report>

6 <https://www2.illinois.gov/dceo/ConnectIllinois/Documents/Broadband%20Strategic%20Plan%202.5.20.pdf>

7 <https://www2.illinois.gov/dceo/ConnectIllinois/Documents/Broadband%20Strategic%20Plan%202.5.20.pdf>

home, business, or community anchor institution without access to broadband of at least 100/20 Mbps as underserved. Areas falling below this threshold are underserved areas.”⁸

Internet and Technology Adoption in Illinois

Internet and technology adoption among households in Illinois is broken down by each of the state’s 10 Economic Development Regions, income, race/ethnicity, age, education, and households with children under the age of 18. The metrics of main interest are Illinois households with the following, as reported in the 2019 American Community Survey: (1) wireline broadband subscriptions at home, (2) desktop or laptop computers, and (3) desktop or laptop computers *or* tablet computing devices.⁹ These metrics are the focus of this study because research shows they are the tools that facilitate using the internet for schoolwork, telehealth consultation, and working from home.¹⁰

Key Findings

- **70.4% of Illinois households subscribe to wireline high-speed internet service.**
 - 1,441,161 Illinois households do not subscribe to such service.
- **77.0% of households have a desktop or laptop computer.**
 - 1,119,013 Illinois households lack computers of this sort.
- **82.6% of Illinois households have either a desktop, laptop, or tablet computer.**
 - 846,677 households lack any of these devices.

Race, ethnicity, and age are important factors in internet and technology access and adoption.

- 57.9% of African American households in Illinois have wireline broadband at home, and 62.1% have a desktop or laptop computer.
- 63.4% of Latino households in Illinois have wireline broadband subscriptions, and 69.0% have a desktop or laptop computer.
- 71.2% of White households in Illinois have wireline broadband subscriptions, and 80.4% have a desktop or laptop computer.

8 <https://www2.illinois.gov/dceo/ConnectIllinois/Documents/Broadband%20Strategic%20Plan%202.5.20.pdf>

9 <https://www.census.gov/programs-surveys/acs>

10 Although many of the tables in this report focus on ownership of a smartphone or subscriptions to cellular data plans, reliance on these tools alone constrains people’s use of the internet for many applications.

- 63.8% of those between the ages of 65 and 74 in Illinois have wireline service, and 73.9% have a desktop or laptop computer. For those ages 75 and older, 44.8% subscribe to high-speed service at home, and 52.3% have a desktop or laptop computer.

Another key finding concerns the “homework gap,” that is, those households in Illinois with children who do not have a high-speed subscription at home.¹¹ **Some 20.2% of households with children under the age of 18 do not have a wireline high-speed subscription.** That is 285,419 households—or 19.8% of all households without such service in the state of Illinois. The homework gap, the focus of much current concern about the digital divide, applies to 1 in 5 households in Illinois.

Estimating the Costs of Universal, Affordable Broadband Access and Service

The costs of offering free (or, alternatively, affordable) broadband internet service to all residents in Illinois are estimated using recent adoption and availability data. The following four separate cost estimates are provided:

1. Free service to all Illinois residents with no infrastructure investment required, lending out hotspots or satellite equipment to those with no fixed broadband options (annual cost)
2. Free access and service to all Illinois residents by deploying wireline infrastructure in all currently unserved areas (one-time cost + annual cost for free service)
3. Affordable service for all Illinois residents (annual cost)
4. Affordable service for only those in poverty (annual cost)

Applying an Illinois Office of Broadband frame to this analysis, these estimates are presented in terms of (1) shorter-term, non-infrastructure “fixes” that are intended to provide relatively immediate impact but lack sustainability, and (2) longer-term, infrastructure-based “solutions” that are intended to serve as sustainable strategic investments.

Shorter-Term Approach

To estimate the cost to provide free service to all Illinois residents without investing in the infrastructure required, this study uses 2019 American Community Survey (ACS) data to estimate the number of Illinois households with and without internet service and computing devices. Mirroring a 2020 Common Sense Media digital divide report,¹² this study examines four distinct household categories:

¹¹ <https://www.pewresearch.org/fact-tank/2015/04/20/the-numbers-behind-the-broadband-homework-gap>

¹² Common Sense Media and Boston Consulting Group. 2020. “Closing the K-12 Digital Divide in the Age of Distance Learning.” https://www.common Sense Media.org/sites/default/files/uploads/pdfs/common_sense_media_report_final_7_1_3pm_web.pdf

1. Fully Disconnected—neither internet service nor computing device
2. Internet Insufficient—no internet service but access to computing device
3. Device Deficient—internet service but no computing device
4. Connected, with Device—internet service and computing device

Following the Common Sense Media methodology, computing devices are defined as either a desktop or laptop *or* a tablet (*or both*), while internet access is defined as cable, fiber-optic, DSL, or satellite service. Based on our analysis, **the total estimated cost of providing free internet service to Illinois households that currently have neither a device nor internet service is between \$389 million and \$867 million annually** (depending on assumptions made about the underlying costs of providing devices and internet service).

To estimate the cost of providing free service to all Illinois residents, we must also consider those households that currently have service (and a device). The cost of providing free access for households that already subscribe to the internet and have a usable device is estimated to be between \$2.975 billion and \$3.397 billion. **Combining the costs results in a total estimate of between \$3.364 billion and \$4.264 billion annually.**

Longer-Term Approach

To estimate the costs of providing access to all Illinois households where infrastructure (i.e., wireline access) does not exist, we begin with the Federal Communications Commission (FCC) Form 477 data as of December 2019.¹³ These data are submitted by all broadband internet access service providers, which generate a list of all Census blocks they serve (or could serve shortly after receiving a request from a potential customer) and the different speeds offered in those blocks. We use the Form 477 data to compile a list of all Census blocks in the state that lack access to at least one broadband provider. We then use the FCC's 2019 block-level estimates to generate the number of housing units that lack such access.

The FCC Form 477 data have been highly criticized because if even a single household in a Census block is offered service, the entire block is considered to be served. These data also capture only advertised (as opposed to actual) speeds. To account for this, we also provide analyses of several different data sets that capture actual user speeds as alternative estimates.

Because Illinois is interested in knowing the number of housing units that lack access to specific types of broadband, we estimate the following¹⁴:

1. The number of housing units lacking access to terrestrial 25/3 speeds (i.e., excluding satellite)
2. The number of housing units lacking access to wireline 25/3 speeds (i.e., excluding satellite and fixed wireless connections)

¹³ As of this writing, the December 2019 data are the most recent available.

¹⁴ Note that the FCC's definition (and number) of "housing units" is different from that for the Census' "households" because the FCC includes vacant structures and group housing.

3. The number of housing units lacking access to terrestrial 100/20 speeds¹⁵

We perform this analysis at both the state and regional levels. When conducting the regional analysis, county-level estimates are generated from the Census block data and then aggregated to the Economic Development Region.

Due to a significant time lag—another limitation of the FCC Form 477 data—the percentages of households lacking broadband access represent the broadband infrastructure situation as of December 2019 and do not capture investments made after that time. Several sources funded broadband projects in the state after December 2019—namely, the United States Department of Agriculture’s ReConnect Loan and Grant Program, the FCC’s Connect America Fund (CAF), and Round 1 Connect Illinois broadband grant awards made either immediately prior to or after this date—and we account for these as well.¹⁶ We estimate a per-house cost of providing broadband access from these recent awards.

Based on this analysis, **the total cost of providing a 25/3 connection to the current number of Illinois housing units currently estimated as lacking it is between \$306 million and \$485 million.**¹⁷ The lower end of this estimate is built from December 2019 FCC Form 477 data, and it assumes that the future costs to cover unserved households will be the same as recent grant awards. Both of these assumptions are optimistic. Adjustments to this baseline will lead to higher estimates. The higher-end estimate reported here (\$485 million) assumes that the FCC data overstate availability for 20,000 housing units and that the cost per household increases by 25%. **The cost of upgrading all housing units to a 100/20 connection is estimated to be four to six times as large: between \$1.410 billion and \$1.865 billion.**

We then estimate the annual cost to provide all households with free service, which can now be estimated under the assumption that everyone will have a fixed broadband connection available to them. **We estimate that the total annual cost of free broadband service for Illinois households, assuming wired connectivity available to all of the 4,866,014 total households in 2019, would cost \$3.286 billion.**

Affordable Broadband Access

The estimated cost of affordable broadband access is provided using the same approach as the shorter-term estimate, but it assumes that Connect Illinois would subsidize the cost of monthly service so that households would only pay either \$10 or \$25. We estimate the costs of providing

¹⁵ We do not break out wired-only 100/20 service because such connections are assumed to be wired. Only a very small number of all fixed wireless providers claimed to offer 100/20 service in the December 2019 FCC Form 477 data (5%). The median offering of all fixed wireless providers was 25/3, and the offering from fixed wireless providers in the 25th percentile was only 5/1.

¹⁶ We note that the first round of the FCC’s Rural Digital Opportunities Fund auction was completed in December 2020 and these awards are not included in our analysis because they will not be finalized until 2021.

¹⁷ This compares with an \$800 million estimate for 193,000 households provided to the state of South Carolina that used a similar methodology but did not adjust for recent federal investments. See Raven, J. 2020. “It could cost \$800 million and take 5 years to connect every SC household to high-speed internet.” WIST News. Available online: <https://www.wistv.com/2020/06/25/it-could-cost-million-take-years-connect-every-sc-household-high-speed-internet/>

this type of subsidized service both for all households and for low-income households only. When combined with households that currently pay for an internet connection, the full costs of supporting such a program are shown in our analysis. Those households that are already connected with a device are assumed to have their monthly costs subsidized so that they pay only \$10 and \$25 per month, respectively.

We estimate that the total annual cost of a subsidy to bring monthly internet costs for broadband service priced at \$10 per month for the total 4,866,014 households in 2019 would be between **\$2.781 billion and \$3.680 billion** and the total annual cost of a subsidy to bring monthly internet costs for broadband service priced at \$25 per month would be between **\$2 billion and \$2.804 billion**. (We also provide cost estimates for Illinois households in poverty only. These costs are also broken down by each of the state's 10 Economic Development Regions.)

The recommendations to follow unfold in the context of initiatives undertaken to improve broadband in the state. Governor J.B. Pritzker and the Illinois General Assembly have committed to invest \$420 million in broadband for the state. The American Recovery and Reinvestment Act of 2009 directed \$200 million in broadband funding to the state, resources leveraged by accompanying state investments. Many of these investments in network infrastructure improved connectivity for schools, libraries, higher education, and households in the state. Other investments helped Illinois's neediest households discover the value of the internet. Against this backdrop of past progress, the following recommendations seek to build and expand upon these earlier investments.

Recommendations

The State of Illinois should take the following steps to promote universal broadband:

1. **Continue to offer competitive matching grants.** In order to address the cost of deploying broadband networks to reach all Illinois households, the State should continue to offer competitive, broadband deployment matching grants through Connect Illinois. The State should fully utilize the Connect Illinois funds appropriated by the General Assembly as part of Governor Pritzker's Rebuild Illinois capital investment strategy while also pursuing federal funding opportunities and encouraging continued private investment. The State should keep its focus not only on ensuring that all Illinois households have access to 25/3 Mbps wireline service by 2024 but also on the longer-term goal of connecting all households in Illinois with broadband of at least 100/20 Mbps over networks that can scale to at least 100/100 Mbps by 2028.¹⁸
2. **Support development of affordable network alternatives for Illinois residents.** Internet service is out of financial reach for many Illinois households; many homes are in areas with a single (often unaffordable) provider. Given broadband adoption gaps along racial and socioeconomic lines, the State should support community-driven initiatives to introduce more affordable options, expand choice, and drive broadband adoption. There have been a number of publicly funded broadband initiatives across Illinois over the past

¹⁸ <https://www2.illinois.gov/dceo/ConnectIllinois/Documents/Broadband%20Strategic%20Plan%202025.20.pdf>

decade. The State should take steps to facilitate deployment of affordable, high-speed, and high-quality wireline or wireless networks.

3. **Establish a state digital inclusion coordinator.** The Illinois Digital Inclusion Coordinator should be integrated into overall statewide broadband planning, highlighting the digital inclusion implications of broadband policy initiatives and other state policy initiatives that rely on broadband (e.g., government service delivery). The coordinator would develop relationships, partnerships, and programs to promote digital inclusion across the state.
4. **Fund partnerships for digital inclusion.** Illinois should support, in partnership with philanthropic organizations, community-based nonprofits that provide digital skills training and tech support for low-income households.
5. **Increase public awareness of affordability programs.** Many eligible households may not be aware of discount broadband internet access service plans or may experience difficulty in signing up. Policymakers and other stakeholders should encourage awareness of these programs. Policymakers should also work with providers to create these programs and to ease the process of qualifying and signing up for these offers.
6. **Improve the pipeline of computing devices.** Stakeholders should explore ways to expand low-cost computing programs to all parts of Illinois to meet growing demands that the COVID-19 pandemic has spurred. This includes efforts such as the State's current work with PCs for People to refurbish computers for nonprofits and low-income individuals.

Internet and Technology Adoption in Illinois

This section summarizes technology adoption rates among households in the state of Illinois, including findings by each of the state's 10 Economic Development Regions,¹⁹ income, race/ethnicity, age, education, and households with children under the age of 18.

The metrics of main interest are:

- **Households with wireline broadband subscriptions at home.** This is captured in the survey question in the American Community Survey (ACS) that asks whether households subscribe to cable modem service, digital subscriber line (DSL) service, or fiber-optic service. Note that the ACS does not ask respondents the speed of their home service (few would know or be able to give an accurate response), which means a “yes” answer to this question does not necessarily mean home service meets or exceeds the 25 down / 3 up Megabit per second threshold for broadband.
- **Desktop or laptop computers.** The ACS asks whether a household has a working desktop or laptop computer.
- **Desktop or laptop computer or a tablet computing device.** This adds tablet computers to the measure of household computing assets.

These metrics are the focus because research shows they are the tools that facilitate using the internet for schoolwork, telehealth consultation, and working from home. Although many of the tables report ownership of a smartphone or subscriptions to cellular data plans, reliance on these tools alone constrains people's use of the internet for many applications.

Key Findings

- **70.4% of Illinois households subscribe to wireline high-speed internet service.**
 - 1,441,161 Illinois households do not subscribe to such service.
- **77.0% of households have a desktop or laptop computer.**
 - 1,119,013 Illinois households lack computers of this sort.
- **82.6% of Illinois households have either a desktop, laptop, or tablet computer.**
 - 846,677 households lack any of these devices.

Geographically, adoption differences for home wireline service are stark when comparing Economic Development Region 4 (which includes Cook County and the City of Chicago) with the rest of the state. Nearly three-quarters (74.7%) of households in that region have home wireline broadband service, compared with 61.9% for the rest of the state. In Region 8, the Southern Economic Development Region, home wireline broadband adoption is 47.0%, the

¹⁹ <https://www2.illinois.gov/dceo/SmallBizAssistance/RegionSpecificAssistance/Documents/2020ILEcDevRegionMap.pdf>

state's lowest. In Region 7 (Southeast) and Region 1 (Central), broadband adoption rates are 57.5% and 59.7%, respectively.

Household income is another stark dividing line. Nearly one-fifth (18%) of Illinois households make less than \$25,000 per year. Among them, fewer than half (44.4%) have home wireline broadband service, and only half (49.5%) have a desktop or laptop computer. Expanding the income range to include households whose annual incomes are below \$50,000 shows the following: These households total about 40% of all households in the state, but they make up 60% of those in Illinois without wireline broadband.

Adoption of digital tools varies depending on whether a household is in a metropolitan or non-metropolitan (i.e., rural) area.²⁰ Tables 4 and 5 show how both affordability of service and network deployment interact so that wireline broadband adoption is lower in rural areas of Illinois. Overall, 62.6% of households in rural Illinois have wireline broadband at home, compared with 71.4% for households in metro areas. However, for low-income residents in both areas, wireline adoption rates are about the same: 44.6% of metro households whose annual incomes are \$25,000 or less have wireline broadband, compared with 43.5% for rural low-income households. The story is different for higher incomes. In metro areas of Illinois, 90.4% of households whose annual incomes exceed \$150,000 subscribe to wireline service, compared with 78.8% for those in rural areas.

The difference in wireline adoption rates for higher-income rural residents when compared with their urban or metro counterparts has to do with reliance on wireless data plans *only* for internet service. Among non-rural Illinois households with annual incomes above \$150,000, 7% rely on wireless data plans only for service; 16% of rural households in this income range do. For low-income households (that is, those whose annual incomes are below \$25,000), 20% of rural households rely only on wireless data for service, compared with 18% for non-rural households. At higher income levels, it is likely that those reliant only on wireless data do so because wireline networks are either not present or not adequate where they live. For low-income households, it is likely that they rely only on wireless data for service in part because they cannot afford wireline service and in part due to network availability.

The results for upper-income households indicate that lack of (or inadequate) networks limit home wireline adoption in rural Illinois. At the same time, though, affordability inhibits adoption at the lowest income levels. Solving the network deployment problem for rural Illinois, in other words, is not likely to address all issues connected to broadband subscription choices. Low-income households still will struggle to afford service, even with faster networks available.

Race, ethnicity, and age are important factors

- 57.9% of African American households in Illinois have wireline broadband at home, and 62.1% have a desktop or laptop computer.

²⁰ The definition of metro versus non-metro households follows the Census Bureau's practice. Metro areas are urbanized areas of 50,000 or more people and urban clusters of at least 2,500 people but less than 50,000. All other areas are non-metro. In Illinois, 12% of households live in areas classified as non-metro.

- 63.4% of Latino households in Illinois have wireline broadband subscriptions, and 69.0% have a desktop or laptop computer.
- 71.2% of White households in Illinois have wireline broadband subscriptions, and 80.4% have a desktop or laptop computer.
- 63.8% of those between the ages of 65 and 74 in Illinois have high-speed service, and 73.9% have a desktop or laptop computer. For those ages 75 and older, 44.8% subscribe to high-speed service at home, and 52.3% have a desktop or laptop computer.

Finally, there is the “[homework gap](#),”²¹ that is, those households in Illinois with children who do not have a high-speed subscription at home. Some 20.2% of households with children under the age of 18 do not have a wireline high-speed subscription. That is 285,419 households—or 19.8% of all households without such service in the state of Illinois. The homework gap, the focus of much current concern about the digital divide, applies to 1 in 5 households in Illinois. The following tables offer greater detail.

Table 1. By Economic Development Region – Internet Service at Home

Economic Development Region	Households	Broadband of any type	Cellular data plan	Cellular data plan with no other type of internet subscription	Broadband such as cable, fiber optics, or DSL	Satellite internet service
Central	238,223	78.7%	63.3%	13.2%	59.7%	8.2%
East Central	144,104	82.4%	74.8%	15.3%	62.2%	9.4%
North Central	250,379	82.3%	68.3%	12.9%	64.7%	6.3%
Northeast	3,241,195	87.8%	80.4%	10.4%	74.7%	5.6%
Northern Stateline	173,362	86.1%	78.0%	12.0%	69.8%	7.7%
Northwest	159,011	83.9%	74.6%	15.0%	62.4%	8.4%
Southeast	201,715	82.7%	73.3%	16.6%	57.5%	10.5%
Southern	130,474	78.9%	72.3%	24.0%	47.0%	9.3%
Southwest	214,260	85.1%	76.1%	12.4%	67.8%	6.5%
West Central	113,283	80.4%	66.4%	13.9%	60.3%	8.2%
TOTAL Households (state)	4,866,006	86.0%	77.5%	11.8%	70.4%	6.4%

21 <https://www.pewresearch.org/fact-tank/2015/04/20/the-numbers-behind-the-broadband-homework-gap>

Table 2. By Economic Development District – Computing Devices at Home

Economic Development Region	Households	Has one or more types of computing devices (includes smartphone)	Desktop or laptop	Smartphone	Smartphone with no other type of computing device	Tablet or other portable wireless computer	No computer (includes smartphone)	WITHOUT tablet OR desktop or laptop
Central	238,223	89.7%	71.6%	81.8%	10.6%	56.2%	10.3%	18.1%
East Central	144,104	91.7%	75.8%	84.6%	11.7%	51.2%	8.3%	16.2%
North Central	250,379	90.9%	73.4%	84.3%	12.0%	57.2%	9.1%	17.8%
Northeast	3,241,195	93.2%	79.7%	88.1%	8.5%	63.8%	6.8%	17.3%
Northern Stataline	173,362	92.3%	74.5%	85.5%	11.5%	59.7%	7.7%	15.9%
Northwest	159,011	89.9%	70.4%	81.5%	12.5%	55.6%	10.1%	16.7%
Southeast	201,715	89.1%	69.9%	80.6%	11.6%	56.2%	10.9%	17.0%
Southern	130,474	87.1%	61.9%	79.9%	16.7%	49.3%	12.9%	18.4%
Southwest	214,260	92.0%	74.4%	86.1%	11.3%	59.9%	8.0%	20.0%
West Central	113,283	87.4%	69.0%	78.9%	11.7%	54.6%	12.6%	17.0%
TOTAL Households (state)	4,866,006	92.2%	77.0%	86.3%	9.6%	21.8%	7.8%	17.4%

Table 3. By Income – All Illinois Households

	All	Less than \$25K	Between \$25K and \$50K	Between \$50K and \$75K	Between \$75K and \$150K	Greater than \$150K
Broadband of any type	86.0%	64.9%	81.1%	89.2%	94.6%	97.0%
Wireline broadband subscription	70.4%	44.4%	61.8%	71.8%	80.8%	89.5%
Computer (desktop or laptop)	77.1%	49.5%	67.0%	78.8%	89.7%	95.8%
Tablet computer	61.2%	33.4%	48.8%	59.1%	74.6%	85.4%
Smartphone	86.4%	69.2%	80.9%	88.3%	94.0%	96.5%
Number of households	4,864,664	884,587	977,945	784,015	1,409,588	808,529

Table 4: By Income and Region – Metro Areas in Illinois

	All	Less than \$25K	Between \$25K and \$50K	Between \$50K and \$75K	Between \$75K and \$150K	Greater than \$150K
Broadband of any type	86.5%	65.2%	81.8%	89.2%	94.9%	97.2%
Wireline broadband subscription	71.4%	44.6%	62.8%	72.4%	81.8%	90.4%
Computer (desktop or laptop)	77.6%	49.7%	67.4%	78.7%	90.0%	96.0%
Tablet computer	61.6%	34.0%	49.0%	58.4%	74.8%	85.5%
Smartphone	86.8%	69.8%	81.8%	88.3%	94.2%	96.6%
Number of households	4,307,493	773,961	849,638	681,168	1,253,163	749,563

Table 5: By Income and Region – Non-Metro Areas in Illinois

	All	Less than \$25K	Between \$25K and \$50K	Between \$50K and \$75K	Between \$75K and \$150K	Greater than \$150K
Broadband of any type	82.2%	62.9%	76.2%	88.7%	91.9%	94.5%
Wireline broadband subscription	62.6%	43.5%	54.9%	67.9%	72.9%	78.8%
Computer (desktop or laptop)	73.6%	48.5%	64.7%	79.1%	87.4%	93.5%
Tablet computer	57.9%	29.2%	47.7%	63.4%	73.2%	83.6%
Smartphone	82.5%	64.7%	75.2%	88.0%	92.7%	95.2%
Number of households	557,171	110,626	128,307	102,847	156,425	58,966

Table 6. By Race/Ethnicity

	White	African American	Latino	Asian
Broadband of any type	85.9%	77.7%	84.1%	91.8%
Wireline broadband subscription	71.2%	57.9%	63.4%	81.6%
Computer (desktop or laptop)	80.4%	62.1%	69.0%	90.1%
Tablet computer	64.6%	50.5%	58.0%	74.5%
Smartphone	84.4%	82.5%	89.2%	94.0%
Number of households	3,653,049	682,980	600,074	238,863

Table 7. By Age

	Ages 18 to 64	Ages 65 to 74	Age 75 and older
Broadband of any type	90.0%	80.4%	58.4%
Wireline broadband subscription	74.2%	63.8%	44.8%
Computer (desktop or laptop)	82.0%	73.9%	52.3%
Tablet computer	68.7%	54.2%	33.2%
Smartphone	93.2%	73.3%	43.1%
Number of people	7,975,983	1,182,015	863,346

Table 8. By Education

	Less than high school graduate	High school graduate	Some college or associate's degree	College degree or more
Broadband of any type	63.9%	74.1%	87.5%	94.6%
Wireline broadband subscription	44.0%	53.9%	69.9%	84.7%
Computer (desktop or laptop)	44.9%	61.5%	79.2%	93.8%
Tablet computer	37.9%	46.4%	64.1%	77.5%
Smartphone	67.9%	73.8%	87.2%	93.6%
Number of people	875,407	2,645,961	2,946,648	3,236,193

Table 9. Households with Children Under Age 18

	All	Less than \$25K	Between \$25K and \$50K	Between \$50K and \$75K	Between \$75K and \$150K	Greater than \$150K
Broadband of any type	94.7%	84.6%	91.3%	94.7%	97.4%	98.7%
Wireline broadband subscription	79.8%	60.5%	69.6%	76.8%	84.0%	92.9%
Computer (desktop or laptop)	85.0%	61.3%	71.6%	81.5%	92.7%	98.0%
Tablet computer	97.2%	93.5%	95.3%	96.8%	98.4%	98.9%
Number of households	1,413,437	169,549	238,315	199,109	480,158	326,306

Estimating the Cost of Universal Broadband Access and Service in Illinois

The costs of offering free (or, alternatively, affordable) broadband internet service to all residents in Illinois are estimated using recent adoption and availability data in this section. The following four separate cost estimates are provided:

1. Free service to all Illinois residents with no infrastructure investment required, lending out hotspots or satellite equipment to those with no fixed broadband options (annual cost)
2. Free access and service to all Illinois residents by deploying wireline infrastructure in all currently unserved areas (one-time cost + annual cost for free service)
3. Affordable service for all Illinois residents (annual cost)
4. Affordable service for only those in poverty (annual cost)

Applying an Illinois Office of Broadband frame to this analysis, these estimates are presented in terms of (1) shorter-term, non-infrastructure “fixes” that are intended to provide relatively immediate impact but lack sustainability, and (2) longer-term, infrastructure-based “solutions” that are intended to serve as sustainable strategic investments.

Free Service with No Infrastructure Investment

Estimate of cost to provide free service to all Illinois residents without requiring infrastructure investment (i.e., hotspots/satellite)

This study uses 2019 American Community Survey (ACS) data to estimate the number of Illinois households with and without internet service and computing devices. We break households into four distinct categories used in the 2020 Common Sense Media digital divide report²²:

1. Fully Disconnected—neither internet service nor computing device
1. Internet Insufficient—no internet service but access to computing device
2. Device Deficient—internet service but no computing device
3. Connected, with Device—internet service and computing device

22 Common Sense Media and Boston Consulting Group. 2020. “Closing the K-12 Digital Divide in the Age of Distance Learning.” https://www.common sense media.org/sites/default/files/uploads/pdfs/common_sense_media_report_final_7_1_3pm_web.pdf

Following the Common Sense Media methodology, computing devices are defined as either a desktop or laptop *or* a tablet (*or both*), while internet access is defined as access to cable, fiber-optic, DSL, or satellite service. Notably, this methodology does not include households that access the internet only via mobile connections or that have only a smartphone as a computing device. This approach is similar to that used for the earlier section of this report, focused on adoption; however, it does include households with satellite connections as part of group 4 (CD). Table 10 indicates the number of households in each category for Illinois as of 2019.

Table 10. Illinois Household Connectivity Categories

Category	Number of Households (2019)	%
Fully Disconnected (FD)	668,599	14
Internet Insufficient (II)	508,911	10
Device Deficient (DD)	178,233	4
Connected, with Device (CD)	3,510,271	72
TOTAL IL Households	4,866,014	100

We next estimate the costs associated with providing each of these categories with free service, again using the Common Sense Media report methodology. The internet options available to each household are considered. For example, if a household is in an area that has a wired connection available to it, the annual costs of subscribing to that network are included. If no wired connection is available, the household would be provided a hotspot device that runs on the local cellular network.²³ If no such cellular network is available, the household would be provided with a satellite connection. Households lacking a device would be provided with a low-cost laptop or tablet. Estimated costs for the different solutions are taken from the Common Sense Media report and are based on company websites, bulk discounts, and low-cost options available across various manufacturers and providers. These costs were estimated for households with students; however, we assume the costs will remain similar for adult-only households.

A summary of the costs associated with these potential solutions for Illinois households is displayed in Table 11. The underlying solution categories (device and connectivity options) come directly from the Common Sense Media report.

²³ FCC Form 477 data from December 2019 suggest that only 2.2% of Illinois housing units lack access to a fixed broadband connection; however, this likely overstates availability. We assume 90% fixed broadband availability and split the remaining 10% evenly between those with cellular access and those requiring satellite connections.

Table 11. Annual Costs of Providing Service to Illinois Households Lacking Internet or Devices

	Internet Insufficient (II)			Device Deficient (DD)	Fully Disconnected (FD)			
	1	2	3		4	5	6	7
Access considerations	No access to fixed or cellular	Access to cellular only	Access to fixed	Already has fixed	No access to fixed or cellular	Access to cellular only	Access to cellular only	Access to fixed
Device options	None	None	None	Laptop/tablet	LTE-enabled laptop/tablet	LTE-enabled laptop/tablet	Laptop/tablet	Laptop/tablet
Connectivity options	Satellite	Cellular data	Fixed broadband	None	Satellite	Cellular data	Cellular data	Fixed broadband
Other hardware	Dish, install	Hotspot device	Modem, router, install	None	Dish, install	None	Hotspot device	Modem, router, install
Cost/HH	\$850-\$1,075	\$250-\$300	\$125-\$375	\$225-\$475	\$1,075-\$1,525	\$550-\$925	\$475-\$750	\$350-\$825
% of segment	5%	5%	90%	100%	5%	3%	3%	90%
# of HH in IL	25,446	25,446	458,020	178,233	33,430	16,715	16,715	601,739
Lower-bound Cost (\$M)	21.6	6.4	57.3	40.1	35.9	9.2	7.9	210.6
Total:	389.0							
Upper-bound Cost (\$M)	27.4	7.6	171.8	84.7	51.0	15.5	12.5	496.4
Total:	866.8							

This puts the total cost estimate of providing free internet service to Illinois households with neither a device nor internet access at between **\$389 million and \$867 million** annually. The range of these costs is associated with the uncertainty surrounding options for providing devices and access to households without them. For example, the cost of connecting a “fully disconnected” household living in an area with wireline availability would include the provision of a laptop or tablet and the annual connection cost, and it would range from \$350 to \$825. The actual cost of these devices and services will vary depending on what provider options are available within each region.

To estimate the cost of providing free service to all Illinois residents, we must also consider those households that currently have service (and a device). We estimate these costs using average monthly market rates for Illinois-based cable/DSL/fiber internet service providers at 25/3 speeds taken from the FCC’s 2020 Urban Rate Survey (Appendix 1). Slightly higher rates are used for satellite connections. As Table 12 shows, these costs are significantly higher than those for the disconnected households in Table 11.

Table 12. Annual Costs of Providing Free Service for Illinois Households That Already Subscribe

	Broadband	Satellite	Total
Connected HH, with at least 1 device (CD)	3,283,811	226,460	3,510,271
Lower-bound annual cost per HH (\$70/month; \$80/month)	840	960	
Upper-bound annual cost per HH (\$80/month; \$90/month)	960	1,080	
Lower-bound cost (\$M)	2,758.4	217.4	2,975.8
Upper-bound cost (\$M)	3,152.4	244.6	3,397.0

Thus, the cost of providing free service for households that already subscribe to the internet and have a usable device is between \$2.975 billion and \$3.397 billion. Combining the costs in Tables 11 and 12 results in a total estimate of between **\$3.364 billion and \$4.264 billion annually** (Table 13).

Table 13. Total Annual Cost of Free Broadband Service for Illinois Households

Category	Number of Households (2019)	Cost of Free Access	
		Low Estimate (\$M)	High Estimate (\$M)
Fully Disconnected (FD)	668,599	263.7	575.4
Internet Insufficient (II)	508,911	85.2	206.7
Device Deficient (DD)	178,233	40.1	84.7
Connected, with Device (CD)	3,510,271	2,975.8	3,397.0
TOTAL IL Households	4,866,014	3,364.8	4,263.9

This same process can be performed at a lower level of geography, namely, the 88 Public Use Microdata Areas (PUMAs) in Illinois. This is the lowest level of geography for which 1-year ACS data are available. These PUMAs can be mapped to the 10 Economic Development Regions in the state and analyzed using a similar methodology as applied here. These results are shown in Table 14 for the lower-end estimate. They demonstrate that the costs are notably different across Economic Development Regions and are driven by the high number of households in the Northeast region.

Table 14. Total Annual Cost of Free Broadband Service for Illinois Households, by Economic Development Region (Lower-Bound Estimate)

Region	# HH	Costs (\$M) to Connect All Households				Total Cost
		Fully Disconnected	Internet Insufficient	Device Deficient	Connected, with Device	
Central	238,224	16	6	2	129	154
East Central	144,105	10	3	1	84	98
North Central	250,380	17	5	2	143	167
Northeast	3,241,193	149	50	24	2,079	2,303
Northern Stateline	173,362	10	3	2	103	119
Northwest	159,012	11	3	2	87	103
Southeast	201,717	15	5	2	108	130
Southern	130,475	13	4	1	57	75
Southwest	214,260	13	4	2	125	145
West Central	113,286	9	3	1	60	73
Total	4,866,014	264	85	40	2,976	3,365

Free Access and Service by Deploying Wireline Infrastructure

Analysis of the cost of providing universal access and service where existing infrastructure (i.e., wireline access) does not exist

To estimate the costs of deploying broadband networks to all Illinois households, we begin with the Federal Communications Commission (FCC) Form 477 data as of December 2019 (the most recent data available).²⁴ These data are submitted by all internet providers, which generate a list of all Census blocks they serve and the different speeds offered in those blocks. These data have been highly criticized because if even a single household in a Census block is provided service (or could be upon request), the entire block is considered to be served. The data also capture only advertised (as opposed to actual) speeds. To compensate for these shortcomings in FCC data, several different data sets that capture actual user speeds are used to compile alternative estimates.

We use the Form 477 data to compile a list of all Census blocks in the state that lack access to at least one broadband provider. We then use the FCC’s 2019 block-level estimates to generate a number of housing units that lack such access. Note that the FCC’s definition (and number) of “housing units” is different from that for the Census’s “households” because the FCC includes vacant structures and group housing. Because Illinois is interested in knowing the number of housing units that lack access to specific types of broadband, we estimate:

²⁴ We note that an alternative broadband availability map is being funded by Connect Illinois that takes into account the criticisms of the FCC Form 477 data, which are known to overstate broadband availability. Updated estimates of the number of housing units that lack broadband access will likely differ from those provided here based on the differences in the underlying data sources.

1. The number of housing units lacking access to terrestrial 25/3 speeds (i.e., excluding satellite)
2. The number of housing units lacking access to wired 25/3 speeds (i.e., excluding satellite and fixed wireless connections)
3. The number of housing units lacking access to terrestrial 100/20 speeds²⁵

We perform this analysis at both the state and Economic Development Region levels. When conducting the regional-level analysis, county-level estimates are generated from the Census block data and then aggregated to the Economic Development Region.

There are 451,554 Census blocks in Illinois, containing 5,387,995 housing units, as of 2019.²⁶ The number and percentage of housing units depicted as lacking access to the categories of broadband outlined here are depicted in Table 15. A map of Census blocks depicted as not having 25/3 service in the December 2019 data is provided in Appendix 2.

Table 15. Illinois Housing Units Lacking Broadband Access, December 2019

Total Housing Units	No 25/3		No 25/3 Wired Only		No 100/20	
	Number	%	Number	%	Number	%
5,387,995	119,419	2.20	308,554	5.73	402,730	7.47

However, these percentages represent the broadband infrastructure situation based on FCC data as of December 2019 and do not capture investments made after that time. We know that several sources funded broadband projects in the state after December 2019. Namely, the United States Department of Agriculture’s ReConnect Loan and Grant Program, the FCC’s Connect America Fund (CAF), and Round 1 of the Connect Illinois broadband grant program all made awards either immediately prior to or after this date—and we account for these in Table 16. Appendix 3 provides details on the award amounts and the number of currently unserved housing units impacted by each project. We note that the first round of the FCC’s Rural Digital Opportunity Fund auction was completed in December 2020 and that these awards are not included in our analysis because they will not be finalized until 2021.²⁷

²⁵ We do not break out wired-only 100/20 service because such connections are assumed to be wired. Only a very small number of all fixed wireless providers claimed to offer 100/20 service in the December 2019 FCC Form 477 data (5%). The median offering of all fixed wireless providers was 25/3, and the offering from fixed wireless providers in the 25th percentile was only 5/1.

²⁶ These numbers include vacant houses and group housing such as correctional facilities, college dorms, or shelters that are not contained in the ACS household estimates in Table 13. Only 14,300 housing units are listed in blocks with no population.

²⁷ The RDOF awards used June 2019 FCC Form 477 data and assigned support to 159,967 unserved households in Illinois (<https://docs.fcc.gov/public/attachments/DOC-368588A1.pdf>).

Table 16. Illinois Broadband Grants Made After December 2019

Program	# of Awards	Grant Amount	Match	HH Served	Cost/HH
USDA ReConnect	7	89,900,000	-	25,353	3,546
FCC Connect America Fund	4	33,715,374	-	8,958	3,764
Connect Illinois	27	48,123,419	62,594,138	23,061	4,801
Total	38	171,738,793	62,594,138	57,372	4,084

The 57,372 currently unserved housing units that will be impacted by these funded projects are subtracted from the estimates of total unserved housing units as of December 2019 in Table 15. All projects funded through ReConnect, CAF, or Connect Illinois will provide speeds greater than 100 Mbps down / 20 Mbps up, so all three of the categories in Table 15 are impacted. However, not all of the Connect Illinois households noted in Table 16 previously lacked 25/3 service; many (12,952) only lacked 100/20 service. Thus, only the 10,109 households lacking 25/3 are used to adjust the December 2019 FCC data.

Table 17. Adjusted Estimate of Illinois Housing Units Currently Lacking Broadband Access

Total Housing Units	No 25/3		No 25/3 Wired Only		No 100/20	
	Number	%	Number	%	Number	%
December 2019	119,419	2.20	308,554	5.73	402,730	7.47
Post-2019 awards	44,420		44,420		57,372	
5,387,995	74,999	1.34	264,134	4.85	345,358	6.41

To derive a cost of providing access where this infrastructure does not currently exist, we pull from the cost per household for the three funding programs noted in Table 16. The corresponding award announcements typically detail the amount of grant funding distributed and the number of currently unserved households to be passed. For Connect Illinois grant awardees, we review the application packet to account for additional funds to be provided by the awardee that are required to complete the project. This allows us to derive a cost to provide broadband per household. We note that this technique includes only data from communities within the state that recently lacked access, and thus are likely to be similar in nature to those currently without service.

We then multiply the estimated cost per household (\$4,084 from Table 16) with the total number of unserved housing units (Table 17) to derive an estimate of the total cost of providing universal access.²⁸

²⁸ We use this cost regardless of region; however, we note that households in hard-to-reach locations or with difficult terrains will cost significantly more on a per-household basis.

Table 18. Cost Estimate of Providing Access to Currently Unserved Housing Units

Total Housing Units	No 25/3		No 25/3 Wired Only		No 100/20	
	# HH	Cost (\$M)	# HH	Cost (\$M)	# HH	Cost (\$M)
5,387,995	74,999	306	264,134	1,079	345,358	1,410

Thus, the total cost of providing 25/3 access to all Illinois housing units currently estimated as lacking it is between **\$306 million and \$485 million**.²⁹³⁰ The lower end of this estimate is built from December 2019 FCC Form 477 data (i.e., the 74,999 housing units identified in Table 18) and assumes that the future costs to cover unserved households will be the same as recent grant awards (i.e., the \$4,084 per household identified in Table 16). Both of these assumptions are optimistic. Adjustments to this baseline result in higher estimates. In particular, if the FCC data overstate availability for 20,000 housing units, and the cost per household increases by 25%, the resulting estimate for 25/3 service rises to \$485 million. **The cost of upgrading all housing units to 100/20 service is estimated to be four to six times as large—between \$1.410 billion and \$1.865 billion.** This is because a significant number of housing units (more than 270,000) have access to 25/3 service but not 100/20 according to the FCC Form 477 data. Again, the lower-end estimate is built on the housing units identified in Table 18 and the recent grant award cost per household in Table 16, while the higher-end estimate assumes 20,000 additional unserved housing units and a 25% increase in the cost per household.

We also perform this analysis by Economic Development Region by calculating the number of housing units lacking broadband according to the December 2019 FCC data at the county level, reducing that number by the grant program awards listed in Table 18, and then aggregating up to the Economic Development Region. These estimates are displayed in Table 19. The cost for a region is driven by both the total number of housing units and the percentages lacking access.

29 This compares with an \$800 million estimate for 193,000 households without access provided to the state of South Carolina that used a similar methodology but did not adjust for recent federal investments. See Raven, J. 2020. "It could cost \$800 million and take 5 years to connect every SC household to high-speed internet." WIST News. Available online:

<https://www.wistv.com/2020/06/25/it-could-cost-million-take-years-connect-every-sc-household-high-speed-internet/>

30 The state of Colorado also came up with an estimate of \$500 million to \$700 million to connect its remaining 90,000 households without broadband access; however, its assumed per-house cost to connect was two to three times as high as previously funded projects. See Governor's Broadband Initiatives Report. 2020. Available online:

<https://drive.google.com/file/d/1jDAruEshl3cUqMJElu8BkClqJtXxfp5F/view>

Table 19. Cost Estimate of Providing Access to Currently Unserved Housing Units, by Economic Development Region

Region	Name	Total HH	No 25/3		No 25/3 Wired Only		No 100/20	
			# HH	Cost (\$M)	# HH	Cost (\$M)	# HH	Cost (\$M)
1	Central	251,695	9,267	38	30,413	124	50,509	206
2	East Central	166,556	4,137	17	17,076	70	22,947	94
3	North Central	320,181	7,052	29	29,613	121	38,811	159
4	Northeast	3,506,019	31,117	127	58,229	238	60,387	247
5	Northern Stateline	190,404	676	3	12,293	50	14,160	58
6	Northwest	227,858	1,874	8	32,516	133	45,151	168
7	Southeast	128,320	13,780	56	28,706	117	24,691	101
8	Southern	181,225	613	3	19,730	81	39,042	159
9	Southwest	312,558	499	2	22,941	94	36,189	148
10	West Central	103,179	5,984	24	12,607	51	17,471	71
	TOTAL	5,387,995	74,999	306	264,134	1,079	345,358	1,410

Notably, the estimates in Table 19 are one-time costs that cover the necessary infrastructure investment required for all housing units in the state to have access to a fixed broadband connection. The annual cost to provide all households with free service can be estimated by reconfiguring Tables 10 and 11 under the assumption that everyone will now have a fixed broadband connection available to them. Note that this estimate reverts to the ACS-defined number of households that excludes group housing and vacant households.

Table 20. Total Annual Cost of Free Broadband Service for Illinois Households, Assuming Wired Connectivity Available to All

Category	Number of Households (2019)	Access Consideration	Annual Cost / HH	Total Cost (\$M)
Fully Disconnected (FD)	668,599	Access to Fixed	\$350	234.0
Internet Insufficient (II)	508,911	Access to Fixed	\$125	63.6
Device Deficient (DD)	178,233	Laptop or Tablet	\$225	40.1
Connected, with Device (CD)	3,510,271		\$840	2,948.6
TOTAL IL Households	4,866,014			3,286.4

Alternative Broadband Availability Estimates

As we previously noted, the FCC Form 477 data have been heavily criticized based on the underlying assumption that a single household served (or *potentially* served) within a Census block implies that all households in that block have access. Recent research has shown the potential overstatement of this assumption by reverse-engineering the coverage tools offered by most major broadband internet access service providers and reporting the results for more than 19 million residential addresses across nine states.³¹ The results showed that the overstatement is not severe in urban areas, where 98% of those shown as having service via the FCC data are confirmed with the address checks. In rural areas, however, only 92% of those shown as having 25/3 service according to the FCC were confirmed with the broadband providers' coverage tools. We can use this analysis to adjust the estimates for the number of unserved households in Illinois by assuming that the FCC coverage shown in urban and rural areas is 98% and 92% correct, respectively.

Another criticism of the data is that they capture only advertised, and not actual, speeds. As an alternative to the FCC Form 477 data, we use data on actual speeds from two sources: Microsoft and M-Lab. Microsoft's data come from anonymized information (i.e., speed tests) from households updating or connecting to Microsoft services, which is available for every U.S. county.³² Similarly, M-Lab is an open-source internet measurement tool that gathers data on actual connectivity speeds for millions of U.S. households. The M-Lab data can be compiled at various geographical levels, including counties. Median download and upload speeds are reported.³³

31 Major, D., Teixeira, R., and Mayer, J. 2020. "No WAN's Land: Mapping U.S. Broadband Coverage with Millions of Address Queries to ISPs." In *Proceedings of the ACM Internet Measurement Conference* (pp. 393-419).

32 Microsoft's data are available at <https://github.com/microsoft/USBroadbandUsagePercentages> and list the percentage of residents in each county not using the internet at broadband speeds.

33 Since M-Lab reports only median speeds, we assume that 100% of households in counties with median speeds of <10 Mbps are unserved; 50% of households in counties with median speeds between 10 and 25 Mbps are unserved, and 25% of households in counties with median speeds of between 25 and 35 Mbps are unserved. Additional information about M-Lab is available at <https://www.measurementlab.net/blog/speed-tests-accuracy/>

We use the most recent Microsoft (November 2019) and M-Lab (2020) data available for Illinois counties to provide alternative estimates of the number of households not using the internet at official broadband speeds (i.e., 25 Mbps down / 3 Mbps up). These numbers are much higher than those reported by the FCC Form 477 and its adjusted counterpart. The associated costs to provide access to these households is also estimated using the cost per household from Table 16.

Table 21. Alternative Broadband Availability Estimates and Costs to Provide Access

			No 25/3							
			FCC Original		FCC Adjusted		M-Lab		Microsoft	
Reg.	ED Name	Total HH	# HH	Cost (\$M)	# HH	Cost (\$M)	# HH	Cost (\$M)	# HH	Cost (\$M)
1	Central	251,695	9,267	38	9,899	40	84,416	345	158,320	648
2	East Central	166,556	4,137	17	4,617	19	18,387	75	104,454	273
3	North Central	320,181	67,052	29	7,496	31	63,294	258	1837414	750
4	Northeast	3,506,019	31,117	127	31,766	130	574,666	2,347	1,484,3701	6,062
5	Northern Stateline	190,404	676	3	874	4	23,064	94	98,888	404
6	Northwest	227,858	1,874	8	2,067	8	75,921	310	156,741	638
7	Southeast	128,320	13,780	56	15,496	63	51,199	209	94,544	386
8	Southern	181,225	613	3	2,000	8	86,951	355	119,295	487
9	Southwest	312,558	499	2	640	3	80,084	327	184,036	752
10	West Central	103,179	5,984	24	6,657	27	27,115	111	67,403	275
	Total	5,387,995	74,999	306	81,513	333	1,085,098	4,432	2,638,735	10,896

Affordable Service for All Residents

Estimate of annual cost to provide affordable service to all Illinois residents

We use the same approach as the non-infrastructure estimate previously described, but we assume that all households would receive a subsidy bringing their monthly broadband costs to either \$10 or \$25. Recent research has suggested that these thresholds are reasonable for low-income households.³⁴ We estimate the costs of providing this type of subsidized service for all households and for low-income households only.

The non-infrastructure approach established in Tables 11 and 12 estimates the cost of providing free service for all households. This approach can easily be modified to assume that each household pays \$10 or \$25 per month instead of being given free service. The costs for households without internet service or devices are demonstrated in Table 22. The lower-bound costs are reduced from \$389 million in Table 11 to \$226 million under the \$10/month option and to \$77 million under the \$25/month option.

34 Strover, S., Whitacre, B., Rhinesmith, C., and Schrubbe A. 2019. "The Digital Inclusion Role of Rural Libraries: Social Inequalities Through Space and Place," *Media, Culture, & Society*.

Table 22. Annual Costs of Providing Affordable Service to Illinois Households Lacking Internet or Devices (\$10 and \$25 / month option)

	Internet Insufficient (II)			Device Deficient (DD)	Fully Disconnected (FD)			
	1	2	3		4	5	6	7
Access considerations	No access to fixed or cellular	Access to cellular only	Access to fixed	Already has fixed	No access to fixed or cellular	Access to cellular only	Access to cellular only	Access to fixed
Device options	None	None	None	Laptop/tablet	LTE-enabled laptop/tablet	LTE-enabled laptop/tablet	Laptop/tablet	Laptop/tablet
Connectivity options	Satellite	Cellular data	Fixed broadband	None	Satellite	Cellular data	Cellular data	Fixed broadband
Other hardware	Dish, install	Hotspot device	Modem, router, install	None	Dish, install	None	Hotspot device	Modem, router, install
% of segment	5%	5%	90%	100%	5%	3%	3%	90%
# of HH in IL	25,446	25,446	458,020	178,233	33,430	16,715	16,715	601,739
Cost / HH	\$850-\$1,075	\$250-\$300	\$125-\$375	\$225-\$475	\$1,075-\$1,525	\$550-\$925	\$475-\$750	\$350-\$825
Cost paid by HH (\$10/month)	\$120	\$120	\$120	\$120	\$120	\$120	\$120	\$120
Lower-bound cost (\$M) – \$10	18.6	3.3	2.3	18.7	31.9	7.2	5.9	138.4
Total:	226.3							
Upper-bound cost (\$M) – \$10	24.3	4.6	116.8	63.3	47.0	13.5	10.5	424.2
Total:	704.1							
Cost paid by HH (\$25/month)	\$300	\$300	\$300	\$300	\$300	\$300	\$300	\$300
Lower-bound cost (\$M) – \$25	14.0	0.0	0.0	0.0	25.9	4.2	2.9	30.1
Total:	77.1							
Upper-bound cost (\$M) – \$25	19.7	0.0	34.4	31.2	41.0	10.4	7.5	315.9
Total:	460.1							

When combined with households that currently pay for broadband service, the full costs of supporting such a program are shown in Table 23. Those households classified as connected with a device are assumed to have their monthly costs subsidized so that they pay only \$10 and \$25 per month, respectively.

Table 23. Total Annual Cost of \$10 and \$25 / Month Broadband Service for Illinois Households

Category	Households (2019)	Cost of \$10/Month Service		Cost of \$25/Month Service	
		Low Estimate (\$M)	High Estimate (\$M)	Low Estimate (\$M)	High Estimate (\$M)
Fully Disconnected	668,599	183.4	495.2	63.1	374.8
Internet Insufficient	508,911	24.2	145.7	14.0	54.1
Device Deficient	178,233	18.7	63.3	0.0	31.2
Connected, with Device	3,510,271	2,554.6	2,975.8	1,922.7	2,344.0
TOTAL IL Households	4,866,014	2,780.9	3,679.9	1,999.8	2,804.0

These costs can also be broken out by Economic Development Regions by using 2019 ACS data for the 88 PUMAs within the state. Each PUMA is broken into the four connectivity categories, and the aforementioned methodology is used to derive the cost of connecting each type of household. Again, the total costs are driven by the Northeast region that contains two-thirds of all households in the state.

Table 24. Annual Costs of Providing Affordable Service to Illinois Households (\$10 and \$25 / month), by Economic Development Region

Region	Number of Households (2019)	Cost of \$10/Month Service		Cost of \$25/Month Service	
		Low Estimate (\$M)	High Estimate (\$M)	Low Estimate (\$M)	High Estimate (\$M)
Central	238,224	125	173	89	130
East Central	144,105	80	109	57	83
North Central	250,380	137	187	97	142
Northeast	3,241,193	1,914	2,483	1,386	1,900
Northern Stateline	173,362	98	131	70	100
Northwest	159,012	84	116	60	88
Southeast	201,717	106	148	75	111
Southern	130,475	59	90	41	67
Southwest	214,260	119	161	85	122
West Central	113,286	59	83	42	63
TOTAL IL Households	4,866,014	2,781	3,680	2,000	2,804

Affordable Service for Only Those in Poverty

We are also interested in estimating the cost of providing affordable broadband service specifically to Illinois households in poverty. The map in Appendix 4 demonstrates that pockets of high-poverty zip codes are present in many different regions of the state. However, 1-year ACS estimates on broadband adoption are not available for zip codes, and our methodology instead focuses on the geographies where the 1-year data are available (entire state and PUMAs).

To estimate the costs of providing affordable (\$10 or \$25 per month) broadband service to households in poverty, we again use the 2019 ACS data. After breaking out the number of households in poverty, we estimate the numbers in each of the four Common Sense Media categories used in the first section of this report. The percentages of impoverished households lacking a connection and/or device are much higher than for the general population. Tables 25 and 26 break out the number and costs of providing these households with affordable broadband connections. The lower-bound costs of providing service solely to impoverished households that lack either connectivity or a device are \$46.1 million for the \$10/month option and \$16.4 million for the \$25/month option (Table 26; categories FD, II, and DD only).

Table 25. Illinois Household Connectivity Categories – Households in Poverty Only

Category	Number of Households (2019)	%
Fully Disconnected (FD)	149,796	23
Internet Insufficient (II)	83,423	13
Device Deficient (DD)	9,769	1
Connected, with Device (CD)	408,297	63
TOTAL IL Households in Poverty	651,285	100

Table 26. Total Annual Cost of \$10 and \$25 / Month Broadband Service for Illinois Households in Poverty

Category	Households (2019)	Cost of \$10/Month Service		Cost of \$25/Month Service	
		Low Estimate (\$M)	High Estimate (\$M)	Low Estimate (\$M)	High Estimate (\$M)
Fully Disconnected (FD)	149,796	41.1	110.9	14.1	84.0
Internet Insufficient (II)	83,423	4.0	23.9	2.3	8.9
Device Deficient (DD)	9,769	1.0	3.5	0.0	1.7
Connected, with Device (CD)	408,297	294.0	343.0	220.5	269.5
TOTAL IL Households in Poverty	651,285	340.1	481.3	236.9	364.0

We can also break these costs into the 10 Economic Development Regions by using 2019 ACS data from the 88 PUMAs. The number of households in poverty are calculated for each PUMA and aggregated to the Economic Development Region level. We then estimate the number of

households across the four connectivity categories and apply the methodology in Table 14 to estimate the cost to connect each category. These costs are shown in Table 27.

Table 27. Annual Costs of Providing Affordable Service to Illinois Households in Poverty (\$10 and \$25 / month), by Economic Development Region

Region	Number of Households in Poverty (2019)	Cost of \$10/Month Service		Cost of \$25/Month Service	
		Low Estimate (\$M)	High Estimate (\$M)	Low Estimate (\$M)	High Estimate (\$M)
Central	36,636	17	25	12	19
East Central	27,490	14	20	10	15
North Central	40,284	20	29	14	21
Northeast	389,740	207	291	145	221
Northern Stateline	26,057	15	20	10	15
Northwest	24,932	14	19	10	14
Southeast	32,570	17	24	12	18
Southern	26,696	13	19	9	14
Southwest	30,450	15	22	11	17
West Central	16,430	9	12	6	9
TOTAL IL Households in Poverty	651,285	340	481	237	364

Recommendations

The State of Illinois should take the following steps to promote universal broadband:

1. **Continue to offer competitive matching grants.** In order to address the cost of deploying broadband networks to reach all Illinois households, the State should continue to offer competitive, broadband deployment matching grants through Connect Illinois. The State should fully utilize the Connect Illinois funds appropriated by the General Assembly as part of Governor Pritzker's Rebuild Illinois capital investment strategy while also pursuing federal funding opportunities and encouraging continued private investment. The State should keep its focus not only on ensuring that all Illinois households have access to 25/3 Mbps wireline service by 2024 but also on the longer-term goal of connecting all households in Illinois with broadband of at least 100/20 Mbps over networks that can scale to at least 100/100 Mbps by 2028.³⁵
2. **Support development of affordable network alternatives for Illinois residents.** Internet service is out of financial reach for many Illinois households; many homes are in areas with a single (often unaffordable) provider. Given broadband adoption gaps along racial and socioeconomic lines, the State should support community-driven initiatives to introduce more affordable options, expand choice, and drive broadband adoption. There have been a number of publicly funded broadband initiatives across Illinois over the past decade. The State should take steps to facilitate deployment of affordable, high-speed, and high-quality wireline or wireless networks.
3. **Establish a state digital inclusion coordinator.** The Illinois Digital Inclusion Coordinator should be integrated into overall statewide broadband planning, highlighting the digital inclusion implications of broadband policy initiatives and other state policy initiatives that rely on broadband (e.g., government service delivery). The coordinator would develop relationships, partnerships, and programs to promote digital inclusion across the state.
4. **Fund partnerships for digital inclusion.** Illinois should support, in partnership with philanthropic organizations, community-based nonprofits that provide digital skills training and tech support for low-income households.
5. **Increase public awareness of affordability programs.** Many eligible households may not be aware of discount broadband internet access service plans or may experience difficulty in signing up. Policymakers and other stakeholders should encourage awareness of these programs. Policymakers should also work with providers to create these programs and to ease the process of qualifying and signing up for these offers.
6. **Improve the pipeline of computing devices.** Stakeholders should explore ways to expand low-cost computing programs to all parts of Illinois to meet growing demands

35 <https://www2.illinois.gov/dceo/ConnectIllinois/Documents/Broadband%20Strategic%20Plan%202022.5.20.pdf>

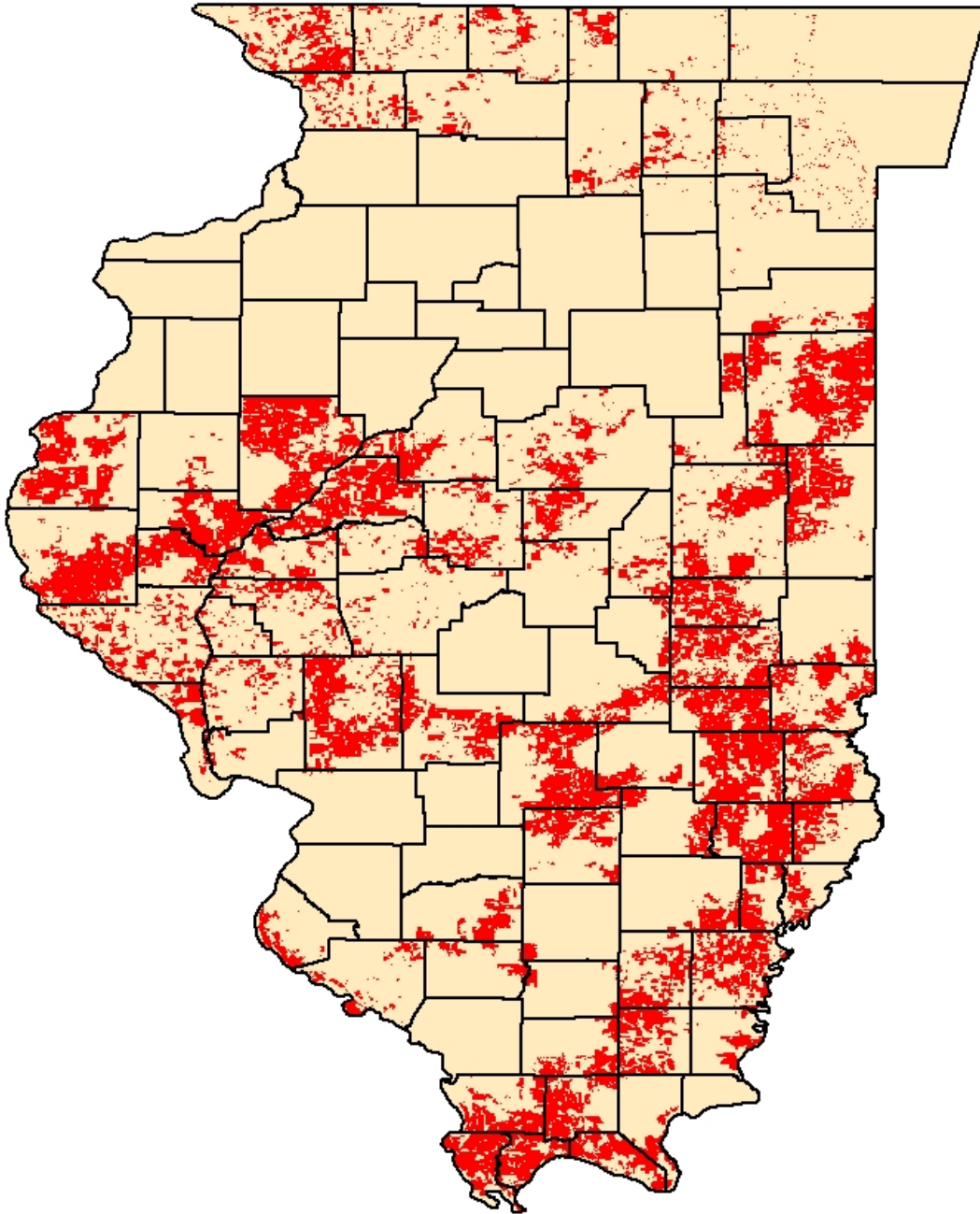
that the COVID-19 pandemic has spurred. This includes efforts such as the State's current work with PCs for People to refurbish computers for nonprofits and low-income individuals.

Appendix 1. FCC Urban Rate Survey – Summary for Illinois (2020)

Service Level (Mbps Down/Up)	# Providers Listed	Average Monthly Cost (\$)
< 25/3	109	64
25/3 - 50/3	27	70
50/10 - 100/20	88	70
More than 100/20	49	102

Source: <https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources>

Appendix 2. Illinois Census Blocks Without 25/3 Broadband Access as of December 2019



Source: FCC Form 477 Data, December 2019; Author's calculations. Available from: <https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477>. Red blocks are those with populations >0 and shown as lacking 25/3 fixed terrestrial access.

Appendix 3. Illinois Broadband Grant Awards Made After December 2019

Connect Illinois Grant Awards (2020)

	Provider	Year	Award (\$)	Match (\$)	HH Served	Cost/ HH (\$)	Cost / All Passes (\$)
1	Adams	2020	4,954,066	4,954,066	974	10,173	8,959
2	Allpoint	2020	2,679,502	2,679,502	846	6,335	5,787
3	Cambridge	2020	817,054	817,054	144	11,348	9,501
4	Century	2020	3,123,122	3,123,122	485	12,879	10,751
5	Comcast 2	2020	595,301	595,301	179	6,651	6,651
6	Comcast 3	2020	630,904	630,904	270	4,673	4,673
7	Diverse Communications	2020	426,000	426,000	50	17,040	10,519
8	Geneseo	2020	5,000,000	8,442,029	3,674	3,659	3,560
9	Grafton	2020	1,483,007	2,427,223	460	8,501	6,696
10	Illinois Electric Coop.	2020	3,443,670	3,443,670	746	9,232	8,189
11	Illinois Fiber Connect	2020	4,874,174	4,874,174	755	12,912	11,550
12	JoCarroll Energy 2	2020	4,035,843	4,035,843	626	12,894	8,587
13	JoCarroll Energy 3	2020	2,014,272	2,014,272	1,122	3,591	2,709
14	Madison	2020	4,230,223	5,170,272	8,741	1,075	1,013
15	Mediacom 2	2020	249,424	249,424	234	2,132	2,011
16	Mediacom 3	2020	210,831	210,831	224	1,882	1,764
17	Oneida	2020	576,900	576,900	48	24,038	16,722
18	Shawnee LEC 1	2020	2,264,157	5,283,033	787	9,590	7,717
19	Shawnee LEC 2	2020	3,525,068	8,225,157	1,523	7,715	7,187
20	Shawnee LEC 3	2020	1,183,982	2,298,318	327	10,649	8,816
21	Spectrum (6 grants)	2020	214,822	525,946	247	2,999	2,999
22	Wabash	2020	1,591,097	1,591,097	599	5,313	4,829
	Total		48,123,419	62,594,138	23,061	4,801	4,335

Source: <https://www2.illinois.gov/dceo/ConnectIllinois/Documents/Connect%20Illinois%20Rd%201%20Project%20Summaries.pdf>

Note: Only last-mile projects included. Households served include both “unserved” and “underserved” according to grant applications. Additional businesses, farms, and institutions passed by these projects are not included in the HH column but are in the Cost / All Passes column.

USDA ReConnect Illinois Awards (Late 2019 and 2020)

Provider	Year	Award (\$)	Match (\$)	HH Served	Cost/HH (\$)
1 Hamilton Co. Cooperative	2020	40,000,000	-	14,812	2,701
2 Flat Rock Cooperative	2020	6,400,000	-	1,095	5,845
3 Hamilton Co. Coop.	2020	3,400,000	-	603	5,638
4 Wabash Cooperative	2019	12,800,000	-	1,684	7,601
5 Jo-Carroll Energy	2019	14,000,000	-	3,815	3,670
6 West Kentucky Telephone	2020	11,700,000	-	3,125	3,744
7 Adams Telsystems	2020	1,600,000	-	220	7,273
Total		89,900,000	-	25,353	3,546

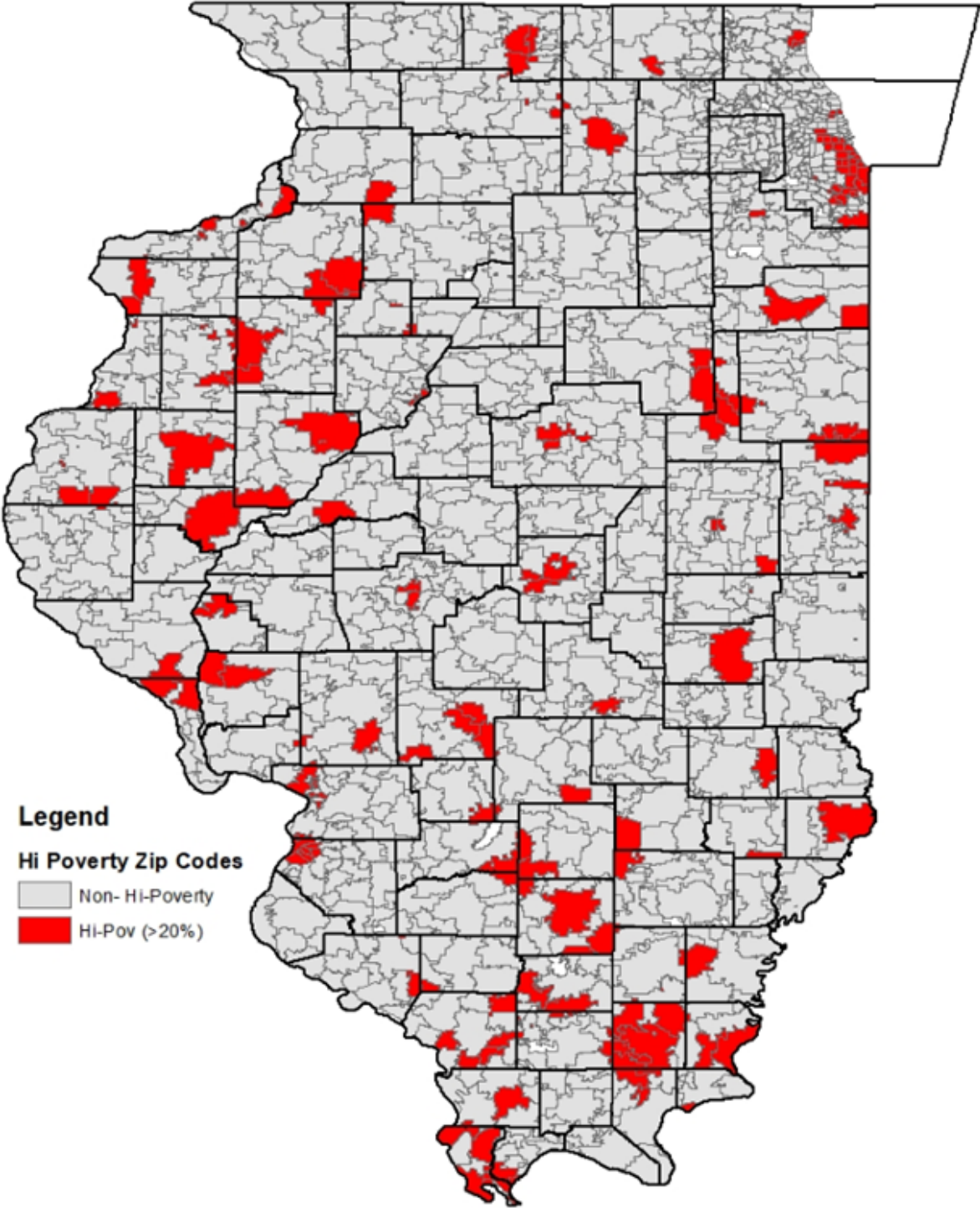
Sources: <https://www.usda.gov/media/press-releases/2020/10/13/trump-administration-invests-464-million-high-speed-broadband-rural>
<https://www.usda.gov/media/press-releases/2020/02/14/usda-invests-34-million-broadband-rural-illinois-communities>
<https://www.usda.gov/media/press-releases/2019/12/04/usda-invests-128-million-rural-broadband-illinois-families>
<https://www.usda.gov/media/press-releases/2020/10/19/trump-administration-invests-14-million-high-speed-broadband-rural>
<https://www.usda.gov/media/press-releases/2020/10/22/trump-administration-invests-117-million-high-speed-broadband-rural>
<https://www.rd.usda.gov/newsroom/news-release/trump-administration-invests-16-million-high-speed-broadband-rural-illinois>

FCC Connect America Funds (2019 / 2020)

Provider	Year	Award (\$)	Match (\$)	HH Served	Cost/HH (\$)
1 Illinois Fiber Connect	2019	310,031	-	98	3,164
2 ShawneeLEC	2019	1,714,708	-	567	3,024
3 W.A.T.C.H. TV	2019	24,366,144	-	6,041	4,033
4 WISPER 100/20 service	2020	7,324,491	-	2,252	3,252
Total		33,715,374	-	8,958	3,764

Sources: <https://docs.fcc.gov/public/attachments/DOC-359631A1.pdf>
<https://rodneydavis.house.gov/news/documentsingle.aspx?DocumentID=403578>

Appendix 4. Map of High-Poverty Zip Codes in Illinois



Source: 2014–2018 American Community Survey Table S1701

Appendix 5: Connect Illinois Digital Equity Programming

The Connect Illinois digital equity programming is a comprehensive approach designed to help communities identify and address existing broadband equity gaps, as well as to leverage new and existing sources of funding for long-term broadband equity.

To create an ecosystem of digital equity and inclusion, the State of Illinois introduced complementary programming to pair with its ongoing \$420 million capital broadband investment that, combined, seeks to ensure affordable in-home broadband service, access to personal computers, digital literacy training, and ongoing technical support. Illinois is working alongside public, private, nonprofit, and philanthropic partners to raise capital for and awareness of the digital equity challenges facing communities.

Broadband READY Grants

A collaborative effort between the Illinois Office of Broadband and the Illinois Innovation Network, Broadband Regional Engagement for Adoption + Digital Equity (READY) grants are being provided to qualified regional entities statewide to explore opportunities for equitable advances in the areas of broadband access, adoption, and utilization. The program is designed to identify current digital inequities as well as next steps in creating a digital inclusion ecosystem through regional collaboration among community and economic-development organizations, educators, local leaders, and other related stakeholders, and it seeks to provide scalable solutions for broadband utilization across all 10 Illinois economic development regions—including pressing current needs such as telehealth and remote learning.

Illinois Connected Communities Grants

A partnership of the Office of Broadband, the Benton Institute for Broadband & Society, and local philanthropy, the Illinois Connected Communities (ICC) program was launched in the summer of 2020 to help drive community planning for broadband access, adoption, and use implementation. Two initial rounds of state grant funding, combined with philanthropic dollars that underwrite the cost of expert consultative services and access to best-practice curricula, have been made available to assist local governments, libraries, schools, and various community organizations with planning and progress around broadband access, adoption, and utilization.

The first round was directed to 12 community-based organizations to assist with planning; round two communities will be announced in spring 2021.

Digital Navigator Collaboration

To support community digital equity needs, the Office of Broadband and program partners are building digital navigator capacity within communities around the state. Navigators will work to address the digital inclusion process—including home connectivity, devices, and digital skills. Digital navigators will assess residents' needs and connect them to resources that match their

households' lifestyles. These navigators can be volunteers or cross-trained staff who already work in social service agencies, libraries, health care, and elsewhere, and they will offer remote and socially distant in-person guidance. An initial cohort will be provided with expert training as well as the opportunity to work directly with project partners on resource establishment and digital equity mapping.

Connect Illinois Computer Equity Network

To expand digital access for low-income households in Illinois, a unique collaboration among nonprofit PCs for People and other community-based organizations will help put refurbished computer equipment and low-cost internet service into the hands of Illinois households in need. The resulting statewide computer equity network will hold distribution events in every county of the state, leveraging donated computers from public- and private-sector sources. Grant funding from the Illinois COVID-19 Response Fund brought PCs for People to Illinois, with additional philanthropic support spurring the full statewide expansion.

To participate in the program, residents' income must be below 200% of the poverty level or they must be enrolled in an income-based government assistance program, such as free and reduced lunch, Medicaid, or the Supplemental Nutrition Assistance Program (SNAP). With an estimated 1.1 million households in Illinois without a computer at home, the statewide network will include two central warehouse locations – one in southern Cook County and the other in the Metro East Region. Each centralized warehouse location will receive, refurbish, and redistribute computers for use by low-income households around the state. The network will also expand digital literacy programming and contribute to workforce development.

The implementation of this comprehensive Connect Illinois digital equity programming builds on concerted efforts by the Pritzker administration to increase broadband capacity and is critical for the economic growth of Illinois communities in the wake of the COVID-19 pandemic.