THE DIGITAL DIVIDE IN CONNECTICUT

How digital exclusion falls hardest on low-income households in cities, older adults, communities of color, and students.

JOHN B. HORRIGAN, PHD

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Most of the contents of this report will surprise no one because we've known for some time that the "digital divide" is a real problem in Connecticut. What I don't think we had a clear handle on was where the problem is most acute, and who it is disproportionately affecting.

The problem is most pervasive in our urban areas, and it's disproportionately affecting communities of color.

Covid has exacerbated this problem in two specific ways: a high percentage of Black and brown students simply don't have the capacity to do remote learning, and too many adults living in urban areas lack the capacity to go online to do the basics: search and apply for jobs, access unemployment benefits, etc.

Barbara Dalio and her team at Dalio Education deserve an enormous amount of credit for having stepped up when the pandemic shutdown happened in March to begin to address this crisis. Working with state leaders, they purchased 60,000 laptops for students who didn't have them and made generous donations in Hartford and Norwalk to address the connectivity issue.

But this is a statewide problem, and it requires a statewide solution; advocating for that solution is beyond the capacity of a philanthropic organization. To that end, CCM is committed to picking up the mantle and advocating for that solution.

All our students need to have the capacity to do remote learning, and every adult needs to be able to harness the power of the Internet to reach their economic potential.

JOE DELONG
Connecticut Conference of Municipalities
Executive Director & CEO

Dalio Education

In the weeks after schools were shut down in March, we began hearing stories from students and teachers about the difficulties they were experiencing with remote learning, including lack of reliable access to the Internet. We commissioned this report because we wanted to better understand the problem from a statewide perspective.

When we first met Joe DeLong from CCM, he asked one question: "What can CCM do to help?" Right away Joe began connecting us to mayors and first selectmen who were struggling with significant digital divide issues. In speaking with local leaders, it became clear that there is no "one size fits all" way to fix this problem. A combination of different topographies and the costs involved led us to the conclusion that only state and federal intervention could address this problem in a comprehensive fashion.

We were grateful to work with state leaders to donate the 60,000 laptops to students who didn't have them and glad to make the donations that allowed the cities of Hartford and Norwalk to make citywide, high-speed access to the Internet a reality.

We at Dalio Education will continue to look for creative ways to help our school children adapt to this new educational reality, and we are grateful to Joe DeLong and CCM for their willingness to step up to the plate to advocate for a statewide solution.

BARBARA DALIO
Dalio Education
Founder

Illustration by Michael Glenwood

EXECUTIVE SUMMARY

Americans will remember 2020 as the year of the pandemic, but it may also go down as the year society took aim at digital equity. When COVID-19 outbreaks closed schools and businesses in March, many Americans retreated to their homes where they worked online and logged on to lesson plans at school. Yet this "new normal" unfolded with great difficulty for many households. Without broadband, moving school from classrooms to the internet was impossible for millions of households with school-age children. Many people whose jobs could be done from home struggled with limited network connectivity and a scarcity of access devices.

23% of all Connecticut households lack high-speed internet at home

36% of low-income Connecticut households lack high-speed internet at home

Addressing these gaps means understanding their size. In the state of Connecticut, nearly one-quarter (23%) of Connecticut households do not have high-speed internet subscriptions at home. Connectivity deficits fall hardest on low-income residents, older adults, and communities of color. Specifically:

LOW-INCOME HOUSEHOLDS

36% of households below the state's median income do not have wireline broadband compared with 11% of all other households.

OLDER ADULTS

36% of Connecticut residents age 65 and older do not have wireline broadband at home.

HISPANICS

35% of Hispanics lack wireline broadband at home compared with 21% of whites.

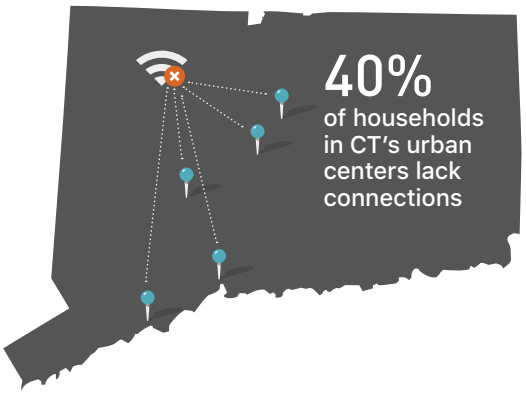
AFRICAN AMERICANS

34% of African Americans do not have wireline broadband.

Broadband access gaps also stand out for the urban poor and low-income households with children under the age of 18.

More than one-third of households without wireline broadband at home reside in the state's eight largest cities; most of them are in Hartford, Waterbury, New Britain, Bridgeport, and New Haven. In those cities, nearly 40% of households do not have wireline broadband at home.

For lower-income Connecticut households with children under age 18, 29% do not have wireline broadband at home.



Closing digital adoption gaps is at once a logistical problem and a social policy challenge. Some entity should be responsible for aggregating information about available computers and discount service plans, and communicating this to potential beneficiaries. Nonprofit and other community organizations must raise funds to develop curricula and teaching capacity for digital skills that meet the varied needs of the people they serve. State agencies must determine how they can deliver services digitally while encouraging clients to use online means for more convenient and efficient service delivery.

Addressing these challenges require leadership at all levels. A first step would be for the Governor of Connecticut to issue an executive order calling for the development of a state broadband plan to close digital adoption gaps and explore ways to improve the state's digital infrastructure. Convening a range of stakeholders in the public and private sectors would lay the groundwork for a sustainable effort to enhance digital equity in the state. Here are several specific recommendations for the state:

01 ESTABLISH PARTNERSHIPS WITH LOCAL COMMUNITY GROUPS

These partnerships can serve as conduits for connectivity for both devices and low-cost service plans. This could involve collaborating with computer refurbishing operations to increase the supply of low-cost devices to those who need them. It would also mean easing the process by which qualifying households can sign up for discount internet plans that many companies offer. Some of this is underway in Connecticut with a focus on access for school-age children, but the state's digital divide is broader. Libraries can be key players in this equation, as well as other community anchor institutions. Trusted institutions should publicize the availability of low-cost offerings to low-income households.

02 DEVELOP A DIGITAL SKILLS INFRASTRUCTURE

Simply having internet access does not always translate into use. As the pandemic unfolded, many households – even those with internet connectivity – did not embrace online learning. Using telehealth is more involved than simply clicking on a browser. Investment in digital skills is a proven approach to increase the likelihood that new broadband adopters use connectivity for learning, communicating with children's teachers, and in job searches. The state of Connecticut should consider asset mapping to determine which institutions could serve as digital skills and tech support centers that can reach populations targeted for broadband outreach.

03 INTEGRATE BROADBAND ADOPTION INTO PUBLIC SERVICE DELIVERY

The state should convene a task force to evaluate how state agencies can ensure that service delivery systems can enhance access to digital tools and training for beneficiaries. Those who use government benefits, whether they are for health care or food support, are less likely to have online connectivity. The Connecticut State Broadband Office could take a leading role in convening an effort to modernize service delivery with an emphasis on increasing digital access and cultivating skills for beneficiaries.

57,000 HOUSEHOLDS WITH CHILDREN LACK RELIABLE INTERNET ACCESS

Altogether, approximately 321,000 households in the state lack wireline broadband subscriptions. Of these disconnected Connecticut households, 57,000 have children under the age of 18. Closing that gap entirely should be a goal. For the remaining 264,000 Connecticut households without wireline, 80% are households whose incomes are below the state median. Bringing the wireline adoption rate for those households up to the level of homes above the median income would result in 140,000 more households with wireline broadband in Connecticut. Getting nearly 200,000 more Connecticut households online with wireline broadband within the next two years should be the state's target.

As the pandemic fades, digital exclusion will remain a hard reality for many households. A sluggish economy will make it hard for some segments of the population to maintain home high-speed subscriptions. Connecticut can start today in developing mechanisms to close gaps.

CONNECTICUT'S DIGITAL DIVIDE BY THE NUMBERS

FOR HOME WIRELINE BROADBAND SUBSCRIPTIONS

38% of residents in five Connecticut cities (Hartford, New Haven, Waterbury, New Britain, and Bridgeport) do not have wireline broadband at home.

36% of Connecticut households with incomes below the state median (i.e., $75,000 annually) do not have connectivity compared with 11% of households with incomes above $75,000 annually.

36% of Connecticut residents age 65 and older do not have wireline broadband at home.

35% of Hispanics do not have wireline broadband at home.

34% of African Americans do not have a home wireline broadband connection at home.

FOR HOUSEHOLDS WITH CHILDREN UNDER THE AGE OF 18

14% of all Connecticut households with children under age 18 do not have wireline broadband.

29% of low-income households (households whose annual incomes are below $50,000) do not have wireline broadband at home.

25% of Hispanic households with children under age 18 do not have wireline broadband.

23% of African American households with children lack wireline broadband.

FOR WORKING DESKTOP OR LAPTOP COMPUTERS

33% of households with incomes below the state's median income do not have a computer, while just 6% of households whose annual incomes exceed the median do.

31% of Connecticut residents age 65 and older do not have a computer.

37% of Hispanics do not have a computer at home.

37% of residents of Hartford, New Haven, Waterbury, New Britain, and Bridgeport do not have computers.

31% of African Americans do not have a working computer at home.

WITH RESPECT TO COMPUTERS AT HOME AND HOUSEHOLDS WITH CHILDREN UNDER AGE 18

12% of homes with children under age 18 do not have a computer.

27% of Hispanic households do not have computers.

25% of low-income households (i.e., those with annual incomes under $50,00) do not have a computer as opposed to just 5% of all other households.

21% of African American households do not have computers.

THERE ARE ALSO GROUPS THAT CUT ACROSS THOSE NOTED ABOVE THAT ARE OF INTEREST

42% of those who receive government benefits (either food/nutrition support, Medicaid, or Supplementary Income Support) do not have wireline broadband.

45% of Connecticut residents with a disability do not have wireline broadband.

This report is based on extensive analysis of the 2018 American Community Survey and focuses on two key metrics for digital access. The first is whether a household has a wireline internet connection, such as cable modem, fiber optic, or digital subscriber line service. The other is whether the household has a desktop or laptop computer.

THE COST OF DIGITAL EXCLUSION

In 2010, the National Broadband Plan (NBP) raised public awareness about the "cost of digital exclusion"—a phenomenon by which the lack of digital connectivity imposes critical disadvantages on people.[1] By the late 2000s, a growing number of employers were taking job applications exclusively online. For the one-third of Americans in 2010 without broadband at home, the right job might be out of reach due to no connectivity. Lacking broadband at home meant forgoing the convenience of being able to do online what would otherwise take a lot of time, such as visiting government offices to apply for benefits or shopping.

Fast forward ten years, and what was once a costly inconvenience is now a debilitating deficiency. The COVID-19 pandemic has put digital exclusion into the spotlight once again. Being without online connectivity means the lack of access to education, health care, government services, or the ability to see loved ones. Even though the digital divide – the "haves" and the "have nots" with respect to internet connectivity — has been part of communications policy for 25 years, the closing of schools, businesses, and health care facilities in 2020 has revealed its true scope and consequence. In particular, the pandemic exposes an additional component of the digital divide. It is not just access to networks and devices to log onto the internet. There is the "second-level" digital divide – the skills needed to *use* the internet for homework or telehealth.[2] Having internet service at home is not an end in itself, but rather a means to use information for education, health care, civic engagement, entertainment, and more.

As stakeholders turn their attention to the digital divide, a host of questions arise. What exactly is the digital divide? What metrics matter in defining it? Where is it most severe? And what can be done about it?

I. INEQUALITY AND TECHNOLOGY: FROM THE DIGITAL DIVIDE TO DIGITAL INCLUSION

Ever since personal computers became consumer goods, there has been worry about equity, that is, whether those with computing devices would have advantages relative to those that do not that would exacerbate inequality. The term to capture this – the digital divide – first came into use in the mid-1990s in the context of computers in the classroom.

[01] Federal Communications Commission, "Connecting America: The National Broadband Plan," March 2010., p. 5. Available online at: https://transition.fcc.gov/national-broadband-plan/national-broadband-plan.pdf.

[02] Eszter Hargittai, "Second-Level Digital Divide: Differences in People's Online Skills," First Monday, 2002. Available online at: https://firstmonday.org/article/view/942/864.

This was at a time when access devices – the personal computer – were relatively rare in households, and the means to access the internet (the telephone network) was universal. The digital divide simply referred to who had access to digital technology and who did not.

Broadband

Today, the digital divide has more dimensions. One part of the digital divide has to do with ***network deployment*** – that is, whether a home or building is connected to digital infrastructure that allows access to the internet. In the United States, 92% of wireline connections meet the Federal Communications Commission's (FCC) definition of , which is a service that provides a download speed of 25 Mbps and an upload speed of 3 Mbps.[3] That leaves just 21 million people underserved by broadband networks. However, the FCC's measurement of network speed in specific places relies on carriers reporting advertised speeds (which can and do differ from actual speeds) by Census blocks. That approach overstates broadband coverage since an entire Census block will show coverage even if a carrier provides service in a small portion of it. Network speed analysis by Microsoft finds that 162 million people in the United States do not use the internet at speeds exceeding 25 Mbps.

In Connecticut, FCC data shows that nearly everyone (with the exception of 33,000 people) has networks available to them at the 25 Mbps threshold (at least), but the Microsoft analysis shows far more Connecticut residents without 25 Mbps service. According to Microsoft, 1.7 million people in Connecticut do not use the internet at 25 Mbps speeds.[4] That is about half the state's population, a figure that is roughly the same for each of the state's eight counties. Given that the range of findings nationally on availability of 25 Mbps service differs by a factor of nearly eight, it is difficult in the aggregate to characterize precisely whether network speeds in Connecticut are better or worse than the nation at large. However, Akamai's "State of the Internet" report found in 2016 that Connecticut ranked 10th among all states in the share of households with internet speeds of 15 Mbps or more.[5]

The other element of the digital divide is ***adoption*** of service at home. This refers to the choice (of an individual or the household) to subscribe to internet service given the presence of a network that enables service. A decade ago, measuring broadband adoption was fairly easy.

[03] Federal Communications Commission, "2018 Broadband Deployment Report." Available online at: https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2018-broadband-deployment-report.

[04] "Microsoft Airband: An update on connecting rural America." Available online at: https://news.microsoft.com/rural-broadband/.

[05] Akamai, "State of the Internet Report 2016." Available online at: https://www.akamai.com/us/en/multimedia/documents/state-of-the-internet/akamai-state-of-the-internet-report-q1-2016.pdf. Reference to Connecticut on page 20.

National surveys asked if people subscribed to high-speed internet service – and this typically meant wireline service from a cable company, i.e., cable modem service, or a telephone company, through digital subscriber line (DSL) technology. In 2010, 65% of households subscribed to broadband and, for the most part, people accessed digital content using a desktop or laptop computer. However, people use wireless networks (through data plans from mobile service providers), public Wi-Fi, Wi-Fi at home (which usually runs off of a wireline connection), and wireline connections directly to computers. Multiple devices connect people to digital content, such as smartphones, tablet computers, as well as desktop or laptop computers.

BRIDGING THE DIGITAL DIVIDE OFFERS THE OPPORTUNITY TO EXTEND DIGITAL TOOLS TO HELP ADDRESS LONG-STANDING STUBBORN PROBLEMS SUCH AS POVERTY AND INCREASE ECONOMIC OPPORTUNITY.

As the digital divide has taken on more dimensions, the terminology to describe it has evolved. The National Broadband Plan in 2010 had as a goal to increase "broadband adoption and use," (to encompass second-level digital divides). This meant taking steps to ensure people can use the internet for education, job training, and more. By the late 2010s, the National Digital Inclusion Alliance defined digital inclusion as "the activities necessary to ensure that all individuals and communities, including the most disadvantaged, have access to and use of Information and Communication Technologies (ICTs)."[6] These activities include ensuring communities have low-cost internet options, devices to access the internet, tech support, digital literacy training, and applications and online content that encourage self-sufficiency, participation, and collaboration. By putting digital equity in the context of inclusion, the challenge of addressing broadband gaps extends beyond devices and discounts. It now includes how communities can use digital tools to address long-standing stubborn problems such as poverty and economic opportunity.

With the pandemic, encouraging digital inclusion has been identified as a legislative goal in addressing internet access gaps. The Digital Equity Act of 2019, which proposes grants to states to support digital inclusion activities, has been included in legislation introduced in the House (H.R. 7302) to spend $100 billion for high-speed infrastructure.[7]

[06] National Digital Inclusion Alliance. Definition available online at: https://www.digitalinclusion.org/definitions.

[07] See "Clyburn, Rural Broadband Task Force and Hous Democrats Introduce Accessible, Affordable Internet for All Act." Available online at: https://www.majoritywhip.gov/?press=clyburn-rural-broadband-task-force-and-house-democrats-introduce-accessible-affordable-internet-for-all-act.

II. METRICS THAT MATTER FOR CONTEMPORARY INTERNET USE

For this report, the focus will be on broadband adoption, that is, the degree to which households in Connecticut have adopted digital tools to connect to the internet. Two metrics will anchor the discussion of the digital divide in Connecticut – whether people have a desktop or laptop computer at home and whether they subscribe to wireline broadband service. To understand why, it is worth looking at research on how internet use varies by mode of access – and in particular the limits of smartphones.

STUDENTS: A team of Michigan State researchers recently surveyed rural students in Michigan and examined educational outcomes by mode of access.[8] Students with wireline broadband at home (as compared to those who rely on the smartphone only or have no home internet) performed better on a number of metrics such as measures of digital skills, homework completion, and grade point average. With the onset of the pandemic, a number of news reports cite families in urban and suburban areas that struggle to carry out schoolwork due to scarcity of wired broadband connections and computing devices for access.[9]

> **"STUDENTS WITH FAST HOME INTERNET CONNECTIONS HAVE HIGHER OVERALL GPAS THAN STUDENTS WITH NO HOME ACCESS, SLOWER HOME ACCESS, OR CELL ONLY ACCESS."**
>
> **– BROADBAND AND STUDENT PERFORMANCE GAPS**

ADULT LEARNERS: Research on adult learning underscores the importance of having a desktop or laptop computer. The Pew Research Center found that for lifelong learning, adults overwhelmingly use their desktop or laptop computers for such pursuits relative to their smartphones – by a 69% to 11% margin.[10] Such learning, whether it is about personal interests or job skills, works better for people on larger screens.

[08] K.N. Hampton, L. Fernandez, C.T. Robertson, & J.M. Bauer, "Broadband and Student Performance Gaps." James H. and Mary B. Quello Center, Michigan State University. Available online at: https://doi.org/10.25335/BZGY-3V91.

[09] Jeddy Johnson, "Remote Learning Highlights Buffalo's Digital Divide," WKBW, August 20, 2020. Available online at: https://www.wkbw.com/news/local-news/remote-learning-highlights-buffalos-digital-divide. See also James Rundle, "Chicago Hopes Broadband Plan Could Help Other Cities Address Digital Divide," The Wall Street Journal, July 9, 2020. Available online at: https://www.wsj.com/articles/chicago-hopes-broadband-plan-could-help-other-cities-address-digital-divide-11594287000.

[10] John B. Horrigan, "Lifelong Learning and Technology," Pew Research Center, March 2016. Available online at: https://www.pewresearch.org/internet/2016/03/22/lifelong-learning-and-technology

GOVERNMENT BENEFITS: The Information Technology and Innovation Foundation (ITIF) found that in the wake of the pandemic crisis, 86% of state government unemployment websites failed at least one test of "mobile friendliness."[11] In other words, mobile access on devices such as smartphones and tablets presented a roadblock to accessing a key government benefit during a public health and economic crisis.

WHILE MANY LOW-INCOME AMERICANS USE SMARTPHONES AS THEIR PRIMARY INTERNET ACCESS POINT, 86% OF STATE GOVERNMENT UNEMPLOYMENT WEBSITES ARE NOT MOBILE-FRIENDLY

TELEHEALTH: The COVID-19 crisis has led to a surge in telehealth. New analysis from the U.S. Department of Health and Human Services shows that following the March shutdowns, nearly half of Medicare primary visits were via telehealth compared with 1% in February.[12] For older adults in particular, telehealth on a smartphone or tablet is not likely to be a good experience, underscoring the need for larger screens and robust wireline broadband than can handle video connections with health care providers.

SINCE THE PANDEMIC HIT IN MARCH, 50% OF ALL MEDICARE PRIMARY CARE VISITS WERE VIA TELEHEALTH COMPARED TO JUST 1% IN FEBRUARY 2020.

Along with small screens, data caps for smartphones help define their limits for many online uses. Smartphone subscription plans run on 4G networks and carriers usually reserve the right to slow a user's data speeds once they use a certain amount of data – sometimes as much as 100 GB, but often 50 GB or less. For context, 2018 research on 4G use on mobile hotspots for internet access found average monthly data use to be 60 MB among low-income households who use the internet for schoolwork.[13] For many wireline broadband plans, such as those offered by Comcast (Xfinity), Spectrum, or CenturyLink, monthly data caps are either 1,024 GB or unlimited.[14]

[11] Michael McLaughlin and Daniel Castro, "Most State Unemployment Websites Fail Mobile and Accessibility Tests," Information Technology and Information Foundation, April 2020. Available online at: https://itif.org/publications/2020/04/15/most-state-unemployment-websites-fail-mobile-and-accessibility-tests.

[12] U.S. Department of Health and Human Services, "ASPE Issue Brief: Medicare Beneficiary Use of Telehealth Visits: Early Data from the Start of the COVID-19 Pandemic." July 28, 2020. Available online at: https://aspe.hhs.gov/pdf-report/medicare-beneficiary-use-telehealth?utm_source=sendgrid&utm_medium=email&utm_campaign=Newsletters.

[13] Samantha Schartman-Cycyk and Katherine Messier, "Bridging the Gap: What Affordable, Uncapped Internet Means for Digital Inclusion." Available online at: https://www.mobilebeacon.org/wp-content/uploads/2017/05/MB_ResearchPaper_FINAL_WEB.pdf.

[14] See "Summary of internet providers data caps." Available online at: https://www.cabletv.com/blog/which-brands-have-data-caps.

At the end of 2019, the average data usage for home broadband households was 344 GB – not all of which is for homework and includes households who have "cut the cord" on cable TV subscriptions.[15] Data caps are a constraint on use for those with mobile hotspots or smartphones while they generally are not for households with wireline broadband.

For all these reasons, this report will examine access gaps for the two foundational tools – having a wireline broadband subscription at home and a computer (either a desktop or laptop). The American Community Survey (ACS) captures wireline access in a question that asks whether a household subscribes to internet service such as cable, fiber, or digital subscriber line (DSL). Throughout this report, an affirmative answer to this question will be referred to as a household having wireline broadband service. It is worth pointing out that an affirmative answer to having wireline broadband at home does not reflect the speed of the underlying service. DSL service usually falls short of the FCC's 25 Mbps threshold for broadband. As such, DSL is a basic internet service that may present difficulties when more than one person would like to engage in educational applications that, for instance, require streaming video. But the ACS data does not tell us which households have DSL compared to, say, cable modem service.

For computers, the ACS asks whether a household has a working laptop or desktop computer, and this report will also focus on access to this type of digital tool. And, as noted, the report will discuss the combined metric of whether a household contains either a computer (laptop or desktop) or a tablet device.

III. CONNECTICUT'S CONNECTIVITY IS BETTER THAN THE NATION'S

Nationally, according to the 2018 ACS, 85.1% of households have broadband of any type and 69.6% have wireline broadband. The 15.5 percentage point gap between the two represents, for the most part, households whose online access is only through a smartphone. Since 2010, wireline home broadband adoption has not grown much. A survey conducted for the National Broadband Plan found a wireline adoption figure of 65% in 2010.[16] ACS data shows wireline broadband adoption figures of 67.3% in 2016, 68.8% in 2017, and 69.6% in 2018. Smartphone adoption is, of course, the accelerant to overall increases in broadband adoption. According to the Pew Research Center, just 35% of Americans had a smartphone in 2011, a figure that rose to 81% by early 2019. For computers, 77.5% of U.S. households have a desktop or laptop computer and 62.5% have a tablet.

[15] Daniel Frankel, "Average U.S. Broadband Consumer's Monthly Data Use Surged 27% in 2019 to 340 GB," NextTV, February 2020. Available online at: https://www.nexttv.com/news/average-us-broadband-consumers-monthly-data-use-surged-27-in-2019-to-340-gb.

[16] John B. Horrigan, "Broadband Adoption and Use in America," OBI Working Paper Series 1, Federal Communications Commission, February 2010. Available online at: https://transition.fcc.gov/national-broadband-plan/broadband-adoption-in-america-paper.pdf.

[17] Pew Research Center, "Mobile Fact Sheet." Available online at: https://www.pewresearch.org/internet/fact-sheet/mobile.

In Connecticut, the broadband adoption rate is higher than those for the entire United States. Some 87.0% of Connecticut households have a broadband subscription of any type and 76.7% have a wireline subscription; 80.1% have a desktop or laptop computer. The wireline broadband figure for Connecticut is about 7 percentage points higher than the entire nation. Compared to other states, Connecticut has the fifth highest wireline broadband adoption rate in the nation, trailing New Hampshire (79.3% of households have wireline broadband), Massachusetts (78.3%), New Jersey (77.5%), and Washington (77.3%).

There are a number of reasons why Connecticut has higher adoption rates than the nation.

- **INCOME:** In 2018, the U.S. Census Bureau reported the median household income in Connecticut was $76,348, above the $61,397 figure for the United States.[18] Although these figures are not adjusted for cost of living, they convey robust economic health in Connecticut relative to elsewhere.

- **DENSITY:** The economics of broadband are such that network buildout occurs first in densely populated areas where there are more potential customers from which to earn a return on capital investment. With 736 people per square mile, Connecticut is the fourth most densely populated state.

- **DIVERSITY:** As the report will show, whites have higher adoption rates for digital tools than Blacks and Hispanics. The state's population has a larger share of whites than the nation at large, with 66% of people in Connecticut identifying as white compared with 60% for the United States.

IV. DIGITAL INEQUALITY IN CONNECTICUT FALLS ALONG FAMILIAR LINES OF INCOME, AGE, EDUCATION, AND RACE AND ETHNICITY

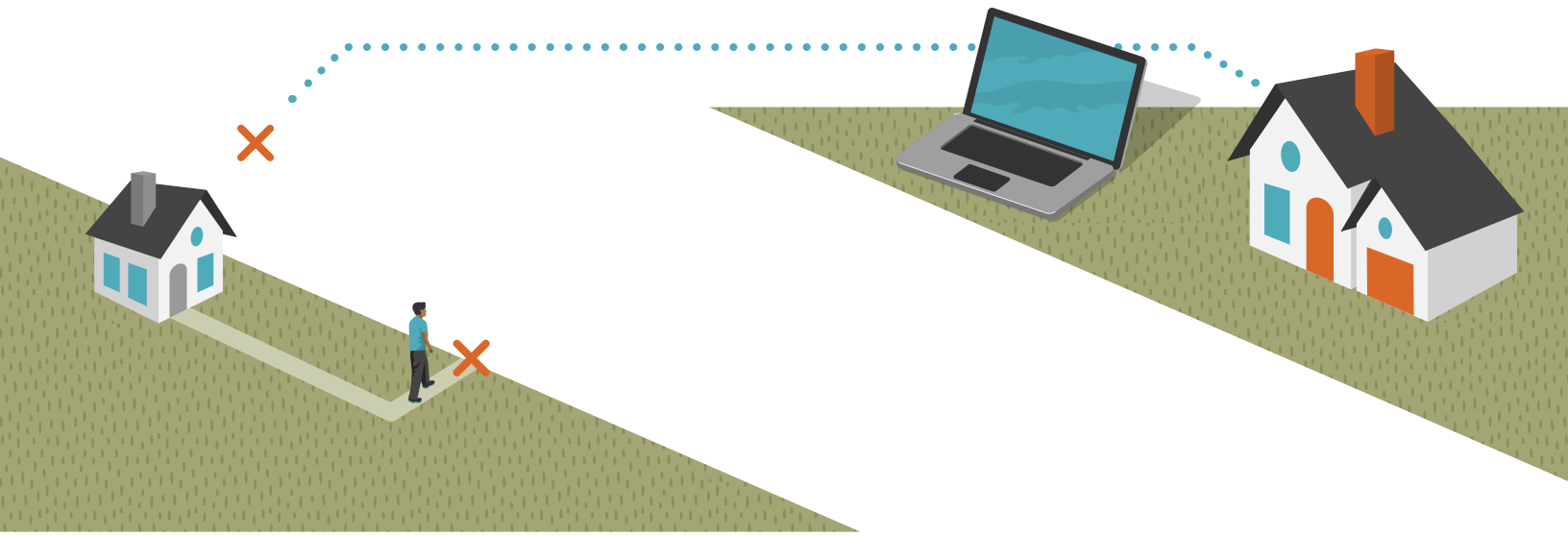
Even with adoption rates that exceed most states, there are variations in Connecticut by geography, demography, and socio-economic status. Focusing on wireline broadband and computer (laptop or desktop) access at home, the following figures display how adoption rates vary. Note again that the overall adoption figures for the state of 76.7% for wireline broadband at home and 80.1% for computers.

[18] Gloria Guzman, "Household Income 2018." U.S. Census Bureau, September 2019. Available online at: https://www.census.gov/content/dam/Census/library/publications/2019/acs/acsbr18-01.pdf .

Some 321,000 households in the state do not have a home broadband wireline subscription, and 274,000 do not have a desktop or laptop computer.

17% OF CONNECTICUT HOUSEHOLDS MAKE LESS THAN $25,000 ANNUALLY – AND ARE HALF AS LIKELY TO HAVE RELIABLE INTERNET ACCESS AT HOME.

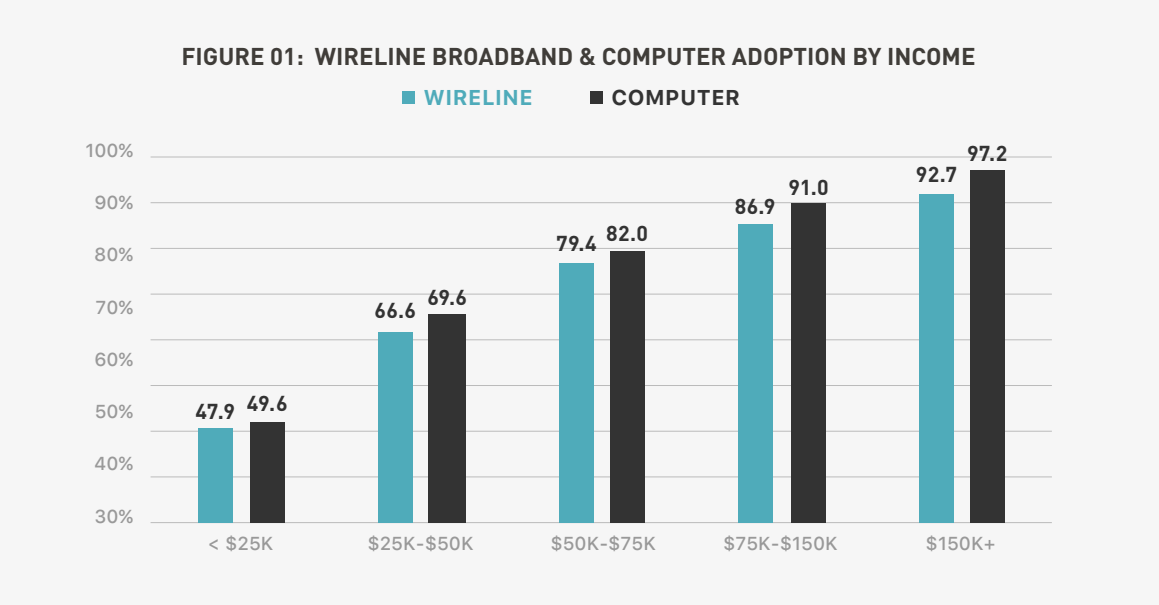
In the discussion that follows, each of the factors differ significantly, from a statistical perspective and from the state's overall adoption figures for wireline broadband or computers. The gaps vary, but each are significant while holding others constant. For instance, wireline broadband adoption rates are lower for both Hispanic and low-income households. But the difference is not explained entirely by a higher likelihood that Hispanic households have lower incomes than the state average.[19] The independence of each effect is evident when comparing wireline broadband adoption rates for upper income households. Hispanic households (with annual incomes over $150,000) have lower wireline broadband adoption rates (87.0%) than the same upper-income group of white households (93.2%). Both figures are well above the state average (so income matters), but the figure for Hispanics is lower than that for whites (so there is an unobserved factor that results in Hispanics having lower adoption rates than whites).



[19] The findings on the statistical significance of different factors are based upon a logistical regression that models the likelihood of having wireline broadband at home as a function of multiple variables, including household income, age, race/ethnicity, levels of educational attainment, and whether a household resides in Hartford, Waterbury, or New Britain.

A. INCOME

Households' ability to pay for service is among the most prominent explanatory factors that drive differences in adoption levels. Connecticut's poorest households (i.e., those who make less than $25,000 and are 17% of the state's population) are about half as likely to have wireline service or a computer than well-off households.

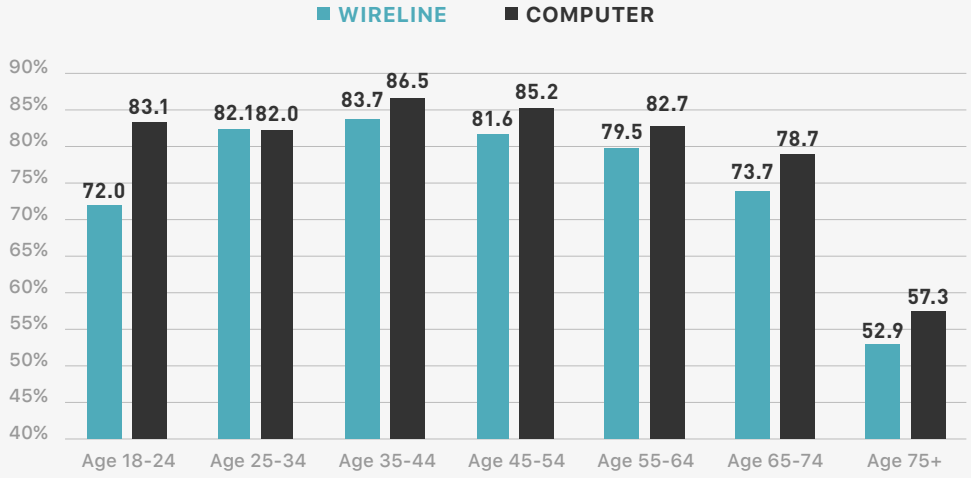


For households below the state's median income, 64.1% have wireline broadband while 89.4% of households over the median ($75,000 annual household income is used for analysis) have wireline broadband. The figures are 66.5% and 93.6% for computers, respectively.

B. AGE

The internet, in many ways, is a young person's medium and that shows up in Connecticut in adoption rates by age. As the following chart shows, wireline and computer adoption fall off significantly for those age 75 or older.

FIGURE 02: WIRELINE BROADBAND & COMPUER ADOPTION BY AGE



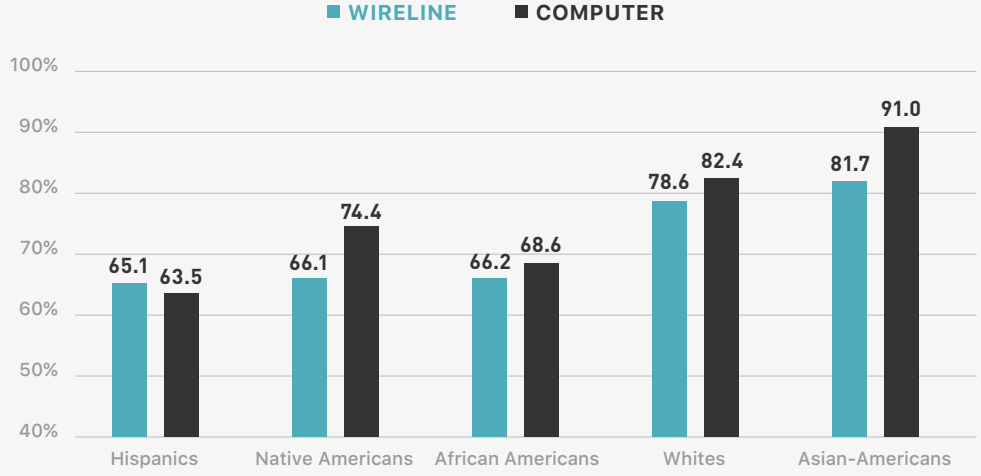
Taking age 65 as a cutoff for comparison, 64.4% of Connecticut residents age 65 or older have wireline at home, and 69.2% have computers. For those under age 65, 81.2% have wireline broadband and 84.1% have computers at home.

C. RACE AND ETHNICITY

Research has shown consistently that African Americans and Hispanics have lower broadband adoption rates than whites.[20] The pattern holds up for Connecticut as well.

[20] Andrew Perrin and Erica Turner, "Smartphones help blacks, Hispanics bridge some – but not all – digital gaps with whites," Pew Research Center, August 2019. Available online at: www.pewresearch.org/fact-tank/2019/08/20/smartphones-help-blacks-hispanics-bridge-some-but-not-all-digital-gaps-with-whites.

FIGURE 03: WIRELINE BROADBAND & COMPUTER ADOPTION BY RACE/ETHNICITY



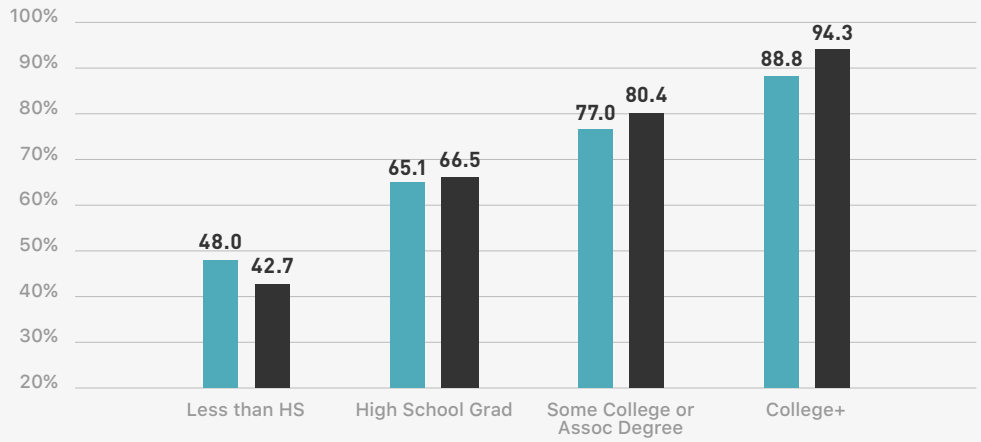
Some 78.6% of whites have wireline broadband at home, while 68.6% of Blacks and 65.1% of Hispanics do. For computers at home, the numbers are 82.4% for whites, 68.6% for Blacks, and 63.5% for Hispanics.

Comparing Connecticut to the nation shows that African Americans in the state have higher broadband and computer adoption rates. Nationwide, 60.8% of African American adults have wireline broadband at home (about 8 percentage points below Connecticut's figure). For Hispanics, 63.9% of Hispanics have wireline broadband in the United States, which is comparable to Connecticut's figure. Some 65.9% of all African Americans in the country have a desktop or laptop computer and 68.7% of Hispanics do.

D. EDUCATIONAL ATTAINMENT

Another common theme in talking about the digital divide is that those with lower levels of educational attainment are less likely to use the internet. For individuals in Connecticut, those who did not graduate from high school have severe digital deficits.

FIGURE 04: WIRELINE BROADBAND & COMPUTER ADOPTION BY EDUCATION



Those without high school degrees make up only 7% of Connecticut adults, so it is worth combining this group with high school graduates. That totals 35% of the adult population in the state. Among those whose educational attainment extended no further than a high school degree, 61.7% have wireline broadband and a similar share (61.8%) have a computer. For those with college degrees or more, 83.9% have wireline service and 88.5% have computers.

V. CONNECTICUT'S CITIES HAVE LARGE NUMBERS OF DISCONNECTED RESIDENTS

CONNECTICUT HAS ONE OF THE LARGEST WEALTH GAPS IN THE NATION, SECOND ONLY TO NEW YORK

Tech adoption may depend on who you are, but also where you are. Nationally, adoption patterns generally follow a pattern whereby rural areas have lower levels of internet subscribership than urban or suburban areas. A 2018 Census Bureau report found that rural counties have lower levels of internet subscribership than other areas by 13 percentage points. For Connecticut, in part because it is a geographically small and densely populated state, the patterns are different.

A. NON-METRO AREAS

The Census Bureau does not use the term "rural" in characterizing geographies, but rather uses "metro" and "non-metro" to describe geographies. Following the Census Bureau's practice, this report defines metro areas as urbanized areas of 50,000 or more people and urban clusters of at least 2,500 people but less than 50,000; remaining areas are non-metro.[21] Connecticut has few non-metro areas.

[21] See "What is Rural?" Available online at: https://www.ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural.

This report takes an expansive view of non-metro areas for Connecticut by including Windham County (which was classified as non-metro in 2000 but not in 2010) for analysis. This puts the share of households in Connecticut classified as non-metro to 8.6%, about half the national share. Even then, there are almost no differences in wireline and computer adoption in metro and non-metro areas in the state. Some 76.5% of non-metro Connecticut households have wireline broadband and 79.8% have computers; for metro households, the figures are 76.7% and 80.1%, respectively.

Using the definition of non-metropolitan areas for 2000 (which includes Windham County), the number of non-metro (or rural) households without wireline broadband subscriptions in Connecticut is approximately 28,000.

B. CITIES

Notwithstanding Connecticut's status as a wealthy state, there are significant inequalities within it. A 2019 Census Bureau analysis of median income by state found that, relative to the nation, the distribution of income in Connecticut is more unequal and ranks second only to New York state in terms of unequal income distribution.[22] Within Connecticut, inequality tends to be more severe in cities with high levels of poverty, such as Hartford, New Haven, and Waterbury.[23]

Within-state inequality is also reflected by health metrics for Connecticut citizens. Life expectancy in low-income parts of Bridgeport are 19 years less than in upper-income Westport. Unsurprisingly, these inequalities extend to a number of other areas, such as educational attainment, housing security, and access to health insurance and care.

The ACS 1-year estimates permit analysis of cities whose population exceed 65,000 and, for Connecticut, eight cities permit this analysis. They are Bridgeport, Stamford, New Haven, Hartford, Waterbury, Norwalk, Danbury, and New Britain. These cities vary considerably in terms of household income and poverty rates. The state's poorest cities – Hartford, New Haven, Waterbury, New Britain, and Bridgeport – have poverty rates that exceed 20%, which is twice the state's average. These cities have very low wireline broadband adoption rates, with just

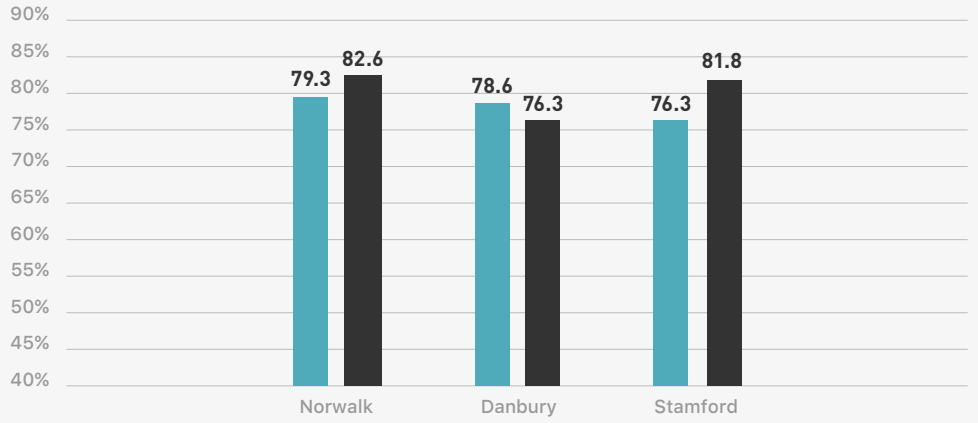
[21] See "What is Rural?" Available online at: https://www.ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural/.

[22] Gloria Guzman, "Household Income: 2018." Available online at: https://www.census.gov/content/dam/Census/library/publications/2019/acs/acsbr18-01.pdf.

[23] Data Haven, "Towards Health Equity in Connecticut: The Role of Social Equity and the Impact of COVID-19," June 2020. Available online at: https://ctdatahaven.org/sites/ctdatahaven/files/DataHaven%20Health%20Equity%20Connecticut%20061820.pdf.

61.7% having wireline broadband subscriptions at home compared with 77.8% for the wealthier cities of Stamford, Norwalk, and Danbury. For computers, 63.2% of households in low-income cities have a laptop or desktop computer at home, while 80.7% of households in wealthier cities do. These aggregate differences obscure larger ones both across and within cities. The figure below shows that in Waterbury, Hartford, and New Britain, more than 40% of households do not have a wireline high-speed internet at home.

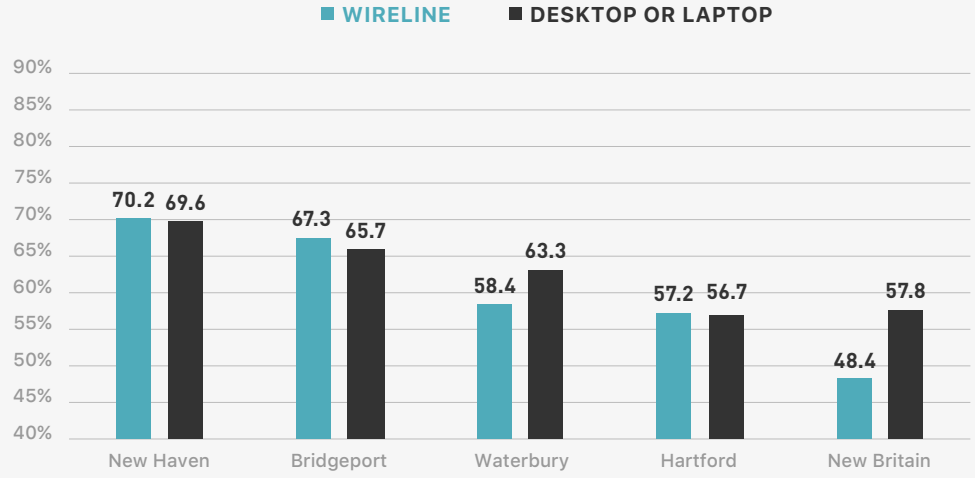
FIGURE 05: WIRELINE & COMPUTER ADOPTION FOR CONNECTICUT CITIES (UPPER INCOME)



The findings on Connecticut cities underscore the role of poverty in wireline broadband adoption. In places such as Waterbury, Hartford, and New Britain, poverty rates are high and households in poverty are likely to be geographically clustered (see Appendix, Table 8).[24] This puts downward pressure on broadband adoption over and beyond what one would expect when just focusing on income. In other words, a household whose income is below $50,000 annually in Hartford (to take one example) is less likely to have wireline broadband than a similar household in, say, Danbury with an annual income below $50,000.

[24] Elizabeth Kneebone, Carey Nadeau, and Alan Berube, "The Re-Emergence of Concentrated Poverty: Metropolitan Trends in the 2000s," Brookings Institution, November 2011. Available online at: https://www.brookings.edu/research/the-re-emergence-of-concentrated-poverty-metropolitan-trends-in-the-2000s/.

FIGURE 06: WIRELINE & COMPUTER ADOPTION FOR CONNECTICUT CITIES (LOWER INCOME)



Looking within low-adoption cities, such as Harford and Waterbury, shows that strong majorities of low-income households lack wireline internet or computers. In Hartford, just 44% of households whose incomes are less than $25,000 annually have wireline internet and only 33% have a desktop or laptop computer. In Waterbury, 43% of low-income households have wireline broadband and 45% have a desktop or laptop computer.

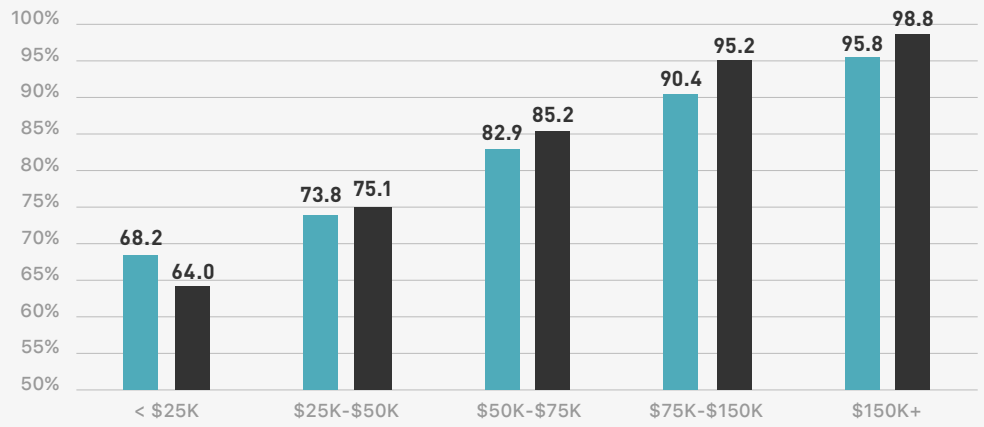
The eight cities highlighted here come to about 333,000 households in Connecticut, or roughly 24% of all Connecticut households. Given high rates of poverty in many of these cities, the total number of households without wireline broadband subscriptions is approximately 110,000 across all eight cities. Put differently, 34% of the state's wireline home broadband subscription shortfall is in cities that total 24% of Connecticut's population.

In the state's poorest cities – Hartford, New Haven, Waterbury, New Britain, and Bridgeport – 82,000 households do not have wireline broadband subscriptions at home. That is nearly three times the number of households without wireline broadband than in non-metro areas of Connecticut. Some 25% of the state's total number of households without wireline broadband subscriptions at home are concentrated in these five cities whose poverty rates are more than twice the state figure.

VI. THE "HOMEWORK GAP" IS MOST PRONOUNCED FOR LOW-INCOME RESIDENTS AND COMMUNITIES OF COLOR

The "homework gap" – i.e., the phenomenon by which some households with children in school do not have the digital access tools for online learning – has received a great deal of attention during the pandemic. Policymakers nationwide are taking steps to address this gap, and Connecticut is no exception.[25] Some 85.8% of households in the state with children under age 18 have wireline broadband and 88.2% have computers. These figures are greater than for all household's in the state, showing the importance digital tools already have in education. The difference (relative to the state average) in wireline and computer adoption for households with children under age 18 is significant, even when controlling for income, education, and other factors that impact adoption decisions. Nonetheless, there are large gaps for households with children by income and race/ethnicity.

FIGURE 07: WIRELINE & COMPUTER ADOPTION BY INCOME (W/ CHILDREN UNDER AGE 18)

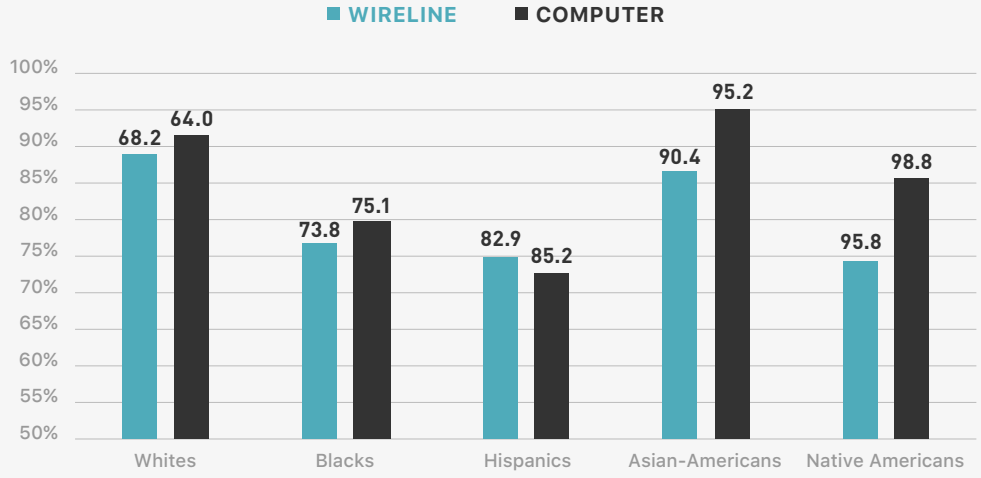


Nearly one-third (29%) of low-income Connecticut households (i.e., those whose annual incomes are $50,000 or less) with children do not have a wireline internet connection at home, while over 90% of upper income ones do. For computers, 25% of low-income households do not have a working desktop or laptop, while just 5% of all other households lack a computer.

Looking at race and ethnicity, patterns are similar for households with children under age 18 as with the Connecticut population at large.

[25] Jacqueline Rabe Thomas, "State aims to provide students with universal internet and computer access during pandemic," The CT Mirror, July 28, 2020. Available online at: https://ctmirror.org/2020/07/28/state-will-provide-students-with-universal-internet-and-computer-access-during-pandemic/.

FIGURE 08: WIRELINE & COMPUTER ADOPTION BY RACE/ETHNICITY (W/ CHILDREN UNDER AGE 18)



African Americans and Hispanics lag for wireline and computer adoption relative to whites by significant margins – about 12 points and 14 points respectively, for high-speed internet at home.

VII. THOSE WHO USE GOVERNMENT BENEFIT PROGRAMS AND PEOPLE WITH DISABILITIES HAVE LOW LEVELS OF HOME CONNECTIVITY

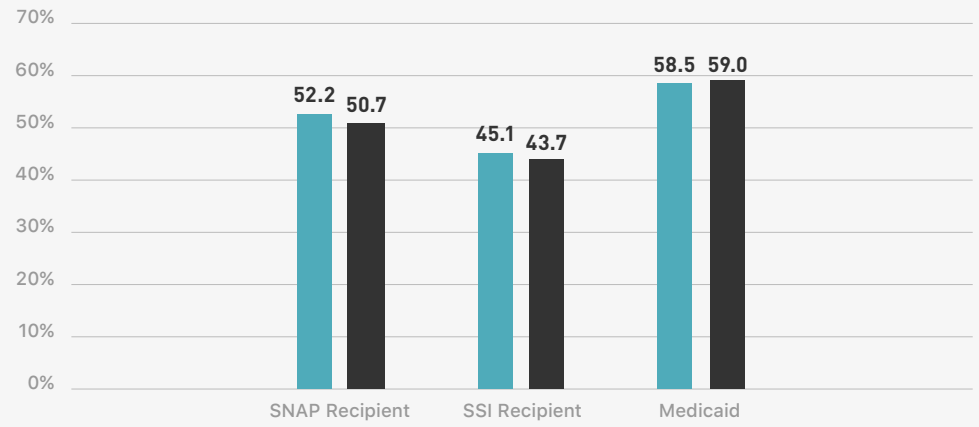
Beyond geography and socio-economic qualities, stakeholders may have interest in individuals with particular characteristics. The ACS shines light on several of these groups – those who receive government benefits and people with disabilities. People receiving government benefits may find it easier to negotiate the process of qualifying and access benefits. For people with disabilities, high-speed access may serve a similar purpose, but also be a great way to connect to the outside world if their disability is a barrier to such connection.

A. GOVERNMENT BENEFITS AND PEOPLE WITH DISABILITIES

One of the long-time hopes in discussions of the digital divide is that closing the divide will help people who need government services get access to them. Applying for government benefits often involves trips to offices and presentation of documents to show that an applicant qualifies for service. Online access can help applicants understand which documents they must have, thus making the sign-up process easier and more efficient. In some states, it is possible to sign up online for the Supplemental Nutrition Assistance Program (SNAP). There is also a benefit to government by having potential beneficiaries connected to the internet. A small or non-existent digital divide might reduce the cost of providing service as government could retire some legacy offline modes of delivery.

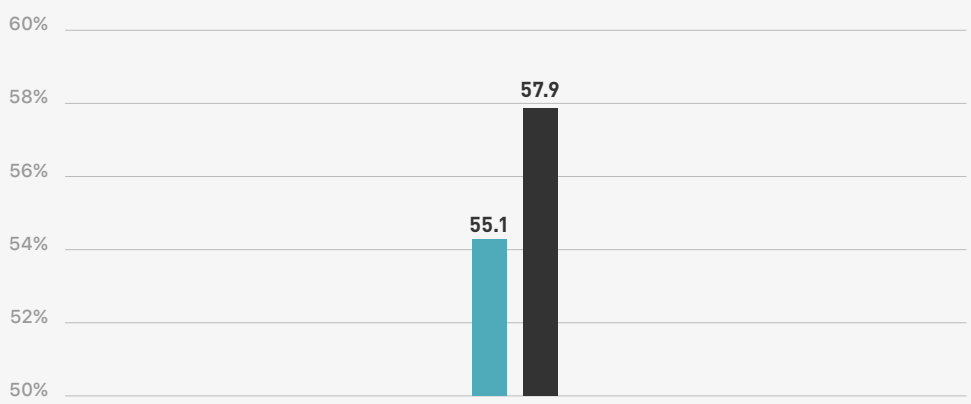
Although individuals who receive government benefits tend to have characteristics that correlate with low levels of tech adoption (such as low incomes), analysis shows that being a recipient of Medicaid, Supplemental Security Income (SSI), or SNAP has an significant negative impact even when controlling for other characteristics. For beneficiaries of any of these services (about 20% of the state's population), just 58.0% have wireline broadband at home and 59.0% have a computer. The following figure shows adoption rates for each of those three benefits.

FIGURE 09: WIRELINE & COMPUTER ADOPTION FOR RECIPIENTS OF GOVERNMENT BENEFITS



Although there may be some overlap of respondents in these groups, about half of SNAP recipients and fewer than half of SSI beneficiaries have wireline broadband at home. The picture is a bit better for those with disabilities (who make up about 13% of the population), but their adoption patterns are well below the norm for the state.

FIGURE 10: WIRELINE & COMPUTER ADOPTION FOR PEOPLE WITH DISABILITIES



Those with disabilities are defined as people who responded "yes" to any of the following questions on the ACS that pertain to sensory disability, physical disability (such as difficulty climbing stairs), mental disability, self-care disability, go-outside-the-home disability, and employment disability.

XIII. SOME 57,000 HOUSEHOLDS WITH CHILDREN UNDER AGE 18 DO NOT HAVE WIRELINE AT HOME – OR 110,000 CHILDREN

This homework gap has put a spotlight on digital equity. With so many schools closing in March – and uncertainty as to whether all schools will re-open this fall – education has gone online. To date, moving schools to the internet has not garnered high marks. Nationally, reports indicate the absenteeism in online classes is high.[26] In Connecticut, the absenteeism cuts across schools with high numbers of low-income students, but also among schools with students from higher income households. As many as one-quarter of students did not show up for online classes after schools closed. In low-income Bridgeport, half of students did not log onto classes; in better-off Newtown, that figure was 14%.[27]

[26] Dana Goldstein, Adam Popescu, Nikole Hannah-Jones, "As School Moves Online, Many Students Stay Logged Out," The New York Times, April 8, 2020. Available online at: https://www.nytimes.com/2020/04/06/us/coronavirus-schools-attendance-absent.html.

[27] Jacqueline Rabe Thomas and Kasturi Pananjady, "A quarter of CT students went MIA when COVID closed schools. Could holding live online classes lure them back?," The CT Mirror, July 28, 2020. Available online at: https://ctmirror.org/2020/07/28/a-quarter-of-ct-students-went-mia-when-covid-closed-schools-could-holding-live-online-classes-lure-them-back/.

Stakeholders in Connecticut have taken aim at the homework gap. In late July, Governor Ned Lamott announced that Connecticut would spend $43 million to provide students with a laptop and an internet connection.[28] A state survey found that 29,000 students lack internet service at home and 50,000 do not have a computer.[29] As the prior section showed, these gaps are acute for low-income households, African Americans, and Hispanics.

The percentage differences in household digital adoption allows for estimates of the number of homes that do not, for example, have wireline access at home. Such analysis shows a larger gap in wireline and computer access than the survey of school districts that the state conducted. Specifically, the ACS data shows that:

- **Approximately 110,000 children age 17 or younger do not have a wireline broadband subscription, which comes to 57,000 households without such access.** That includes children under age 6, who may not be in school, but access for those households is important for parents who may be coordinating with childcare providers.
- Some 86,000 Connecticut children under the age of 6 do not have wireline broadband at home, or 43,000 households.
- **92,000 children under the age of 18 live in households without a desktop or laptop computer.**
- Among households with children between the ages of 6 and 17 only, 68,000 children in that age range live in homes without a desktop or laptop computer.

Of the 57,000 Connecticut households without wireline broadband, 70% are households whose annual household income falls below the state's median income.

A possible difference in the finding is that the state survey might have used an expansive definition of internet access at home that includes, for example, smartphones. When including "broadband of any type" for the ACS analysis, the number of students between the ages 6 and 17 without online access at home falls to 26,000. However, "broadband of any type" includes access via a smartphone or other data plan; as noted, research shows that the small screen and stringent data allotment make such access modes insufficient for schoolwork.

[28] Jacqueline Rabe Thomas, "State aims to provide students with universal internet and computer access during pandemic," The CT Mirror, July 28, 2020. Available online at: https://ctmirror.org/2020/07/28/state-will-provide-students-with-universal-internet-and-computer-access-during-pandemic/.

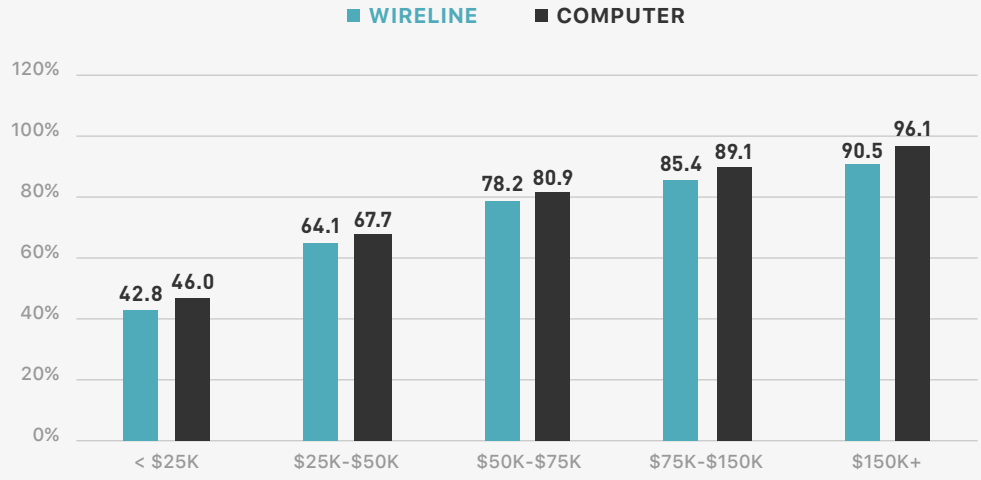
[29] Learn from Home Task Force, "Student Participation in Distance Learning," June 2020. Available online at: https://www.documentcloud.org/documents/6960823-Results-From-District-Survey-on-Student.html.

XIV. MORE THAN ONE-QUARTER MILLION CONNECTICUT HOUSEHOLDS WITHOUT CHILDREN UNDER AGE 18 LACK WIRELINE HIGH-SPEED AT HOME

Gaps in digital adoption for households with children are an understandable priority for policymakers, but they are not the only gaps within the state of Connecticut. Some 29% of Connecticut households have children under the age of 18. What about the other 71%?

For Connecticut households who do not have children under age 18 living in them, 72.9% have wireline broadband at home, which is below the 76.7% for the entire state and the 85.8% for households with children. This means 264,000 households without children under age 18 do not have wireline high-speed subscriptions at home.

FIGURE 11: WIRELINE & COMPUTER ADOPTION BY RACE/ETHNICITY (W/OUT CHILDREN UNDER AGE 18)



The computer and wireline adoption gaps are particularly large for the lowest income Connecticut households that do not have children. In both cases, households whose incomes are $25,000 per year or less are less than half as likely to have both digital access tools than upper income homes.

These gaps translate into a large number of Connecticut households who do not have children under age 18 lacking access to the internet via wireline broadband – some 264,000 households. That figure far exceeds the 57,000 Connecticut households with children who do not have home wireline service. Some 207,000 households without children that lack wireline broadband have annual incomes of $75,000 or less – or nearly 80% of the gap. If households without children

below the state's median income had wireline access rates equal to those above the median income, about 140,000 more Connecticut households would have wireline broadband at home.

XV. THE RETURNS TO CONNECTIVITY

INCREASES IN BROADBAND ADOPTION LEAD TO INCREASES IN LABOR PRODUCTIVITY AND ECONOMIC PROSPERITY.

The drive to get more people online rests on the premise that connectivity is beneficial. That premise is sound, even if quantifying it is not always easy. The range of possible benefits falls into a number of categories. Let's start with the four legs to the stool that surround discussion of broadband's benefits – the economy, education, health care, and social inclusion.

A. ECONOMIC

The way in which broadband might benefit the economy has a number of different components. The first is the return (in terms of economic output) to investing in high-speed networked communications infrastructure. As intuitive as it is to think that this return is positive, putting a number on it is not easy. Research finds that investment in broadband infrastructure is associated with job growth (though not increases in pay).[30] It can also attract new businesses to an area, especially rural ones.[31] However, not all research in this area yields positive results, and often, results depend on context. For example, investments in broadband often go to places that already have a cluster of knowledge-intensive industries, making it hard to distinguish a broadband effect from a region's other attributes.

Another way to frame broadband's economic impact is whether more subscribers in a particular region yield additional economic benefits to that region. A recent study found that increases in broadband adoption were associated with increases in labor productivity (that is, the amount of economic output per job in a region).[32] Research shows that growth in broadband adoption in the 2001 to 2010 period had positive impacts on economic growth in rural areas of the United

[30] Jed Kolko, "Broadband and local growth," Journal of Urban Economics, Volume 71, Issue 1, January 2012. Available online at: https://doi.org/10.1016/j.jue.2011.07.004.

[31] Younjun Kim and Peter Orazem, "Broadband Internet and New Firm Location Decisions in Rural Areas," American Journal of Agricultural Economics, Volume 99, Issue 1, January 2017. Available online at: https://doi.org/10.1093/ajae/aaw082.

[32] Roberto Gallardo, et.al., "Broadband metrics and job productivity: a look at county-level data," The Annals of Regional Science, July 2020. Available online at: https://doi.org/10.1007/s00168-020-01015-0.

States.[33] Other work shows that as broadband adoption was growing in the United States during the 2000s, broadband contributed an additional $28 billion to GDP.[34]

B. EDUCATION

With respect to education, the Michigan State research documents the benefits of broadband subscriptions at home when looking at grades and homework completion. In rural Michigan, students with fast (wireline) broadband at home reported grade point averages (GPAs) of 3.18, compared to 2.81 for students with no home access, and 2.75 for those with smartphone-only connections (and these differences control for a number of socio-economic factors).[35] This does not establish a causal link between wireline access and GPA, but the analysis underscores how internet connectivity has the potential to help children academically.

Beyond the potential for connectivity to help educational performance, broadband can also improve efficiency in the delivery of educational services. Evaluation of Carnegie Mellon's Open Learning Initiative found that "blended learning" (i.e., a combination of in-person and online instruction) can increase course completion rates and enable students to master material faster.

C. HEALTH CARE

As the National Broadband Plan noted 10 years ago, a pandemic makes universal broadband essential, since video consultation and remote access to patient data can take the place of in-person care. Broadband access for patients has benefits beyond a public health crisis, since use of telehealth can result in cost-savings as much as $4.3 billion annually in avoided cost of return visits to health care facilities for patients.[37] Wearable electronic devices can also improve diagnosis of patients,

UNIVERSAL BROADBAND ACCESS COULD RESULT IN $4.3 BILLION IN HEALTH CARE SAVINGS

[33] Brian Whitcre, et.al., "Broadband's contribution to economic growth in rural areas: Moving towards a causal relationship," Telecommunications Policy, Volume 38, Issue 11, December 2014. Available online at: https://doi.org/10.1016/j.telpol.2014.05.005.

[34] Shane Greenstein and Ryan McDevitt, "The broadband bonus: Estimating broadband Internet's economic value," Telecommunications Policy, Volume 35, Issue 7. Available online at: https://econpapers.repec.org/scripts/redir.pf?u=http%3A%2F%2Fwww.sciencedirect.com%2Fscience%2Farticle%2Fpii%2FS0308596111001005;h=repec:eee:telpol:v:35:y:2011:i:7:p:617-632.

[35] K.N. Hampton, L. Fernandez, C.T. Robertson, & J.M. Bauer, "Broadband and Student Performance Gaps." Op. cit. Available online at: https://doi.org/10.25335/BZGY-3V91

[36] Marsha Lovett, et.al., "The Open Learning Initiative," Carnegie Mellon University. Available online at: https://oli.cmu.edu/wp-content/uploads/2012/05/Lovett_2008_Statistics_Accelerated_Learning_Study.pdf.

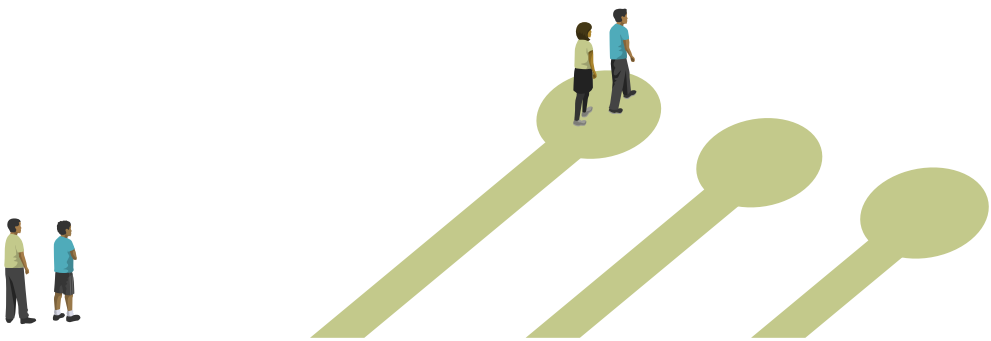
[37] Eric Pan, et.al., "The Value of Provider-to-Provider Telehealth," Telemedicine and e-Health, July 2008. Available online at: https://www.researchgate.net/publication/5276931_The_Value_of_Provider-to-Provider_Telehealth.

including clusters of diseases that have public health implications.[38] These require not just robust broadband networks, but also widespread adoption of smartphones or other electronic devices. That, in turn, requires digital skills among users in order for these applications to work.

D. SOCIAL INCLUSION

Although the internet's impact on social and civic life is hotly debated, research shows that having online access can, for individuals, promote civic engagement on the local level.[39] Home broadband access has benefits that longtime internet users may take for granted: the convenience of using the internet to manage everyday tasks.[40] Recent home broadband adopters report that high-speed connectivity helps them coordinate with employers in ways that help them with family schedules, in addition to access improving communication with their children's schools. This research also finds that new broadband users take advantage of access for job search and job training – which will become increasingly important given high unemployment caused by the pandemic.

The benefits of broadband are evident, if sometimes diffuse and hard to quantify. A $32 billion annual consumer benefit from broadband access is not a lot given a U.S. economy whose GDP is more than $20 trillion. But broadband has been woven into the fabric of how Americans' communicate, work, learn, and care for each other. Even if the return to having a home connection is hard to pinpoint, the cost of digital exclusion is real.



[38] Jennifer Radin, et.al., "Harnessing wearable device data to improve state-level real-time surveillance of influenza-like illness in the USA: a population-based study," The Lancet, Volume 2, Issue 2. Available online at: https://doi.org/10.1016/S2589-7500(19)30222-5.

[39] Keith Hampton, "Comparing Bonding and Bridging Ties for Democratic engagement: Everyday use of communication technologies within social networks for civic and civil behaviors," Information Communication & Society, Volume 14, Issue 4, July 2011. Available online at: 10.1080/1369118X.2011.562219.

[40] John B. Horrigan "Reaching the Unconnected: Benefits for kids and schoolwork drive broadband subscriptions, but digital skills training opens doors to household internet use for jobs and learning." Technology Policy Institute, August 2019. Available online at: https://techpolicyinstitute.org/wp-content/uploads/2019/08/Horrigan_Reaching-the-Unconnected.pdf.

XVI. CLOSING GAPS IN CONNECTICUT

Just under one-quarter (23.3%) of Connecticut households lack wireline high-speed internet service at home and 20% do not have either a desktop or laptop computer. These access gaps run the demographic gamut, but the burdens of the digital divide fall disproportionately on low-income Connecticut residents, older adults, students, and communities of color. For students, some 57,000 Connecticut households with children under the age of 18 do not have wireline broadband at home, with low-income, African American, and Hispanic households most acutely struggling to carry out learning online due to insufficient connectivity. There are another 264,000 Connecticut households without wireline broadband at home without children under 18 living in them. They are disproportionately low-income households, older adults, and people with disabilities. Many of them live in poverty-stricken areas in Connecticut cities.

The gaps also unfold regardless of geography. Some 28,000 non-broadband adopters live in non-metro parts of Connecticut and 110,000 live in the state's largest cities. Among cities with high poverty rates – Bridgeport, New Britain, Waterbury, New Haven, and Hartford – some 82,000 households do not have wireline broadband subscriptions at home.

There is no single place to start, but one step to begin could be executive action. In Connecticut, Governor Lamont, like other governors, has used funds from the federal CARES Act to address the homework gap since the COVID-19 pandemic has forced schools to close. Expanding the scope of such initiatives beyond school children should be a priority. One model to consider is an executive order to catalyze broadband planning in the state. In California, Governor Gavin Newsom in August issued an executive order requiring, among other things, that the state Broadband Council update its 2010 broadband plan to improve network quality and increase broadband adoption.[41] Connecticut may want to consider this as a first step to establish sustainable mechanisms to address digital gaps throughout its population. Recommendations on how to address these gaps fall into three categories:

- **IMPROVING THE SUPPLY CHAIN FOR SERVICE AND DEVICES TO THOSE IN NEED**
- **EXPANDING THE AVAILABILITY OF DIGITAL SKILLS TRAINING**
- **INTEGRATING DIGITAL TOOLS INTO PROGRAMS AIMED TO FIGHT POVERTY.**

[41] Sydney Johnson, "Pressure is on to close the digital divide under California governor's executive order," EdSource, August 14, 2020. Available online at: https://edsource.org/2020/pressure-is-on-to-close-the-digital-divide-under-california-governors-executive-order/638318.

SUPPLY CHAIN OF DEVICES AND SERVICES: The affordability of devices and services is a barrier to people having high-speed internet service at home, but ensuring that those who need it can procure affordable services and devices is a challenge. In some places, nonprofit organizations and philanthropy have stepped in to address device access. In several cities nationwide, the nonprofit PCs for People takes donated computers, refurbishes them, and provides them at little or no cost to low-income people. It has retail outlets in low-income areas of the cities it serves to reach potential customers. Local entrepreneurs have also sought to improve the pipeline of device delivery in cities such as Baltimore.[42]

For service, cable companies such as Comcast and Spectrum have offers tailored to low-income households – Internet Essentials for Comcast and Spectrum Assist for Spectrum. Both companies cover large portions of Connecticut. The nonprofit Mobile Beacon provides hotspots to schools, libraries, and other nonprofits to help them improve connectivity for their operations and the people they serve.

Recommendation: **Establish partnerships with local community groups to serve as a bridge between the suppliers of devices and connectivity and the communities that need them. This could involve collaborating with computer refurbishing operations to increase the supply of low-cost devices to those who need them. It would also mean easing the process by which qualifying households can sign up for discount internet plans that many companies offer. Some of this is underway in Connecticut with a focus on access for school-age children, but the digital divide extends beyond those households. Libraries, as highly trusted local institutions, can be key players in this equation. Working with trusted institutions to publicize the availability of low-cost internet service is worthwhile, as research shows that these offers to increase broadband adoption among low-income communities above what it would otherwise be (given the possibility that broadband adoption would rise, even for many low-income households, in the absence of discount offers).[43]**

DIGITAL SKILLS: A 2017 Pew Research Center study found widespread interest in training on how to use online resources to find trustworthy information (60% of all adults said this) and 54%

[42] Stephen Babcock, "Digital access is more important than ever. These grassroots groups are creating neighborhood-level connectivity hubs," Technical.ly Baltimore, April 23, 2020. Available online at: https://technical.ly/baltimore/2020/04/23/digital-wifi-internet-access-digibmore-neighborhood-level-connectivity-hubs-coronavirus-free-laptops.

[43] Gregory L. Rosston and Scott Wallsten, "Increasing Low-Income Broadband Adoption through Private Incentives," August 2, 2019. Available at: http://dx.doi.org/10.2139/ssrn.3431346.

expressed interest in training on how to better use the internet, computers, and smartphones.[44] Internet users and non-users alike understand the need to develop and update digital skills. Expanding skills training and tech support in schools and communities whose residents are new to home internet service can ensure that they can get the most out of online access. Such training can also help them protect the security and privacy of their data. Although such training is relevant to people of all ages, it may especially be helpful for older adults.

Recommendation: **The state of Connecticut should consider asset mapping to determine which institutions could serve as digital skills and tech support centers that can reach populations targeted for broadband outreach. Investment in digital skills, research shows, increases the likelihood that new broadband adopters use connectivity for learning, communicating with children's teachers, and conducting job searches.**[45]

INTEGRATE DIGITAL INCLUSION SERVICES INTO SOCIAL SERVICE DELIVERY: This report shows sizable broadband adoption deficits for people who use government benefit programs. The need for people to rely on the social safety net is bound to expand given the economic disruption brought about by the pandemic. The pandemic has been described as a "reallocation shock" for the job market, since up to 40% of those who have lost their jobs in the pandemic will not get them back.[46] Increasing job opportunities will be a priority for the state during recovery from the pandemic – and digital skills are an important qualification for good jobs in today's economy. For job training and other services, having sufficient levels of digital skills will be necessary for citizens to make the most out of the social safety net. The healthcare field has seen an explosion in telehealth during the pandemic, but it is clear that digital literacy is hampering access to such resources so that the pandemic, in the end, may exacerbate existing inequalities in the provision of health care services.[47]

[44] John B. Horrigan, "How People Approach Facts and Information," Pew Research Center, August 2017. Available online at: https://www.pewresearch.org/internet/2017/09/11/how-people-approach-facts-and-information/.

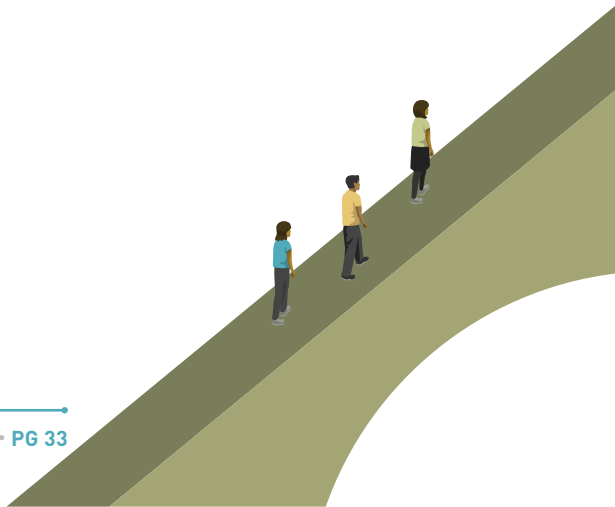
[45] Horrigan, "Reaching the Unconnected," Technology Policy Institute. Available online at: https://techpolicyinstitute.org/wp-content/uploads/2019/08/Horrigan_Reaching-the-Unconnected.pdf.

[46] Jose Maria Barrero, et.al., "COVID-19 Is Also a Reallocation Shock," Becker Friedman Institute, Working Paper No. 2020-59. Available online at: https://bfi.uchicago.edu/wp-content/uploads/BFI_WP_202059.pdf.

[47] David Velasquez and Ateev Mehrotra, "Ensuring The Growth Of Telehealth During COVID-19 Does Not Exacerbate Disparities In Care," Health Affairs, May 2020. Available online at: https://www.healthaffairs.org/do/10.1377/hblog20200505.591306/full.

RECOMMENDATION: **The state should convene a task force to evaluate how state agencies can ensure that service delivery systems can enhance access to digital tools and training for beneficiaries. The Connecticut State Broadband Office could take a leading role in convening this, but it is important to note that closing adoption gaps is as much about poverty as it is about technology. State programs that try to fight poverty should have a prominent seat at the table in linking broadband adoption to use of digital tools in service delivery.**

Finally, the state should also commit to monitoring progress as these recommendations are implemented. Some 321,000 Connecticut households do not have wireline broadband, and the analysis in this report can help stakeholders think about and develop shared goals. For instance, approximately 57,000 households with children under the age of 18 do not have wireline broadband; for educational reasons, closing that gap entirely might be a goal. For the remaining 264,000 Connecticut households without wireline, 80% are households whose incomes are below the state median. Bringing the wireline adoption rate for those households up to the level of homes above the median income would result in 140,000 more households with wireline broadband in Connecticut.



METHODOLOGY

The data used for this report is based on the author's analysis of the 2018 ACS 1- year estimates.[48] This survey, conducted by the Census Bureau, contacts 3.5 million households per year. Households receive notices through the mail that they have been selected for the survey, and they can respond through the mail, using the internet, or by telephone. If contacted households do not respond, ACS follows up with phone calls to ask that the survey be completed. Some 90% of contacted households complete the ACS.

The large sample size of ACS allows analysis of fairly disaggregated geographic units, and, since the ACS is an ongoing survey, the Census Bureau aggregates the data in different ways. For analysis of census tracts (generally having populations of about 4,000 people though census tracts can be geographically large in rural areas), ACS aggregates data over five years, meaning some 17.5 million households are available for analysis. For larger geographic areas, such as states, the "1-year ACS estimates" are acceptable, as that survey can be used to analyze places with populations of 65,000.[49] Samples drawn from areas above that population threshold are representative of those areas and have sufficiently small margins of error to yield reliable estimates.

To characterize "wireline broadband service" at home, the report uses an ACS question that asks whether a household subscribes to internet service such as cable, fiber, or digital subscriber line (DSL). It is worth pointing out that an affirmative answer to having wireline broadband at home does not reflect the speed of the underlying service. DSL service usually falls short of the FCC's 25 Mbps threshold for broadband. As such, DSL is a basic internet service that may present difficulties when more than one person would like to engage in educational applications that, for instance, require streaming video. But the ACS data does not tell us which households have DSL compared to, say, cable modem service.

For computer access, the ACS asks whether a household has a working laptop or desktop computer, and this report will also focus on access to this type of digital tool. The ACS also asks whether a household has a tablet computer. The figures in the body of the report focus on whether a household has a desktop or laptop computer. The tables in the appendix to this report includes numbers for tablet computers, as well as a combined metric of whether a household contains either a computer (laptop or desktop) or a tablet device.

[48] Datasets can be downloaded at the following site: https://data.census.gov/mdat/#.

[49] See "When to Use 1-year, 3-year, or 5-year Estimates," available online at: https://www.census.gov/programs-surveys/acs/guidance/estimates.html.

The report will also include a measure that the ACS captures – broadband of any type. This includes a household with a subscription to any broadband service; i.e., one whose speed exceeds the Federal Communication Commission's 25 Megabit per second (Mbps) definition. This would include smartphones, wireline technologies (e.g., cable or fiber), hotspots, and satellite service. Households answer "yes" if they subscribe to any of these online access technologies. A "yes" answer is not conditioned on a speed test; that is, a tool to determine whether their home access exceeds the 25 Mbps threshold or not. Smartphone access is classified as broadband; speeds on 4G wireless networks generally exceed the Federal Communications Commission's (FCC) 25 Mbps threshold that defines broadband. That is why the incidence for "broadband of any type" is greater than home wireline adoption, since "broadband of any type" includes smartphones.

ABOUT THE AUTHOR

John B. Horrigan is Senior Fellow at the Technology Policy Institute, with a focus on technology adoption and digital inclusion. Horrigan is also a senior advisor to the Urban Libraries Council. Additionally, he has served as an Associate Director for Research at the Pew Research Center, where he focused on libraries and their impact on communities, as well as technology adoption patterns and open government data. During the Obama Administration, Horrigan was part the leadership team at the Federal Communications Commission for the development of the National Broadband Plan. Views expressed in this report are his own.

TABLE 01: DIGITAL ADOPTION BY INCOME

	All	18-24	$25-50k	$50-75k	$75-150k	$150+
Broadband of any type	87.0%	62.7%	81.0%	90.5%	94.9%	98.1%
Wireline broadband at home	76.7%	47.9%	66.6%	79.4%	86.9%	92.7%
Computer (desktop/laptop)	80.1%	49.6%	69.6%	82.0%	91.0%	97.2%
Tablet	64.9%	35.8%	50.4%	62.8%	75.4%	87.8%
Tablet or laptop	85.2%	57.9%	77.7%	88.7%	94.4%	98.6%
Number of households	1,378,087	234,515	247,125	208,045	397,147	291,255

TABLE 02: DIGITAL ADOPTION BY EDUCATION

	All	<HS	HS Grad	Some college /Assoc Degree	College+
Broadband of any type	87.0%	62.2%	77.5%	89.2%	95.7%
Wireline	76.7%	48.0%	65.1%	77.0%	88.8%
Computer (desktop/laptop)	80.1%	42.7%	66.5%	80.4%	94.3%
Tablet	64.9%	34.9%	50.1%	64.8%	78.9%
Tablet or laptop	85.2%	52.6%	73.7%	87.1%	96.5%
Individuals	2,769,496	193,698	777,909	752,563	1,045,326

TABLE 03: DIGITAL ADOPTION BY RACE/ETHNICITY (ADULTS)

	White	Black	Hispanic	Asian	Native American
Broadband of any type	87.4%	82.8%	81.8%	92.8%	80.9%
Wireline	78.6%	66.2%	65.1%	81.7%	66.1%
Computer (desktop/laptop)	82.4%	68.6%	63.5%	91.0%	74.4%
Tablet	66.5%	56.4%	56.5%	73.6%	50.7%
Tablet or laptop	87.1%	75.5%	73.8%	92.3%	81.3%
Individuals	2,784,933	455,214	590,265	194,727	34,923

TABLE 04: DIGITAL ADOPTION BY AGE

	All Ages	18-24	25-34	35-44	45-54	55-64	65-74	75+
Broadband of any type	87.0%	94.5%	92.9%	93.8%	92.6%	88.7%	84.2%	61.3%
Wireline	76.7%	72.0%	82.1%	83.7%	81.6%	79.5%	73.7%	52.9%
Computer (desktop/laptop)	80.1%	83.1%	82.0%	86.5%	85.2%	82.7%	78.7%	57.3%
Tablet	64.9%	61.2%	71.2%	75.9%	72.5%	65.1%	59.6%	37.4%
Tablet or laptop	85.2%	90.1%	89.5%	91.6%	89.3%	86.5%	84.0%	63.6%
Individuals	2,837,877	344,792	440,320	429,977	496,639	514,264	340,682	271,203

TABLE 05: DIGITAL ADOPTION BY METRO VERSUS NON-METRO AREAS

	Non-Metro (2000)	Metro (2000)
Broadband of any type	85.4%	87.1%
Wireline	76.5%	76.8%
Computer (desktop/laptop)	79.8%	80.2%
Tablet	64.5%	64.9%
Tablet or laptop	86.3%	85.1%
Number of households	118,190	1,259,897

TABLE 06: DIGITAL ADOPTION BY HOUSEHOLDS WITH CHILDREN AGE 18 OR YOUNGER

	All	18-24	$25-50k	$50-75k	$75-150k	$150+
Broadband of any type	95.5%	86.0%	95.5%	95.0%	97.9%	99.3%
Wireline	85.8%	68.2%	73.8%	82.9%	90.4%	95.8%
Computer (desktop/laptop)	88.2%	64.0%	75.1%	85.2%	95.2%	98.8%
Tablet	82.3%	59.1%	69.9%	78.1%	86.4%	95.5%
Tablet or laptop	93.6%	78.9%	86.5%	92.3%	97.5%	99.6%
Number of households	402,832	46,560	63,143	52,089	122,761	118,279

TABLE 07: DIGITAL ADOPTION BY METRO VERSUS NON-METRO AREAS

	All	18-24	$25-50k	$50-75k	$75-150k	$150+
Broadband of any type	83.4%	57.0%	77.5%	89.0%	93.6%	97.2%
Wireline	72.9%	42.8%	64.1%	78.2%	85.4%	90.5%
Computer (desktop/laptop)	76.7%	46.0%	67.7%	80.9%	89.1%	96.1%
Tablet	57.7%	30.0%	43.7%	57.7%	70.4%	82.6%
Tablet or laptop	81.8%	52.7%	74.7%	87.5%	93.0%	97.8%
Households without children	975,255	187,985	183,971	155,956	274,386	172,957

TABLE 08: DIGITAL ADOPTION BY HOUSEHOLDS WITH CHILDREN AGE 18 OR YOUNGER

	Broadband of any type	Wireline	Desktop / laptop	Tablet / other portable wireless computer	# of households	Median income	Poverty rate
NORWALK	90.8%	79.3%	82.6%	69.3%	35,333	$80,338	12.8%
DANBURY	86.7%	78.6%	76.3%	68.0%	28,748	$66,820	23.3%
STAMFORD	88.4%	76.3%	81.8%	67.5%	50,847	$86,993	11.3%
NEW HAVEN	85.9%	70.2%	69.6%	57.3%	50,312	$41,950	25.7%
BRIDGEPORT	85.4%	67.3%	65.7%	53.3%	51,014	$44,443	24.2%
WATERBURY	69.9%	58.4%	63.3%	47.9%	42,894	$41,256	20.0%
HARTFORD	78.5%	57.2%	56.7%	52.2%	46,072	$30,444	31.1%
NEW BRITAIN	71.6%	48.4%	57.8%	49.5%	27,440	$46,218	16.5%

APPENDIX: GLOSSARY

Broadband: The FCC defines broadband as any internet service that supports download speeds of 25 Megabits per second (Mbps) and uploads of 3 Mbps. This may include data plans on hotspots or smartphones, as the 4G wireless networks on which most of these plans operate can support these speed thresholds.

Wi-Fi: This refers to a wireless networking protocol that broadcasts a wireless signal from an access point (for homes, this is commonly known as the wireless router) to devices that essentially tune into the signal. The signal gives users access to the internet. Wi-Fi signals are unlicensed, meaning people are able to use the frequencies that broadcast the signal without paying for a license to use the spectrum in these frequencies. Wi-Fi is used broadly in people's home in conjunction with a home broadband subscription.

Wireline broadband: Refers to the provision of internet service to a location using wired transmission capabilities, which for broadband service is commonly digital subscriber line (DSL) service, cable modem service, or fiber optic service. Download speeds for wireline service vary by technology. The median observed DSL speed, according to the FCC, is 16 Mbps, while median speeds for cable are 97 Mbps and 73 Mbps for fiber services.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