

# Disability and the Digital Divide: Internet Subscriptions, Internet Use and Employment Outcomes

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## Summary of Key Findings

### Employment Outcomes

- The first year of the COVID-19 pandemic had many impacts on the labor market. For instance, in Spring 2020, the unemployment rate more than doubled among both workers with and without disabilities. Some workers were disproportionately affected.
- Employment retention in the first year of the pandemic (between November 2019 and November 2020) was highest among those who had home internet subscriptions: 83.7 percent of workers with disabilities who had a mobile satellite or dial-up internet subscription and 81.9 percent of workers with disabilities who had a cable, digital subscriber line (DSL) or fiber internet subscription at home remained employed, while only 68.2 percent of workers with disabilities who did not have internet subscriptions at home remained employed.
- In that same period, 83.1 percent of workers with disabilities who use the internet at work remained employed, while only 75.9 percent of workers with disabilities who don't use the internet at work remained employed.

### Home Internet Subscriptions

- People with disabilities continued to have access to an internet subscription at home at lower rates than people without disabilities. Between 2015 and 2019, 91.5 percent of people without disabilities lived in a household with any kind of internet subscription, while only 78.4 percent of people with disabilities did. In that same period, among those with any kind of internet subscription, 84.1 percent of people without disabilities had high-speed internet service (cable, DSL or fiber), while 79.7 percent of people with disabilities did.
- Between 2015 and 2019, 73.6 percent of internet-connected working-age adults without disabilities (ages 25 to 64) had both high-speed internet and a computing device at home, while only 62.0 percent of working age adults with disabilities did. Among youth and youth adults (ages 5 to 24), this internet-technology gap was narrower between those with and without disabilities (75.9 percent vs. 71.1 percent), but there were large racial disparities: fewer than 7 in 10 of Black, American Indian/Alaska Native, or Hispanic youth had high-speed internet and a computer at home, while more than 8 in 10 white youth without disabilities and Asian youth with and without disabilities did.

### Internet Use

- People with disabilities used the internet at lower rates and more often cited cost as a barrier to home use. In November 2019, 83.4 percent of people over age 15 without disabilities used the internet at home, work, school or elsewhere, while only 63.8 percent of people with disabilities did. Internet use is distinct from home internet subscribership, as not all people who have access to an internet subscription use the internet.
- In November 2019, even only among those who have high-speed internet at home, working-age adults with disabilities (ages 25 to 64) used the internet at work, to telework some of or all the time, to job search or for online training at lower rates than working-age adults without disabilities.
- Working-age adults with disabilities (ages 25 to 64) also reported that cost or affordability was their household's primary barrier to home internet use at higher rates than working-age adults without disabilities (22.3 percent vs. 18.9 percent).

## Introduction

Today, access to computing devices and the internet, and the skill to use both, is essential to all aspects of life. Many Americans rely on the internet to do homework, find and keep a job, or communicate with friends and family. Even among the internet-connected, not all types of internet connections and technologies enable the same degree of online activity participation. Consequently, access to high-speed internet service is of particular interest because it can enable a broad set of online activities.<sup>1</sup>

The National Telecommunications and Information Administration (NTIA) defines the digital divide as gaps that exist between people who do and do not have access to information and communication technologies, such as internet and computers (National Telecommunications and Information Administration, 1999). Some common measures of the digital divide are based on: deployment or availability of internet service for purchase; presence of a home internet connection through an internet subscription; availability of computing devices in the home; personal use of internet and computing devices; and life outcomes associated with such access and use of internet and technology (Scheerder, van Deursen, & van Dijk, 2017).

The NTIA has highlighted the digital divide along various socioeconomic indicators. In 1998, Kaye (2000) observed specific gaps by disability status: people with disabilities were less than half as likely as their non-disabled counterparts to have access to a computer at home, and almost three times as many people without disabilities had the ability to connect to the internet at home as those with disabilities. However, little research to date has examined how this gap may affect employment outcomes of people with disabilities.

During the COVID-19 pandemic that began in 2020, schools, workplaces, businesses, and government offices moved to providing many services virtually. The pandemic had a significant impact on the labor market, particularly in 2020 (Office of Disability Employment Policy, 2022). Many who stayed employed worked remotely to social distance, making the internet an essential utility.

This brief examines several questions that can shed light on the status of the disability digital divide and how it may relate to disability employment. How do the employment outcomes of workers with and without disabilities compare based on home internet subscription type and home internet use? How do Americans with and without disabilities compare in the types of home internet subscription they have and the computing devices that are available at home? How do Americans with and without disabilities compare in their use of internet for various purposes? This brief assesses: the associations of disability status, home internet subscription types and home internet use with individuals' employment retention during the COVID-19 pandemic in 2020; home internet subscriptions by type and disability status from 2015 to 2019; both wired internet subscription and computer availability at home by disability status from 2015 to 2019; and online activity participation by home internet subscription type and disability status in 2019.

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<sup>1</sup> Broadband internet can be defined by both or either the underlying technology and the internet speed it provides. The term broadband commonly refers to high-speed internet access that is always on and faster than dial-up access. Broadband can include several high-speed transmission technologies, such as: digital subscriber line (DSL), cable modem, fiber, wireless, satellite, and broadband over power lines (BPL) (Federal Communications Commission, 2014).

## Literature Review

Both the Current Population Survey (CPS) and the American Community Survey (ACS) document household internet subscription rates in the United States. In 1997, fewer than 20 percent of households had an internet subscription, with the percentage growing to greater than 60 percent in 2007 and nearly 80 percent in 2017. In 2018, 85.3 percent of all households had an internet subscription but only 76.5 percent of households that included a person with a disability had an internet subscription. Further, in 2018, 85.1 percent of all households had a broadband subscription but only 76.1 percent of households that included a person with a disability had a broadband subscription (U.S. Census Bureau, 2021).

There is also ample research on internet use: who goes online and for what purposes. A poll from 2021 found that Black and Hispanic people, people over age 65, people with annual income below \$30,000, people with at most a high school diploma, and people who live in rural areas use the internet at lower rates than their peers not in these categories (Pew Research Center, 2021). There has been some focus on the disability digital divide, and its change over time. In 2002, only 38 percent of disabled Americans went online (are internet users), compared to 58 percent of all Americans. Of people with disabilities who did go online, a fifth said their disability makes using the internet difficult (Pew Research Center, 2003). In 2021, the gap persisted but diminished: 85 percent of people with disabilities went online, while 95 percent of people without disabilities did (Pew Research Center, 2021). In 2017, people with disabilities were as likely as people without disabilities to use the internet to sell items or services and to search for job information online, and they were more likely to use the internet for certain online health-related activities. However, people with disabilities were less likely to use the internet for texting, instant messaging and emailing, or shopping and banking online (Scanlan, 2021).

There is some research on associations or relationships between internet, technology and life outcomes. For example, increased broadband adoption is associated with increased total county employment and average income (Atasoy, 2013), higher income in rural counties (Whitacre, Gallardo, & Strover, 2014) and improved health outcomes in metropolitan/micropolitan statistical areas (Whitacre & Brooks, 2013).<sup>2</sup> At the individual level, home broadband is associated with better school performance among secondary school students (Hampton, Robertson, Fernandez, Shin, & Bauer, 2021). Higher neighborhood levels of broadband adoption are associated with increased individual-level civic participation such as donating to political campaigns and voting (Fox, 2015). Older Americans (age 50 or older) have lower levels of digital skills, particularly older people of color and women, and older workers with more digital skills have significantly higher earnings than those with less skills (Hecker, Spaulding, & Kuehn, 2021). There has been little research on whether disability status, internet and technology together influence the social, health or economic outcomes of individuals, however.

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<sup>2</sup> The United States Office of Management and Budget (OMB) delineates metropolitan and micropolitan statistical areas according to published standards that are applied to Census Bureau data. The general concept of a metropolitan or micropolitan statistical area is that of a core area containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration with that core. Each metropolitan statistical area must have at least one urbanized area of 50,000 or more inhabitants. Each micropolitan statistical area must have at least one urban cluster of at least 10,000 but less than 50,000 population (U.S. Census Bureau, n.d.).

## Data Sources and Methods

This brief uses two data sources. The Current Population Survey (CPS) is a monthly household survey.<sup>3</sup> The CPS basic monthly sample provides demographic information about household members, including age, race and ethnicity, educational attainment, and employment status. Further, the November 2019 sample includes a Computer and Internet Use supplement, sponsored by the National Telecommunications and Information Administration (NTIA). Also known as the NTIA Internet Use Survey, it provides detailed information about household internet subscription type and individuals' use of internet at home, at work, and for purposes such as communications, entertainment, teleworking and job-seeking (National Telecommunications and Information Administration, 2020). We use CPS to estimate internet use rates. See Appendix 1 for details on how the CPS enables us to distinguish between home internet access and internet use. Because the CPS is a panel survey, some households in the November 2019 sample are also observable in the November 2020 sample, allowing us to observe changes in individuals' employment status over time.

This brief also uses data from the American Community Survey (ACS), which is a year-round household and group quarters survey.<sup>4</sup> The 2015-2019 five-year public use microdata provides household-level information about type of internet subscription, availability of computing devices at home, household geography (metropolitan or non-metropolitan household location) and family income. The internet and computer questions are only asked of households, so our analysis excludes individuals who reside in group quarters. It also provides individual demographic characteristics including age, race and ethnicity, educational attainment, and employment status (Ruggles, et al., 2021). It does not collect information about which household members use internet at home if it is available. We use ACS to estimate internet subscription and computer access rates at home. We link individuals to their household internet and technology access characteristics to estimate individual-level rates of access to home internet subscriptions.

The CPS and ACS use the same disability questions, which ask respondents about various functional difficulties. Both surveys ask about six disability types: hearing difficulty, vision difficulty, cognitive difficulty, ambulatory difficulty, self-care difficulty, and independent living difficulty. We consider people who answer "yes" to any one or more of the six questions to have a disability.

This analysis is descriptive. For comparisons of populations, we set the level for statistical significance, or alpha, at 1 percent ( $p \leq 0.01$ ) for comparisons using the ACS data and 5 percent ( $p \leq 0.05$ ) for comparisons using the CPS data. The ACS significance level is higher because the ACS five-year sample size is two orders of magnitude larger than that of the November 2019 CPS sample. All figures note the universe represented,

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<sup>3</sup> The CPS interviews roughly 60,000 sampled households each month. People in institutions, such as prisons, long-term care hospitals, and nursing homes are ineligible to be interviewed in the CPS. In November 2019, the CPS response rate was 83.0 percent and in November 2020, the CPS response rate was 79.3 percent (Bureau of Labor Statistics).

<sup>4</sup> The ACS uses a series of monthly samples to produce annually updated estimates. Between 2015 and 2019, the survey annually selected roughly 3,500,000 initial addresses and 160,000 to 200,000 group quarters for sampling, with roughly 2,000,000 interviewed households and 150,000 interviewed group quarters each year. In that same period, the response rate ranged from 86.0 percent to 95.8 percent among households and 90.9 to 95.3 percent among group quarters (U.S. Census Bureau). Group quarters facilities include such places as college residence halls, residential treatment centers, skilled nursing facilities, group homes, military barracks, correctional facilities, workers' dormitories and facilities for people experiencing homelessness.

which varies. For example, the CPS only asked randomly selected people about their internet use for specific purposes if they reported internet use in any location and were above age 15.

## Definitions

There are numerous measures of internet access and use. The terms “internet access” and “broadband access” are ambiguous. For instance, “internet access” could refer to whether internet infrastructure is physically available for purchase in one’s area (coverage or availability), or it could refer to whether one has internet connectivity at home (internet subscribership) or elsewhere, such as work or school. Further, what internet speeds and connection types are considered fast enough to constitute broadband, or high-speed internet, will continue to evolve as technology improves and participation in internet-based activities and services increases across the population.<sup>5</sup> Thus the notion of “broadband internet access” is ambiguous both in what minimum speed or quality of internet qualifies as broadband internet, and whether access refers to availability in one’s area or to a person’s ability to access an internet connection at home or elsewhere.<sup>6</sup>

Further, because neither the ACS nor CPS measure households’ internet speeds, we cannot determine whether specific households in these surveys have a broadband internet subscription. However, both the ACS and CPS do ask households about the type of internet connection at home: cable, digital subscriber line (DSL), fiber, mobile data, satellite and/or dial-up internet. Internet services such as cable, DSL and fiber generally offer higher speeds than services such as mobile data, satellite or dial-up internet services (HighSpeedInternet.com, 2021). Therefore, we categorize individuals in the survey based on their household’s type or types of home internet subscription: either having (1) at least one mobile, satellite or dial-up home internet subscription, but no cable, DSL or fiber or (2) having a cable, DSL and/or fiber internet subscription, including households that may have multiple subscriptions. We assume the first group tends to have lower-speed internet connections than the second group, but this may not be true in all cases. In general, the analysis considers all households that access the internet through any type of service to have a home internet subscription, and individuals who belong to such households as the “internet-connected.”

The CPS (NTIA Internet Use Survey) asks people about their internet use in multiple locations (at home, at work, at school, etc.) and randomly selected internet users about their online activities (to telework, to job search, whether anyone in their household uses the internet to make medical appointments, etc.). We define internet users as people who report using the internet for any purpose and in any location. See Appendix 1 for further detail on how different questions in ACS and CPS enable us to define home internet subscription types and internet uses.

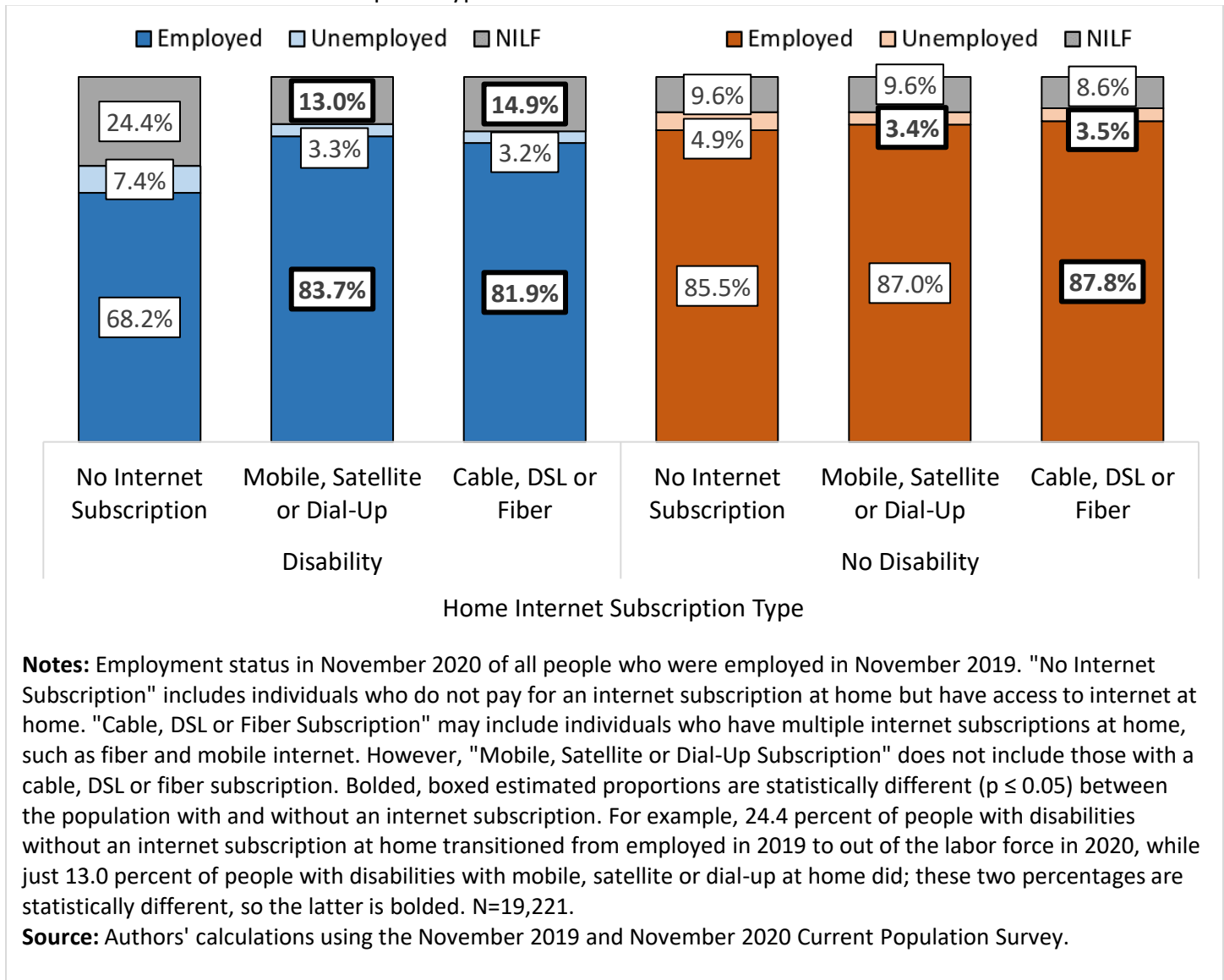
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<sup>5</sup> As of January 2022, the Federal Communications Commission (FCC)’s broadband speed benchmark is minimum speeds of 25Mbps (download)/3Mbps definition (upload). In 2021, the Government Accountability Office recommended that the FCC engagement small business stakeholders and reassess the speed benchmarks for its definition of broadband (U.S. Government Accountability Office, 2021).

<sup>6</sup> The FCC measures broadband availability, which considers a census block served if at least one home or business in that census block has terrestrial fixed broadband available for purchase. Other approaches incorporate observed or estimated internet speeds or estimated internet subscribership: NTIA’s Indicators of Broadband Need Map uses several different data sources to show third-party measures of broadband availability and levels of household internet and technology access. (Congressional Research Service, 2021)

## Findings

Figure 1a: **Employment Retention and Transitions** from November 2019 to November 2020, by Disability Status and Home Internet Subscription Type



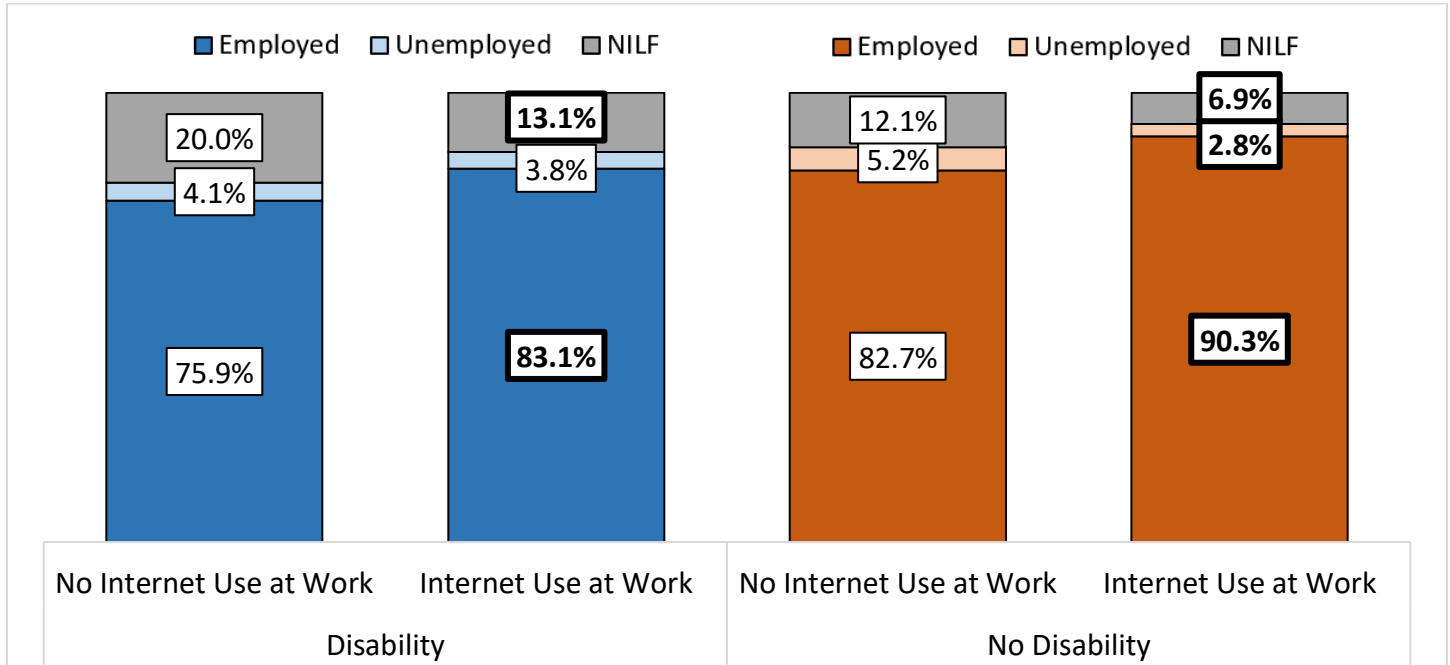
- We define the employment retention rate as the percent of people who were employed in November 2020, given that they were already employed in November 2019.
  - Among those who were employed in November 2019, 79.8 percent of people with disabilities remained employed in November 2020, while 87.5 percent of people without disabilities did (a difference of 7.6 percentage points: statistically different ( $p \leq 0.05$ ) but not shown in figure).
- Households where at least one person reported using the internet at home were asked what type of internet service was installed at home.
  - From 2019 to 2020, workers who had an internet subscription at home had statistically different ( $p \leq 0.05$ ) employment transitions than workers who had no internet subscription at home: among workers with disabilities, the employment retention rate among those with mobile, satellite or dial-up at home and those with cable, DSL or fiber at home was 15.5



percentage points and 13.7 percentage points higher, respectively, compared with workers with disabilities who had no internet at home.

- The gap in employment retention between people with and without disabilities is greatest among those who have no internet subscription at home: a difference of 17.3 percentage points (statistically different ( $p \leq 0.05$ ) but not shown in figure).

Figure 1b: **Employment Retention and Transitions** from November 2019 to November 2020, by Disability Status and Internet Use at Work



**Notes:** Employment status in November 2020 of all people who were employed in November 2019. "Internet Use at Work" corresponds to a survey question regarding individuals' jobs *in November 2019*. "Internet Use at Work" is not observed in November 2020. Bolded, boxed estimated proportions are statistically different ( $p \leq 0.05$ ) between the population with and without reported internet use at work. For example, 20.0 percent of workers with disabilities who did not use internet at work transitioned from employed in 2019 to out of the labor force in 2020, while just 13.1 percent of workers with disabilities who do use internet at work did; these two percentages are statistically different, so the latter is bolded. N = 19,221.

**Source:** Authors' calculations using the November 2019 and November 2020 Current Population Survey.

- From 2019 to 2020, those who had jobs where they used the internet at work (internet-at-work users) had different employment transitions than those with jobs where they did not use the internet at work: for instance, among internet-at-work users with disabilities, the employment retention rate was 7.2 percentage points higher compared with non-internet-at-work users with disabilities.
- The probability of employment retention from 2019 to 2020, a period which included most of the first year of the COVID-19 pandemic, was likely influenced by a variety of external factors in addition to

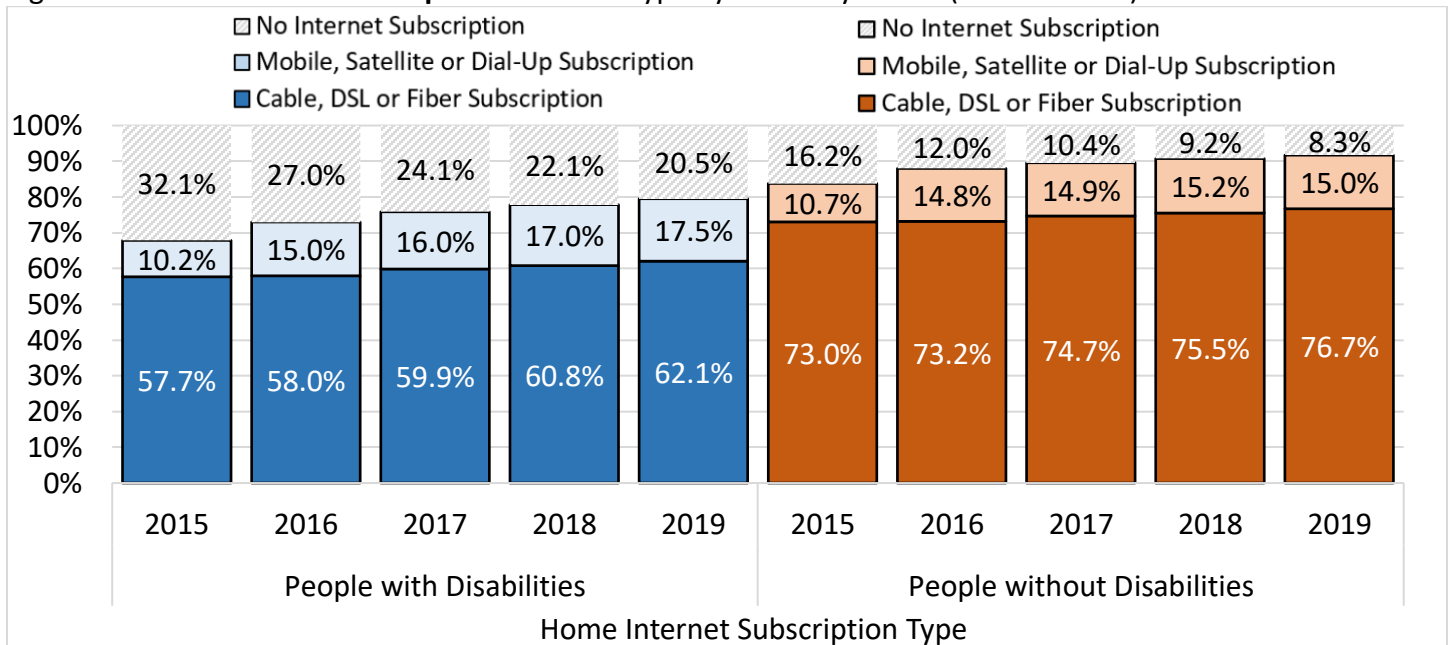
one's home internet subscription type or internet-at-work status.<sup>7</sup> Once accounting for external factors such as age, gender, educational attainment, occupation, industry and state of residence, we observed several associations between internet-related variables and employment retention (See Appendix 3). All associations as follows were found to be statistically significant at the 5% level ( $p \leq 0.05$ ), except where otherwise noted:

- Having a job where one uses the internet at work is positively associated with employment retention (a 4.3 percentage point increase among all workers with and without disabilities age 16 and above, and a 3.7 percentage point increase among all workers with and without disabilities ages 25 to 64).
- Among workers without disabilities, there is no clear association between home internet subscriptions (either mobile, satellite or dial-up or cable, DSL or fiber) and employment retention: only among workers without disabilities above age 16 was having cable, DSL or fiber associated with a 2.4 percentage point decrease in employment retention compared to those with no subscription at home).
- However, for workers with disabilities, there was a positive association between having a home internet subscription and employment retention, regardless of home internet subscription type.
  - Among workers ages 16 and above with disabilities, having mobile, satellite or dial-up was associated with an 11.2 percentage point increase in the employment retention rate and having cable, DSL or fiber was associated with an 8.8 percentage point increase in the employment retention rate, compared to workers with disabilities with no internet subscription at home.
  - Among workers ages 25 to 64 with disabilities, having mobile, satellite or dial-up was associated with a 20.0 percentage point increase in the employment retention rate and having cable, DSL or fiber was associated with an 11.0 percentage point increase ( $p \leq 0.10$ ) in the employment retention rate, compared to workers with disabilities with no internet subscription at home.

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<sup>7</sup> Because the probability of employment retention from 2019 to 2020 (during the first year of the COVID-19 pandemic) was influenced by a variety of external factors outside of one's home internet subscription type or internet-at-work status, we used a regression analysis to control for variables including age, gender, educational attainment, occupation, industry and state of residence (see Appendix 3 for full results).

Figure 2: Home Internet Subscription Rate and Type by Disability Status (2015 to 2019)

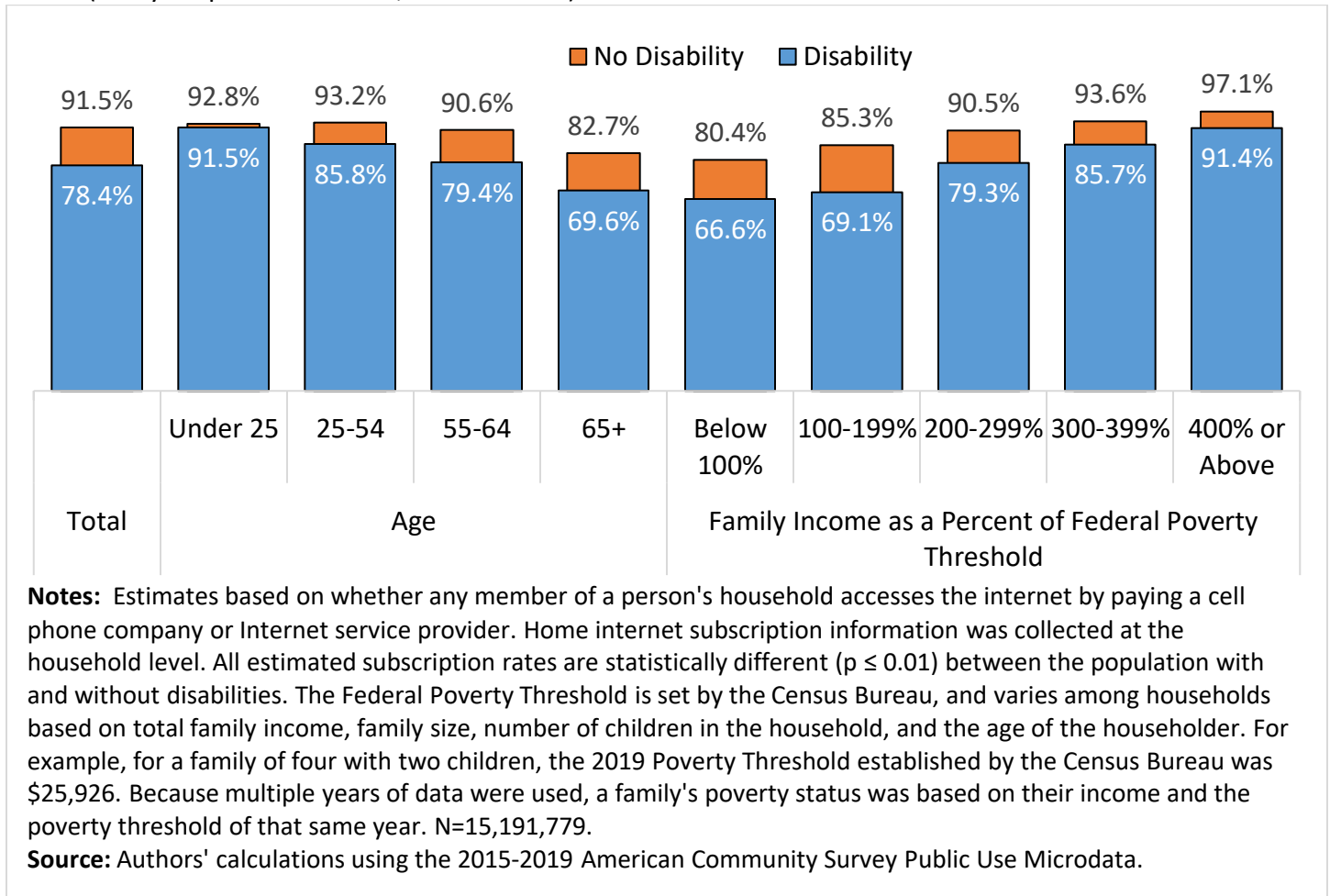


**Notes:** Estimates are person-level, but based on the internet subscription type that is reported by that person's household. "No Internet Subscription" may include individuals who do not pay for an internet subscription at home but have some other means to access to internet at home. "Cable, DSL or Fiber Subscription" may include individuals who have multiple internet subscriptions at home, such as fiber and mobile internet. However, "Mobile, Satellite or Dial-Up Subscription" does not include those with a cable, DSL or fiber subscription. All estimated rates are statistically different ( $p \leq 0.01$ ) between the population with and without disabilities and from year to year. N(2015) = 2,997,503; N(2016) = 3,007,847; N(2017) = 3,038,696; N(2018) = 3,060,442; N(2019) = 3,087,291.

**Source:** Authors' calculations using the 2015-2019 American Community Survey Public Use Microdata.

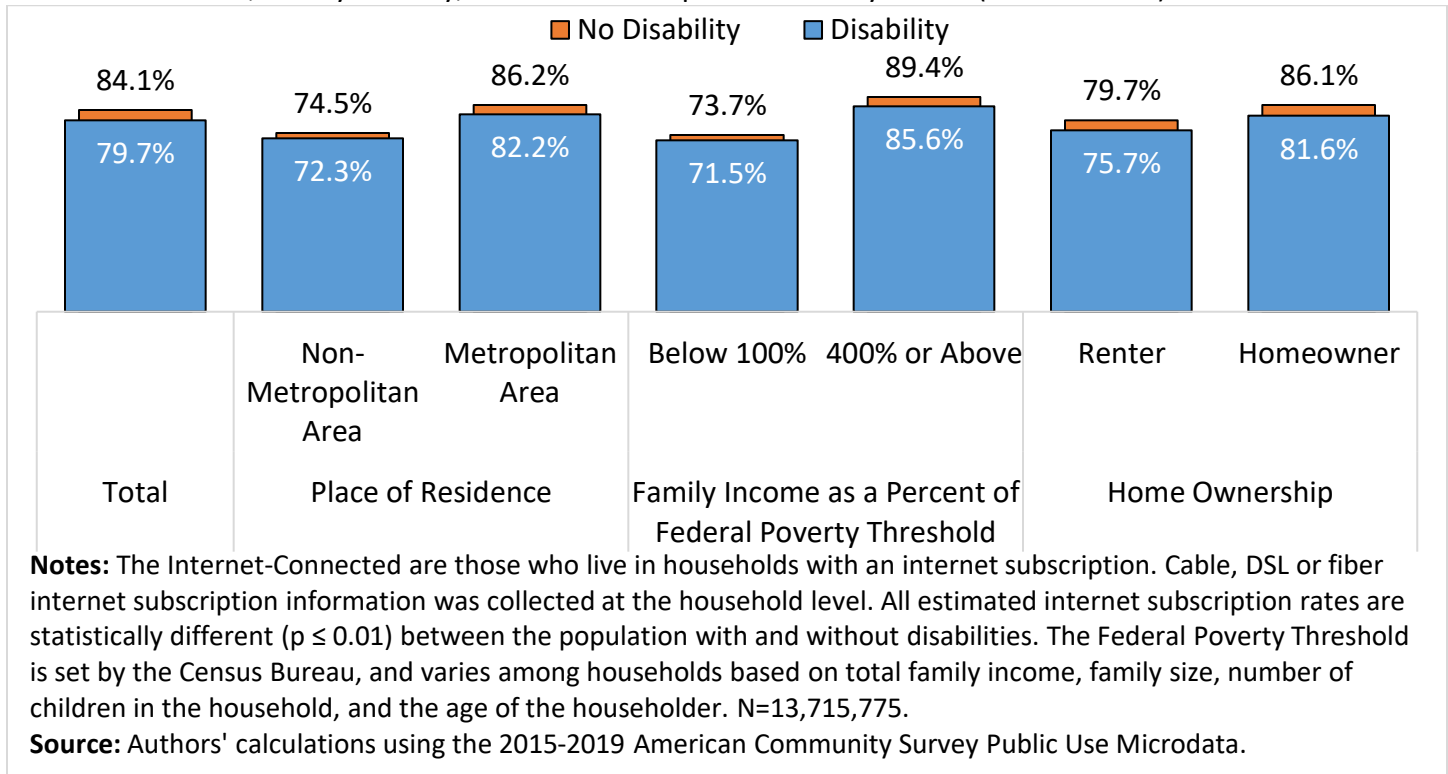
- In each year from 2015 to 2019, there was a persistent disparity between people with and without disabilities in home internet subscription rates.
  - Over 2015 to 2019, there is an observed decrease in the disability internet subscription gap (mobile, satellite or dial-up and cable, DSL or fiber combined). People without disabilities lived in homes with any kind of internet subscription at a rate 15.9 percentage points higher than people with disabilities in 2015; in 2019 the gap was 12.2 percentage points. The percent of people living in homes with an internet subscription grew by 7.9 percentage points among people without disabilities and by 11.6 percentage points among people with disabilities.
  - Over 2015 to 2019, there is also an observed decrease in the disability gap in cable, DSL or fiber internet subscriptions, which typically offer higher internet speeds than mobile, satellite or dial-up connections. People without disabilities lived in homes with a cable, DSL or fiber subscription at a rate 15.3 percentage points higher than people with disabilities in 2015; in 2019 the gap was 14.6 percentage points. From 2015 to 2019, the percent of people living in homes with a cable, DSL or fiber internet subscription grew by 3.7 percentage points among people without disabilities and by 4.4 percentage points among people with disabilities.

Figure 3: Percent of People with **Any Internet Subscription** at Home by Age, Family Poverty and Disability Status (five-year period estimate, 2015 to 2019)



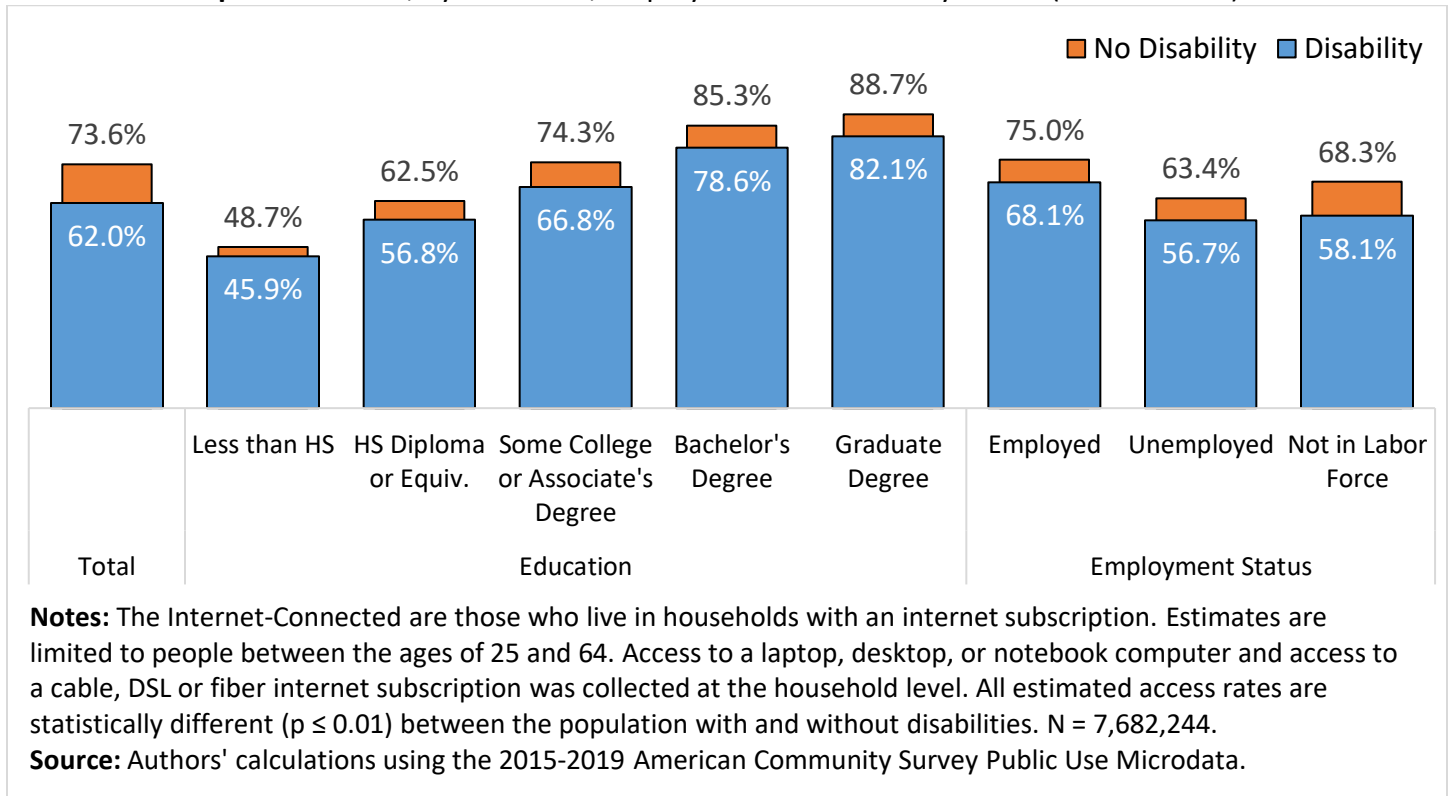
- Between 2015 and 2019, 91.5 percent of people without disabilities had a home internet subscription, while just 78.4 percent of people with disabilities did.
- The disability internet subscription gap by age group increases gradually from approximately 1.3 percentage points for those under 25 years, to 7.4 percentage points for those aged 25-54, to 11.2 percentage points for those aged 55-64, and finally to 13.1 percentage points for those aged 65 and older.
- The disability internet subscription gap was also largest among people who live under or just above the Census Bureau's federal poverty threshold (family incomes either *Below 100%* or *100-199%* of the threshold).
  - More than three quarters (80.4 percent) of people without disabilities who lived below the poverty threshold (family income less than 100 percent of the federal poverty threshold) had access to a household internet subscription, while only 66.6 percent of people with disabilities who lived below the federal poverty threshold did.
  - 85.3 percent of people without disabilities who lived just above the poverty threshold (family income from 100 to 199 percent of the federal poverty threshold) had access to a household internet subscription, while only 69.1 percent of people with disabilities did.

Figure 4: Percent of Internet-Connected People with **Cable, DSL or Fiber Internet Subscriptions** at Home by Place of Residence, Family Poverty, Home Ownership and Disability Status (2015 to 2019)



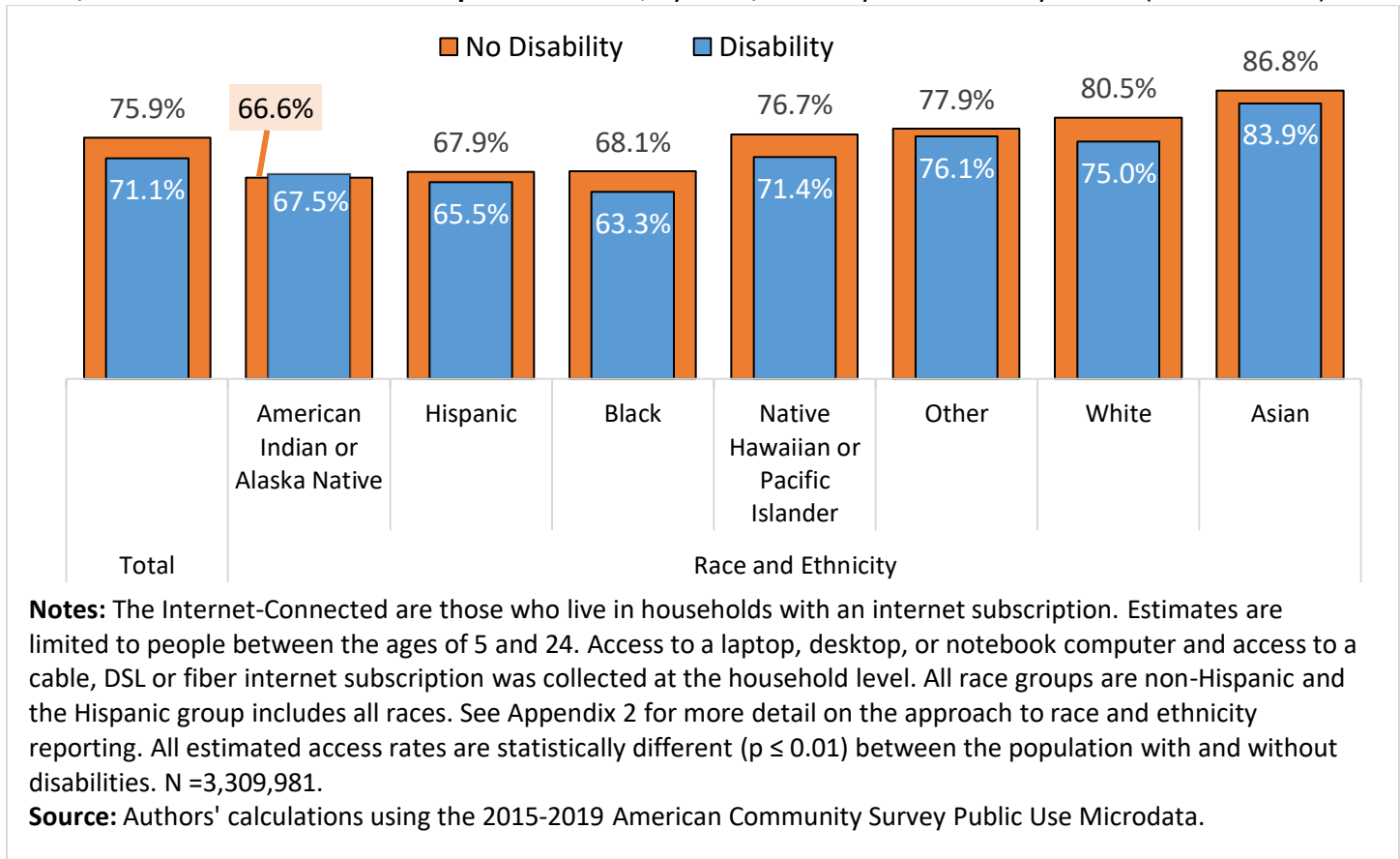
- Not everyone who lives in an internet-connected household had access to a cable, DSL or fiber connection, which can offer higher internet speeds than mobile, satellite or dial-up connections.
  - Out of all internet-connected people, 11.0 percent of people without disabilities and 12.9 percent of people with disabilities had internet access solely through a mobile or cellular data plan (not shown in figure).
- Although most internet-connected people have a cable, DSL or fiber connection at home, there are disparities. People with disabilities lived in households with such internet connections at lower rates than people without disabilities (79.7 percent vs. 84.1 percent). We observed other disparities:
  - Cable, DSL or fiber subscriptions were less common in non-metropolitan areas (72.3 percent and 74.5 percent among people with and without disabilities, respectively) than metropolitan areas (82.2 percent and 86.2 percent among people with and without disabilities, respectively).
  - Cable, DSL or fiber subscriptions were also less common among those who live below the federal poverty threshold (71.5 percent and 73.7 percent among people with and without disabilities, respectively), compared with people whose family income was at least four times the threshold (85.6 percent and 89.4 percent among people with and without disabilities, respectively).
  - Renters had lower rates of cable, DSL or fiber subscriptions than homeowners. 75.7 percent and 79.7 percent of renters with and without disabilities had cable, DSL or fiber subscriptions at home compared with 81.6 percent and 86.1 percent of people with and without disabilities who were homeowners.

Figure 5a: Percent of Internet-Connected Adults Ages 25-64 with **Both a Computer and Cable, DSL or Fiber Internet Subscription** at Home, by Education, Employment and Disability Status (2015 to 2019)



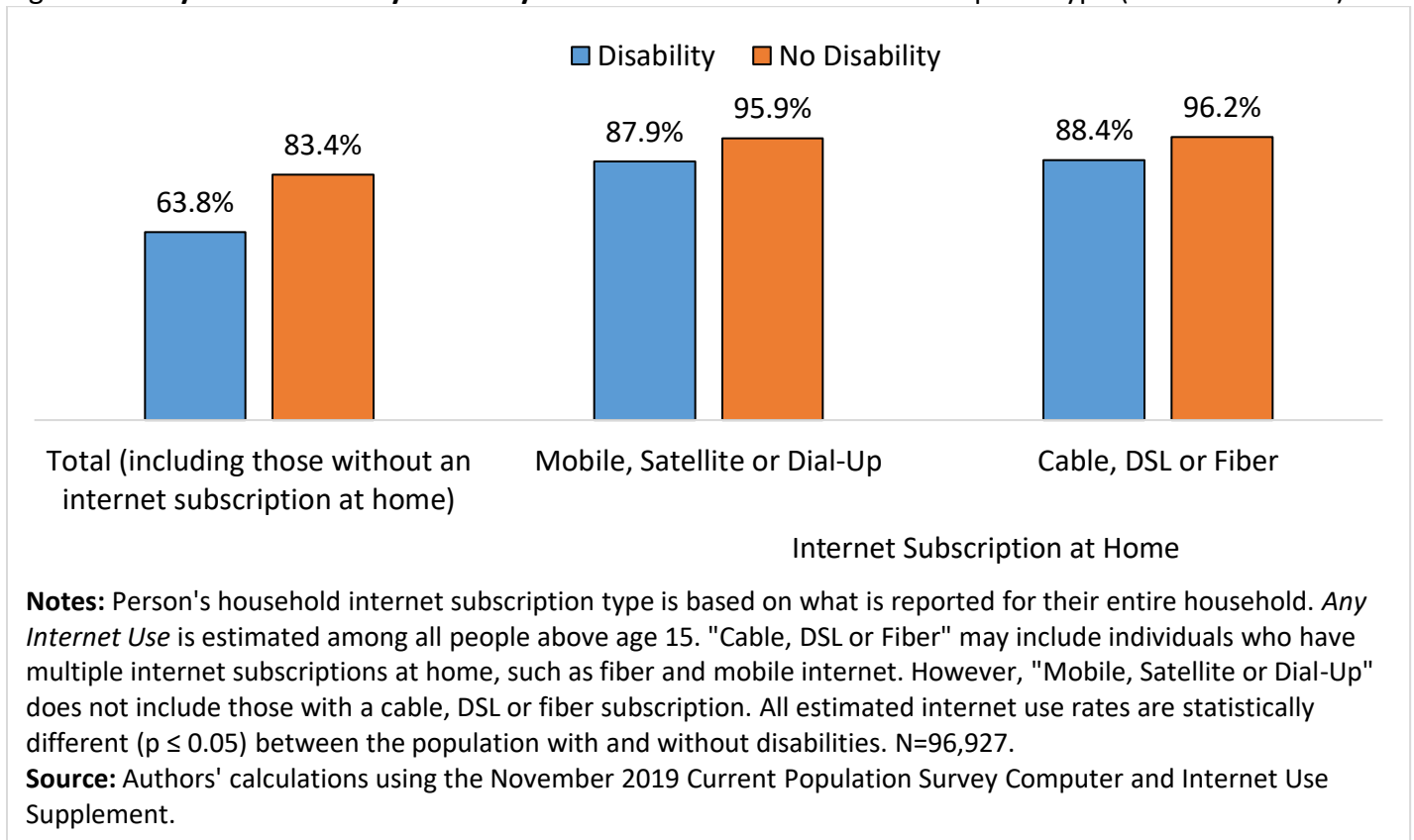
- Technology availability at home varies among internet-connected adults (ages 25 to 64).
  - 15.5 percent of adults with disabilities only had access to a smartphone at home, but not a laptop, desktop, notebook or tablet computer, compared with 10.3 percent of adults without disabilities (statistically different ( $p \leq 0.01$ ) but not shown in figure).
- Having both a cable, DSL or fiber internet connection at home and a computer to access the internet can offer a better experience in a variety of online activities, such as streaming videos, making video calls or working or attending school from home.
  - Among internet-connected adults, there was a significant gap between people with and without disabilities who lived in a household with both a computer and a cable, DSL or fiber internet subscription. 73.6 percent of people without disabilities lived in a household with both, while only 62.0 percent of people with disabilities did.
  - Adults with higher levels of educational attainment had higher rates of access to both a computer and a cable, DSL or fiber internet subscription at home. Regardless of disability status, more than three quarters of adults with at least a bachelor's degree had both, while fewer than half of adults with less than a high school diploma did.
  - Regardless of disability status, employed adults had higher rates of access to both a computer and a cable, DSL or fiber internet subscription at home, compared to unemployed adults or adults not in the labor force (75.0 percent of workers without disabilities and 68.1 percent of workers with disabilities).

Figure 5b: Percent of Internet-Connected Youth and Young Adults Ages 5 to 24 with **Both a Computer and Cable, DSL or Fiber Internet Subscription** at Home, by Race/Ethnicity and Disability Status (2015 to 2019)



- Technology availability varies among internet-connected youth and young adults (ages 5 to 24).
  - 13.6 percent of youth and young adults with disabilities only had access to a smartphone at home, but not a laptop, desktop, notebook or tablet computer, compared with 10.3 percent of youth and young adults without disabilities (statistically different ( $p \leq 0.01$ ); not shown in figure).
- For school-aged youth, both a computer and a cable, DSL or fiber internet subscription at home can be important resources for completing schoolwork.
  - Overall, there was a 4.8 percentage point gap between youth and young adults with and without disabilities in access to both a computer and a cable, DSL or fiber internet subscription at home (75.9 percent vs. 71.1 percent).
  - Asian youth and young adults had the highest rate of both a computer and a cable, DSL or fiber internet subscription at home (over 80 percent), regardless of disability status. Further, Asian youth had the lowest disability prevalence of all race and ethnicity groups (3.3 percent, from 2015-2019 ACS; not shown in figure).
  - Hispanic, Black and American Indian or Alaska Native youth and young adults exhibited the lowest rates of access to both a computer and a cable, DSL or fiber internet subscription, with access rates between 60 to 70 percent. Further, Black and American Indian or Alaska Native had the highest disability prevalence of all race and ethnicity groups (7.0 percent and 9.5 percent, respectively, from 2015-2019 ACS; not shown in figure).

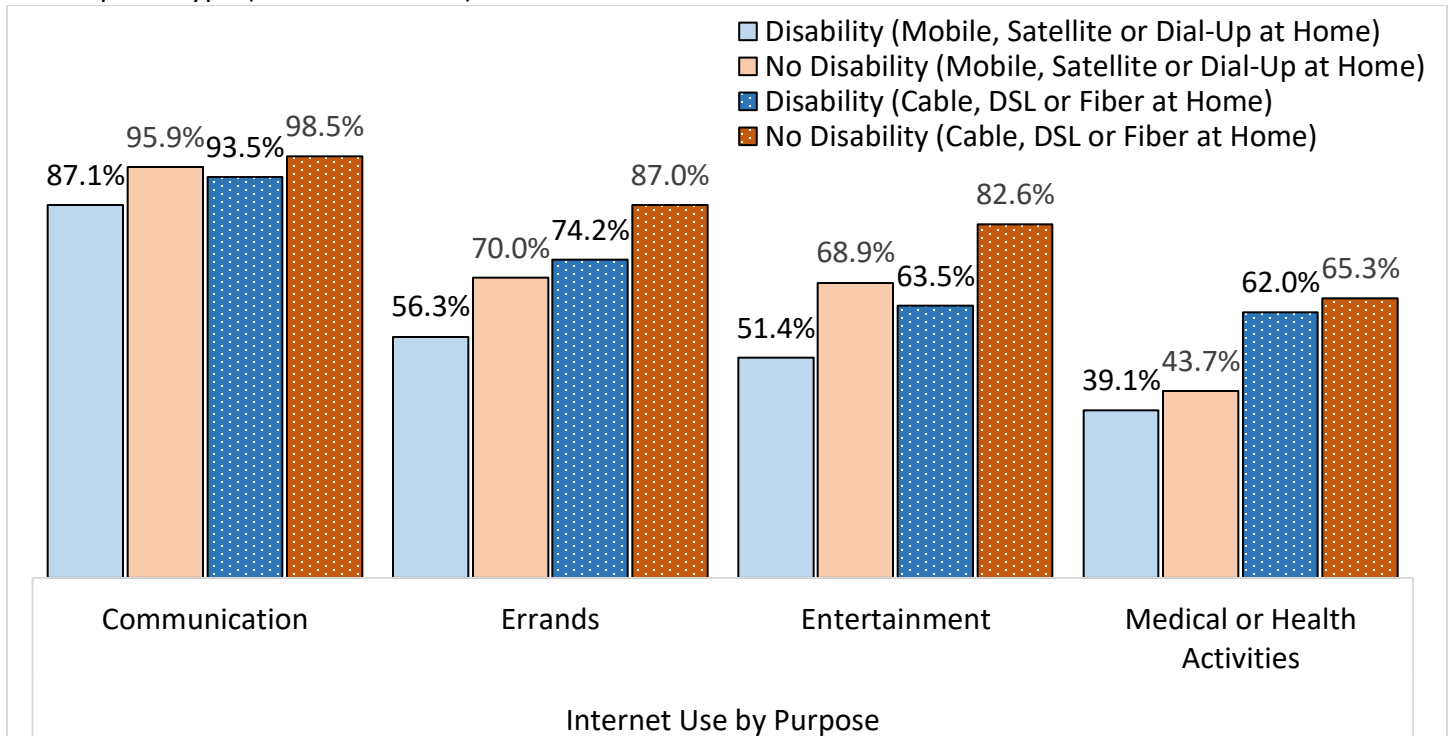
Figure 6a: **Any Internet Use by Disability Status** and Home Internet Subscription Type (November 2019)



- Figures 6a through 8 present data from the CPS, which asks respondents both about whether they use the internet in various locations and contexts, and what type(s) of home internet subscription they have at home, if applicable. See Appendix 1 for a comparison of internet-related survey questions in the ACS and the CPS.
  - Internet use is distinct from having a home internet subscription. Not all people who live in a home with an internet subscription use the internet themselves.
  - In Figures 6a through 6c, a person is an internet user if they report accessing the internet in any location, such as at home, work or school. Internet users can be segmented by the type of home internet subscription reported by their household: either a mobile, satellite or DSL subscription or a cable, DSL or fiber subscription. Generally, the latter set of connection types offer faster internet speeds, but this survey did not measure household internet speeds directly.
- Without accounting for the availability of internet at home, there was a significant gap in internet use among people over age 15 in any setting (at home, at work, at school or in the community) by disability status (83.4 percent among those without disabilities vs. 63.8 percent among those with disabilities).
- Even among those who have a cable, DSL or fiber subscription at home (typically faster internet speeds), internet use in any setting is more prevalent among people without disabilities (96.2 percent among those without disabilities vs. 88.4 percent among those with disabilities).



Figure 6b: **Online Activity Participation** Among Internet Users by Disability Status and Home Internet Subscription Type (November 2019)

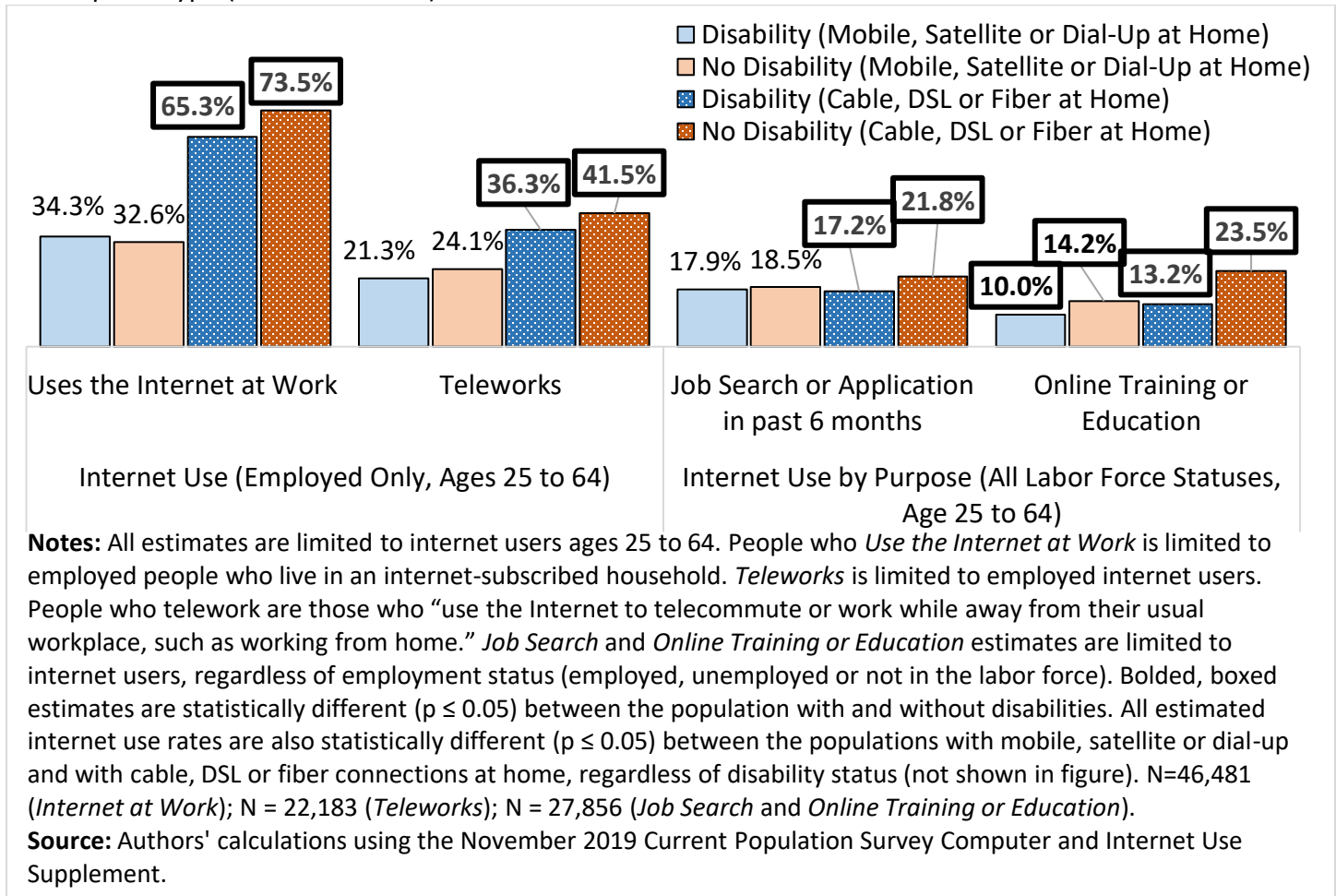


**Notes:** Estimates of internet use for communication, errands and entertainment purposes are limited to internet users above age 15. Internet use for medical or health purposes are asked about the entire household; estimate represents the percent of internet users who belong to a household where least one person uses the internet for medical or health purposes. *Communication* purposes include emailing, texting, social network use, and video calls. *Errands* include requesting services such as Uber or Lyft, online shopping or travel reservations, online banking or bill payments, or interacting with household appliances. *Entertainment* includes using the internet to stream video or audio. *Medical* purposes include communicating with health care professionals, accessing health records or health insurance, researching health information, or using electronic health monitoring services. All estimated internet use rates are statistically different ( $p \leq 0.05$ ) between the population with and without disabilities. N=96,927.

**Source:** Authors' calculations using the November 2019 Current Population Survey Computer and Internet Use Supplement.

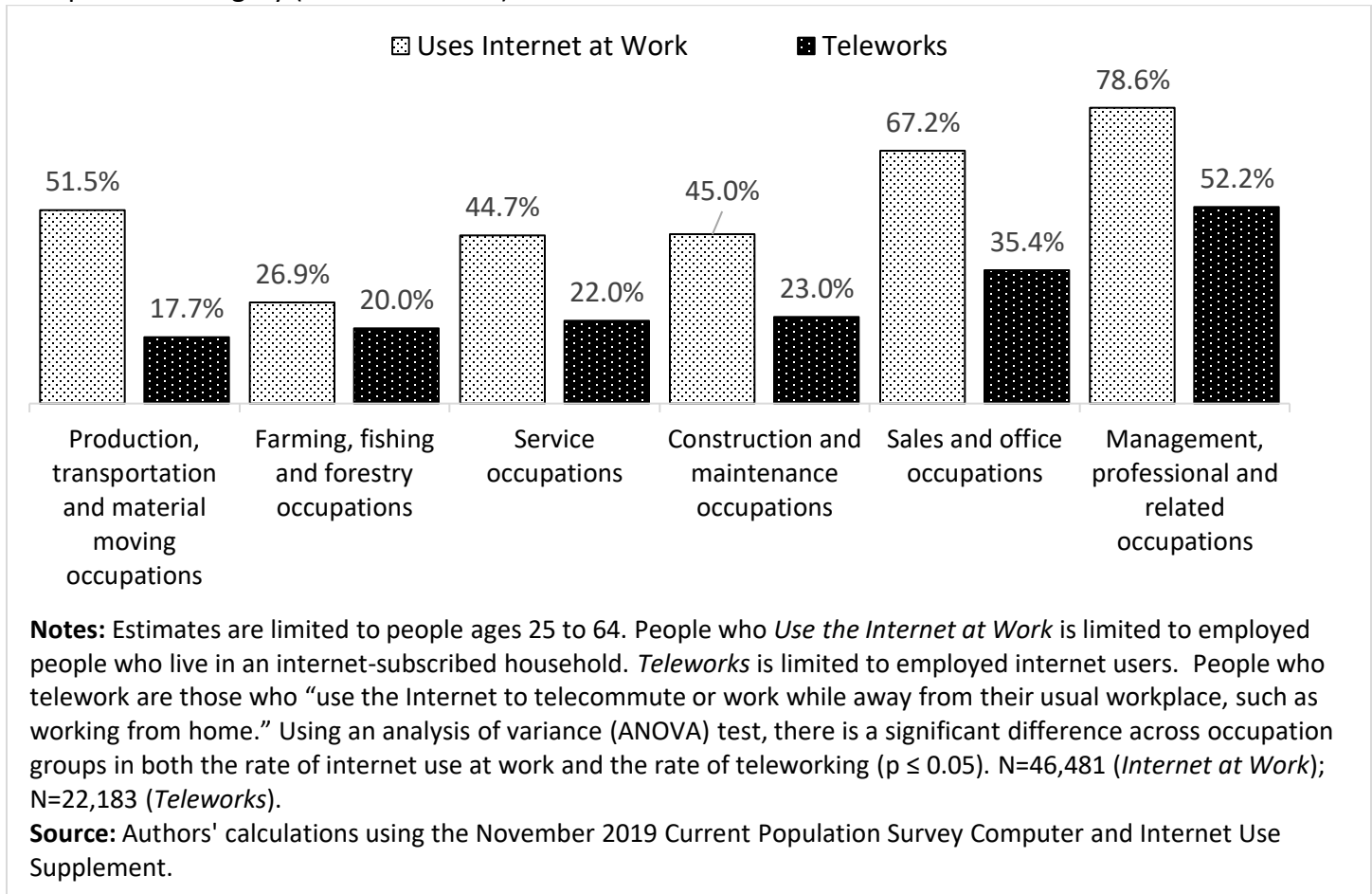
- Among internet users ages 15 and older, there were gaps in reported online activities by disability status for a variety of purposes.
- The largest gap for a specific internet use *by disability status* was for entertainment: regardless of home internet connection type, people without disabilities used the internet for entertainment at higher rates than people with disabilities did, a difference of 17.5 to 19.1 percentage points.
- There was also a large gap between mobile, satellite or dial-up subscribers and cable, DSL or fiber subscribers was for medical or health activities: over 60 percent of those with cable, DSL or fiber at home vs. roughly 40 percent of those who had mobile, satellite or dial-up at home lived in a household where someone used the internet for medical and health-related activities (including both those with and without disabilities).

Figure 6c: **Work-Related Online Activities** among Internet Users by Disability Status and Home Internet Subscription Type (November 2019)



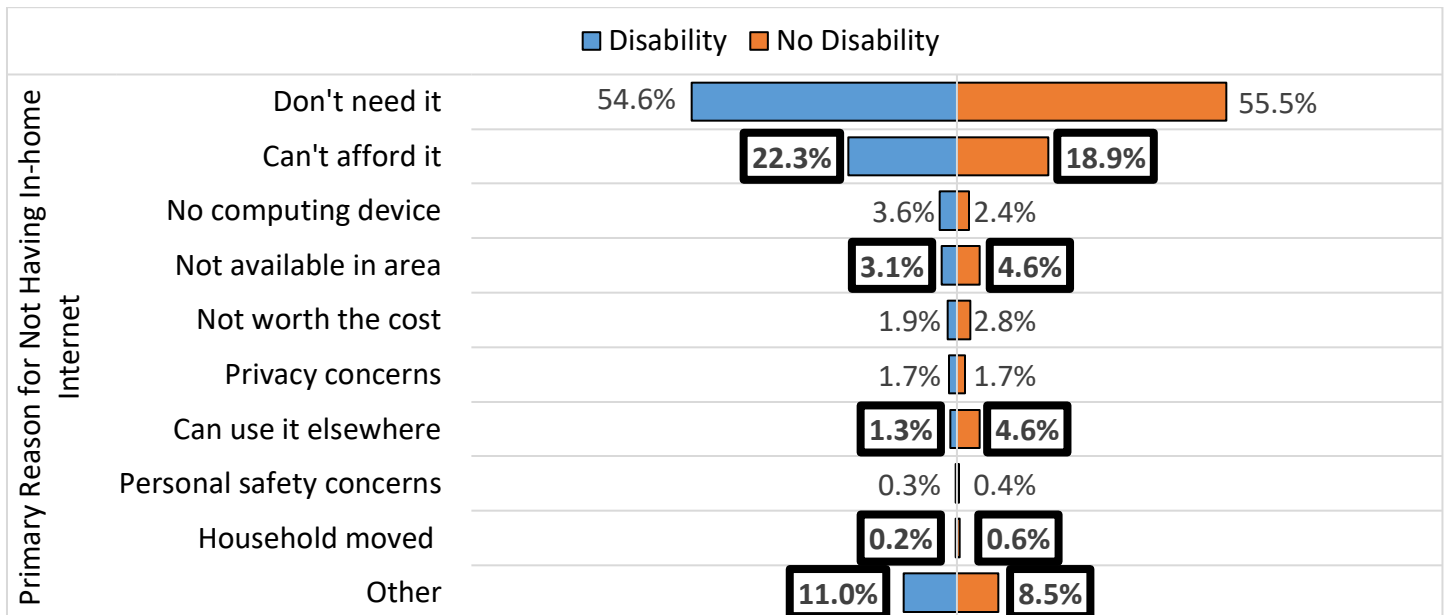
- Having a cable, DSL or fiber internet subscription at home was associated with higher rates of internet use for several work and work-related activities compared with mobile, satellite or dial-up at home.
  - Overall (without controlling for disability), adults who had cable, DSL or fiber at home used the internet for all work-related activities in Figure 6c at statistically higher rates than people with mobile, satellite or dial-up internet (statistically different ( $p \leq 0.05$ ) but not shown in figure).
  - Among adults with disabilities, cable, DSL or fiber at home was associated with statistically higher rates of internet use at work and teleworking compared with mobile, satellite or dial-up internet, but internet subscription type was not associated with statistically different rates of online job searching or attending online training ( $p \leq 0.05$ , significance not shown in figure).
- Even among those with cable, DSL or fiber at home, adults with disabilities used the internet for all types of work-related activities at lower rates compared to adults without disabilities:
  - 73.5 percent of workers without disabilities used the internet at work compared with 65.3 percent of adults with disabilities, and 41.5 percent of workers without disabilities used the internet to telework compared with 36.3 percent of adults with disabilities.
  - 21.8 percent of adults without disabilities job searched online compared with 17.2 percent of adults with disabilities, and 23.5 percent of adults without disabilities attended online training or education compared with 13.2 percent of adults with disabilities.

Figure 7: Percent of Employed Internet Users who perform **Work-Related Online Activities**, by Major Occupational Category (November 2019)



- The rates of internet use at work and telework varied by occupation categories, and this difference was statistically significant ( $p \leq 0.05$ ). In 2019, 3.7 percent of all workers had a disability (Bureau of Labor Statistics, 2020; not shown in figure).
  - Internet users in management, professional and related occupations used both the internet at work (78.6 percent) and used the internet to telework (52.2 percent) at the highest rates out of all occupation categories (statistically higher than all other occupation categories,  $p \leq 0.05$ , including a Bonferroni adjustment for multiple comparisons). This occupation category also had a lower-than-average disability prevalence: in 2019, 3.1 percent of all workers in management, professional and related occupations had a disability.
  - Internet users in production, transportation and material moving occupations used the internet to telework some or all of the time (17.7 percent) at the lowest rates out of all occupation categories. This occupation category also had a higher-than-average disability prevalence: in 2019, 4.7 percent of production, transportation and material moving workers had a disability.
  - Internet Users in farming, fishing and forestry occupations used the internet at work (26.9 percent) at the lowest rates out of all occupation categories. The disability prevalence in this occupation category was roughly equal to the national average: in 2019, 3.6 percent of farming, fishing and forestry workers had a disability.

Figure 8: Primary Reason Given for **No Household Internet Use** by Disability Status (November 2019)



**Notes:** Estimates are limited to people ages 25 to 64 who live in households where no person in the household reports using the internet for any purpose at home. Primary respondents for each such household were asked what the most important reason was for not going online at home. Estimates in bold represent statistically significant differences ( $p \leq 0.05$ ) between the population with and without disabilities. Disability status is not collected for household members under age 15. N = 8,978.

**Source:** Authors' calculations using the November 2019 Current Population Survey Computer and Internet Use Supplement.

- Among households where no person reported using the internet at home, the primary respondent gave reasons why they and/or their household did not and could specify the single most important reason why.
  - Adults ages 25-64 listed lack of need or lack of interest as the most common reason for internet non-use. 54.6 percent of non-internet users with disabilities and 55.5 percent of non-internet users without disabilities did not need internet or were not interested. There was no statistical difference in the rate by disability status.
  - Lack of affordability was the second most common reason for lack of internet use among adults ages 25 to 64. 22.3 percent of non-internet users with disabilities and 18.9 percent of non-internet users without disabilities could not afford the internet service. This difference is statistically significant ( $p \leq 0.05$ ), which suggests that lack of affordable internet is a more common barrier to adult, non-internet users with disabilities than it is to adults without disabilities.
  - Among people under age 25 and above age 64, there was no statistical difference between people with and without disabilities in the rates of internet non-use due to affordability. Lack of affordability is the primary barrier to home internet for an estimated 23.4 percent of people under age 25 and 9.9 percent of people above age 64 (not shown in figure).

## Conclusion

Between late 2019 and late 2020, workers with disabilities transitioned from being employed to unemployed or out of the labor force at higher rates than workers without disabilities, even when accounting for age, race and ethnicity, sex, marital status, education, industry, and occupation. During this time, workers that reported internet use at work (likely with jobs that involve using the internet and computing devices) stayed employed at higher rates than those who reported they did not use the internet at work. Further, workers with disabilities that had some form of internet subscription at home stayed employed at far higher rates than workers with disabilities who did not have an internet subscription at home. Among workers without disabilities there was no clear association between home internet and employment retention (Figure 1a, Figure 1b and Appendix 3). This suggests that, particularly for adults with disabilities who want to work, having a home internet connection and the skills to use the internet and computing devices could be important to employment success.

Yet, people with disabilities do not have internet subscriptions at home at the same rates as people without disabilities, and people with disabilities report lower levels of internet use in a variety of settings. Between 2015 and 2019, people with disabilities had lower home internet subscription rates than people without disabilities (Figure 2 and Figure 3). Further, in 2019, adults ages 25 to 64 with disabilities lived in households that lacked internet due to affordability concerns at higher rates than people without disabilities (Figure 8).

Over the five-year time period between 2015 and 2019, disparities existed even within the internet-connected, or people who had internet subscriptions at home. Internet-connected people with disabilities had slightly lower rates of cable, DSL or fiber internet subscriptions than internet-connected people without disabilities, particularly those who lived outside metropolitan areas, those who lived below the federal poverty threshold and renters as compared to those who lived in metropolitan areas, had family incomes above the federal poverty threshold and homeowners, respectively (Figure 4). Among youth and young adults (people ages 5 to 24), and among those with or without disabilities, Black, Hispanic and American Indian or Alaska Native youth had the lowest rates of access to both a computer and a cable, DSL or fiber subscription at home compared to other race/ethnicity groups. Asian youth had the highest rates of access to both (Figure 5b).

Further, not all who are internet-connected are necessarily internet users themselves. People with disabilities use the internet at significantly lower rates compared to people without disabilities. This gap exists regardless of whether one has an internet subscription at home or not. However, the disability internet use gap narrows among those with a typically higher-speed internet subscription such as cable, DSL or fiber. (Figure 6a). Even among those who had these typically higher-speed internet connections at home, workers with disabilities used the internet at their jobs or to telework at lower rates (Figure 6c).

Disparities in access to and use of the internet and technology could lead to broader social, economic or health disparities. Understanding of these disparities offer policy makers and practitioners opportunities to consider policies and practices which could increase access to reliable high-speed internet at home and better digital skills for people with disabilities to improve their socioeconomic outcomes.

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## Appendix 1: Internet-related Questions in the American Community Survey (ACS) and Current Population Survey (CPS)

Table 1: Comparison of Home Internet Subscription and Internet Use Questions in the 2015-2019 ACS and 2019 CPS

	ACS	CPS	
<b>Internet Subscription</b>	Access to any kind of internet at home	At this house, apartment, or mobile home - do you or any member of this household have access to the internet? Yes, by paying a cell phone company or Internet service provider	There is no single household internet subscription question. Instead, we assume that households have some sort of internet subscription at home if at least one person in the house reports using the internet at home.
	Access to high-speed internet at home	Do you or any member of this household have access to the Internet using a broadband (high speed) Internet service such as cable, fiber optic, or DSL service installed in this household?	At home, (do you/ does anyone in this household) access the Internet using: High-speed Internet service installed at home, such as cable, DSL, or fiber optic service? (asked of households where at least one person uses the internet at home)
<b>Internet Use</b>	There is no household or individual internet use question.	<ul style="list-style-type: none"> <li>• Does anyone in this household, including you, use the Internet at home? This includes accessing the Internet with a cell phone, computer, tablet, or other device. Who uses the internet at home?</li> <li>• What about at work?</li> <li>• What about at school?</li> <li>• What about at a coffee shop or other business that offers Internet access?</li> <li>• What about while traveling between places?</li> <li>• What about at a library, community center, park, or other public place?</li> <li>• What about at someone else's home?</li> <li>• (Do you/Does anyone in this household) use the Internet at some other location we haven't covered yet?</li> </ul>	

## Appendix 2: Race and Ethnicity Groupings

In both surveys used, the American Community Survey (ACS) and the Current Population Survey (CPS), respondents can report multiple races. Further, Hispanic origin (ethnicity) is reported separately from race.

This analysis uses the “alone-or-in-combination” approach to defining race groups. For estimates by race and ethnicity groups, this analysis includes all non-Hispanic people in a group who identified as that race, including those who identified as that race and any other race (U.S. Census Bureau, 2021). People who report Hispanic origin are analyzed separately. For example, a person who is both Black and Asian would be included in the estimate for both Black and Asian groups. However, a person who is Black and Hispanic would be included in the estimate for Hispanic but not Black.

On the other hand, the “alone” approach would only include someone in the Black group if they reported no other race and non-Hispanic. As a matter of policy, the Census Bureau does not advocate the use of the alone population over the alone-or-in-combination population or vice versa (U.S. Census Bureau, 2011).

## Appendix 3: Regression of Employment Retention

We define the outcome of interest as the probability of employment retention, or the percent of people who were employed in November 2020, given that they were already employed in November 2019. We use the November 2019 and November 2020 CPS basic monthly samples. The November 2019 sample also contained the responses to the Computer and Internet Use survey sponsored by the NTIA, also known as the NTIA Internet Use Survey. Respondents who appear in both panels are linked based on unique household ID, age, sex, and race; we use a script developed by IPUMS to perform this linking process (IPUMS-CPS, 2018).

The outcome of interest, employment retention, is a binary outcome equal to one if the individual was employed in both November 2019 and November 2020, and equal to zero if the individual was employed in November 2019 but unemployed or out of the labor force in November 2020. Although there are limitations to using a linear approach on a binary outcome (such as predicted probabilities falling outside of the range from zero to one), we choose a linear probability model (LPM) over a nonlinear model such as logistic regression. Wooldridge (2002) offers two examples of circumstances where the LPM is a reasonable modeling approach: first, the main purpose of this analysis is to estimate the partial effect of certain variables on the employment retention probability, rather than prediction; second, all of the covariates are discrete and only take on a few values. Both of these conditions motivate the use of the LPM in this analysis.

We estimate two LPMs of the probability of employment retention. Model 1 includes all people above age 16, while Model 2 limits observations to people between the ages of 25 and 64:

$$\begin{aligned} \text{Probability}(\text{Employed}_{ih,\text{year}=2020} = \text{yes} \mid \text{Employed}_{ih,\text{year}=2019}) = \\ \text{Disability}_i\beta_1 + \\ \text{WirelessInternet}_h\beta_2 + \text{Disability}_i\text{WirelessInternet}_h\beta_3 + \\ \text{WiredInternet}_h\beta_4 + \text{Disability}_i\text{WiredInternet}_h\beta_5 + \\ \text{InternetUseAtWork}_i\beta_6 + \\ \mathbf{X}_i\boldsymbol{\theta} + \mathbf{S}_h\boldsymbol{\delta} + \varepsilon_i \end{aligned}$$

where *Disability* is a binary variable equal to one if individual *i* responded yes to at least one disability question in 2019; *InternetUseAtWork* is a binary variable equal to one if individual *i* reported using internet at their job in 2019; *WirelessInternet* is a binary variable equal to one if individual *i* lived in a household *h* that reported having a mobile, satellite or dial-up internet subscription; and *WiredInternet* is a binary variable equal to one if the individual *i* lived in a household *h* that reported having a cable, DSL or fiber subscription. We also include  $\mathbf{X}_{it}$ , a vector of individual sociodemographic characteristics (age, race, ethnicity, sex, marital status, highest educational attainment, industry of employment and occupation), and  $\mathbf{S}_h$ , a vector of controls for state of residence.

We estimate this model while taking into account panel attrition between two consecutive years in the CPS and the survey design. Only half of respondents in November 2019 were eligible to be included in the November 2020 wave of the CPS, and 69% of those eligible did respond. This rate is consistent with other research that has examined the longitudinal design of the CPS (Rivera Drew, Flood, & Robert, 2014). To account for this, we use the survey weights provided by IPUMS for linking two consecutive years of CPS data; IPUMS creates these longitudinal weights based on the official cross-sectional weights but adjusts them to reflect people who were either not eligible to be included in the second wave or were nonresponsive (IPUMS, n.d.).

These adjusted weights allow for unbiased estimates of measures of central tendency such as proportions and means. However, these weights alone may not produce accurate standard errors (such as in the case of estimating regression coefficients and their standard errors) because they do not account for the complex sample design of the CPS, namely that the CPS is not conducted as a simple random sample. To protect respondent privacy, the Census Bureau does not publicly release details about the primary sampling units or strata that each household is included in, but instead provides replicate weights that enable researchers to estimate standard errors while retaining all information about the survey's complex sample design. However, these replicate weights are only applicable to CPS data when they are treated as a cross-sectional sample and cannot be used in combination with the IPUMS longitudinal weight for linking two consecutive years of CPS. To approximate the survey design while using the IPUMS longitudinal weights, we use an approach recommended in Davern et al. (2007), which compared methods for estimating multivariate regression standard errors from CPS public use data when the actual survey design is unknown. We declare the lowest level of geography available as strata (either a state, county or metropolitan area) and the household IDs as the clusters. This approach also estimates the heteroscedastic-robust standard errors which also adjusts for factors that lead to non-random heterogeneity in survey weights among the respondents.

Table 2 presents the regression model results. In both models several variables are associated with a statistically significant change in the probability of employment retention after one year: for example, having a disability, being a woman or being Black or Hispanic is associated with a lower probability of employment retention compared to not having a disability, being a man or being non-Black or non-Hispanic, respectively. Among workers ages 16 and above, having a highest educational attainment of a high school diploma, some college or associate degree, bachelor's degree or a graduate degree is associated with a higher probability of employment retention compared to not having a high school diploma.

Table 2: Linear Probability Model Results for Employment Retention on Worker Characteristics, Demographics, Internet Use and Internet Access Levels

<b>Dependent Variable: Probability (Employed in Nov. 2020   Employed in Nov. 2019)</b>					
		Model 1: All Workers 16+		Model 2: Workers Ages 25 to 64	
		Coef.	Std. Err.	Coef.	Std. Err.
<b>Disability Status</b> (Base: No Disability)	Has Disability	-0.145***	0.045	-0.165***	0.0559
<b>Internet-at-Work User</b> (Base: No Internet Use at Work)	Uses Internet at Work	0.0429***	0.00749	0.0369***	0.00753
<b>Home Internet Subscription Type</b> (Base: No Subscription)	Mobile, Satellite or Dial-up	-0.0136	0.0131	0.0114	0.013
	Cable, DSL or Fiber	-0.0244**	0.0104	0.000615	0.011
	Mobile, Satellite or Dial-up x Disability	0.126**	0.0573	0.189***	0.0637
	Cable, DSL or Fiber x Disability	0.112**	0.0483	0.109*	0.0594
<b>Age</b> (Model 1 Base: 16 to 24; Model 2 Base: 25 to 54)	25 to 34	0.0786***	0.0138	-	-
	35 to 44	0.0825***	0.0136	-	-
	45 to 54	0.0888***	0.0134	-	-
	55 to 64	0.0328**	0.014	-0.0500***	0.00696
	65+	-0.0990***	0.0174	-	-
<b>Race</b> (Base: White, American Indian, Asian, Other or Multiple)	Black	-0.0477***	0.0113	-0.0417***	0.0113
<b>Ethnicity</b> (Base: Not Hispanic)	Hispanic	-0.0166*	0.01	-0.0215**	0.00953
<b>Sex</b> (Base: Male)	Female	-0.0417***	0.00627	-0.0478***	0.00627
<b>Marital Status</b> (Base: Not Married)	Married	0.0173***	0.00605	0.0170***	0.00619
<b>Educational Attainment</b> (Base: Less than High School Diploma)	H.S. Diploma or Equivalent	0.0300**	0.0137	-	-
	Some College or Associate's Degree	0.0212	0.0143	-	-
	Bachelor's Degree	0.0334**	0.0149	-	-
	Graduate Degree	0.0475***	0.0157	-	-
<b>Industry</b> (Base: Agriculture, Forestry, Fishing and Hunting)	Mining, Quarrying, and Oil and Gas Extraction	-0.0817*	0.0487	-0.0897*	0.0518
	Utilities	0.0537*	0.028	0.0707**	0.0278
	Construction	0.0226	0.0235	0.0204	0.0254
	Manufacturing	0.0274	0.0237	0.0407	0.0254
	Wholesale Trade	0.000445	0.0293	0.00634	0.0306

	Retail Trade	0.00796	0.0242	-0.000593	0.0263
	Transportation and Warehousing	-0.00729	0.0267	-0.000490	0.0284
	Information	-0.0118	0.0304	0.0234	0.0296
	Finance and Insurance	0.0439*	0.0241	0.0538**	0.0254
	Real Estate and Rental and Leasing	0.0285	0.0285	0.0374	0.0301
	Professional, Scientific, and Technical Services	0.0272	0.0239	0.0286	0.0258
	Management of companies and enterprises	0.0528	0.068	0.110***	0.0306
	Administrative and support and waste management services	0.00251	0.0277	-0.00598	0.0298
	Educational Services	0.0237	0.0247	0.0554**	0.0261
	Health Care and Social Assistance	0.0237	0.0245	0.0342	0.0264
	Arts, Entertainment, and Recreation	-0.0708**	0.0338	-0.0578	0.0368
	Accommodation and Food Services	-0.0660**	0.0271	-0.0581**	0.0296
	Other Services, Except Public Administration	0.0140	0.0255	0.0183	0.0274
	Public Administration	0.0586**	0.0244	0.0723***	0.0259
<b>Occupation</b> (Base: Management, Business and Financial Occupations)	Computer, Engineering, and Science	-0.00452	0.00969	-0.00352	0.00927
	Education, Legal, Community Service, Arts, and Media	-0.0400***	0.011	-0.0365***	0.0109
	Healthcare Practitioners and Technical Service	0.00469	0.0127	-0.000498	0.013
	Sales and office	-0.0604***	0.0118	-0.0659***	0.0117
	Natural Resources, Construction, and Maintenance	-0.0148	0.0119	-0.0256**	0.0118
	Production, Transportation, and Material Moving	-0.0361***	0.0122	-0.0464***	0.0122
	Constant	0.863***	0.031	0.939***	0.0293
<b>Observations</b>		19,209		15,803	
<b>R-squared</b>		0.073		0.051	

**Significance Levels**

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Authors

This research brief was prepared by staff in the Office of Disability Employment Policy (ODEP) in the U.S. Department of Labor (DOL): Amy Fong, Mathematical Statistician and Savi Swick, Director of Research and Evaluation. The Current Population Survey (CPS) office from the DOL Bureau of Labor Statistics (BLS), the DOL Chief Evaluation Office (CEO) and the National Telecommunications and Information Administration (NTIA) provided independent expert review. For further information, please email [Swick.Savi@dol.gov](mailto:Swick.Savi@dol.gov) or [odep@dol.gov](mailto:odep@dol.gov) or call 1-866-ODEP-DOL (633-7365).

## About ODEP

ODEP promotes policies and coordinates with employers and all levels of government to increase workplace success for people with disabilities. ODEP's mission is to develop and influence policies and practices that increase the number and quality of employment opportunities for people with disabilities. For more information, please visit the ODEP website at [dol.gov/odep](http://dol.gov/odep).