

COVID-19: Equity in Recovery Series

Broadband Access, Computer Use, and Labor Market Attachment in Philadelphia

By Alvaro Sanchez and Adam Scavette, August 2020

Introduction

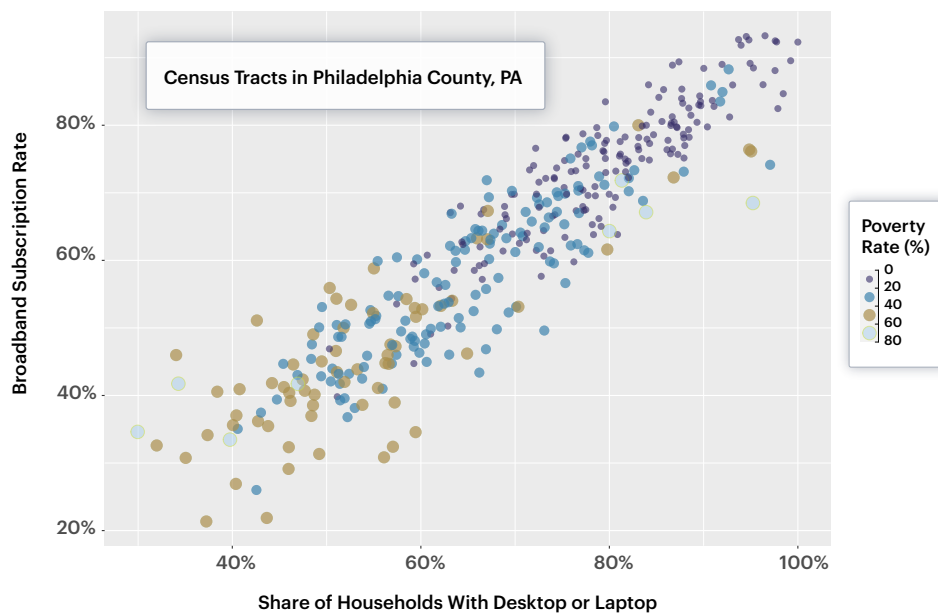
Throughout the COVID-19 pandemic, our reliance on high-speed internet – commonly known as broadband – has grown dramatically. As the pandemic has shifted our work and home routines, high-speed internet has become a critical linking mechanism for households in an era defined by social distancing. However, our increased use of broadband has also highlighted the adverse impacts of the digital divide on rural, low-income, and Black and Latinx households.

The COVID-19 crisis has occurred in the context of an increasingly digitally dependent workforce that has required workers to develop digital skills to be competitive in the labor market.¹ From a job application and training

standpoint, bridging the digital divide can help individuals find and apply to jobs or access training courses to upskill amid the pandemic.² Broadband access can also promote reemployment after periods of job loss³ and reduce the risk of an unemployed person stopping their job search entirely.⁴ Especially in Philadelphia, a city with concentrated economic insecurity, a digital inclusion strategy will be key to ensuring the resilience of the local economy and the economic well-being of city residents. Moreover, as the COVID-19 pandemic continues, more research is necessary to understand the impact of the digital divide on the labor force.

In this research brief, we use labor force participation and unemployment rates from 2014 to 2018 as indicators

Figure 1. Broadband Subscription, Computer Use, and Economic Insecurity in Philadelphia



Source: Authors' calculations using ACS 5-Year Estimates (2014–2018). One dot represents a single census tract in Philadelphia. Fixed wireline broadband is defined as an internet connection via DSL, cable, or fiber optic to the home.

for labor market attachment, and we find disparities along these indicators based on patterns of broadband access and computer use. First, we show which Philadelphia census tracts (or “neighborhoods”) are most likely impacted by the digital divide, which includes an overview of broadband subscription rates and the share of households that own a desktop or laptop (or “computers”). Afterward, we use a broadband typology to describe patterns of broadband access, with a focus on the dichotomy between households that do and do not have a broadband-enabled computer. The typology places census tracts into three categories: unserved (broadband is not available to residents), low-uptake neighborhoods (broadband is available, but tract-level subscription rates are below the national average), and high-uptake neighborhoods (broadband is available, and subscription rates equal or exceed the national average). These metrics are then used to explore disparities in labor market attachment across Philadelphia neighborhoods. In this brief, we do not determine the causes of disparities in labor market attachment based on broadband access; however, the results highlight how broadband is another important factor of welfare gaps in Philadelphia.

By analyzing patterns of broadband access, computer use, and disparities in labor market outcomes, we find that:

- Only 47 percent of households in Philadelphia’s low- and moderate-income (LMI) tracts subscribe to broadband, well below households in middle- and upper-income neighborhoods (63 percent and 77 percent, respectively).
- Households in predominantly Latinx neighborhoods have the lowest subscription rates (47 percent), followed by 52 percent of households in predominantly Black neighborhoods and 76 percent of households in predominantly white tracts.
- The share of households that have a computer is lower in LMI and predominantly Black and Latinx neighborhoods (55 percent, 61 percent, and 49 percent, respectively) than in predominantly white and middle- and upper-income neighborhoods (81 percent, 69 percent, and 83 percent, respectively).
- There is a 27 percentage point gap in labor force participation between workers with and without an at-home broadband computer in Philadelphia, compared with a 21 percentage point gap in the nation.
- There is a 7 percentage point gap in the unemployment rates between workers with and without an at-home broadband computer in Philadelphia, compared with a 4 percentage point gap in the nation.

Which Philadelphia Neighborhoods Are Most Likely to Be Impacted by the Digital Divide?

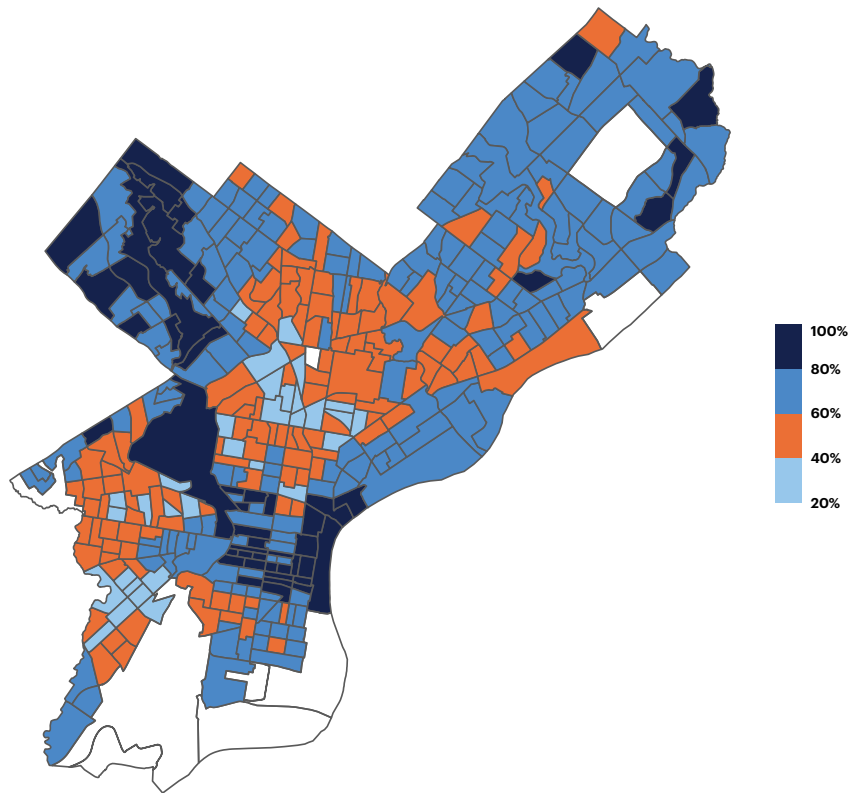
Figure 1 shows the relationship between broadband subscription rates, the share of households with a desktop or laptop, and the poverty rate of each census tract. Tract-

level household broadband subscription rates range from 21 percent to 93 percent, with **63 percent of Philadelphia households overall subscribing to a fixed wireline** broadband service. Furthermore, the share of households in each neighborhood with a desktop or laptop varies from 30 percent to 100 percent, while **about 69 percent of Philadelphia households overall own a computer**. The sizing and shading of the dots indicate the poverty rate of each census tract, which ranges from 1 percent to 72 percent — Philadelphia’s overall poverty rate is about 25 percent.

The trend displayed in Figure 1 indicates that neighborhoods with lower broadband subscription rates also tend to have a greater share of households without an in-home computer. Moreover, the least connected and computer-equipped neighborhoods are places in Philadelphia where a larger share of residents live below the poverty line. When one considers how broadband can be a medium for social and economic inclusion,⁵ **these data underscore the need to both provide households experiencing economic insecurity with an affordable high-speed internet connection and intentionally distribute devices that promote greater access to online resources**. Research shows that many groups that do not subscribe to a fixed wireline broadband use mobile devices and services instead.⁶ However, given the data processing and bandwidth constraints of cellular broadband, as well as expensive data caps associated with wireless internet use, mobile phones cannot be considered an adequate alternative to fixed wireline home-based broadband. The limits of wireless broadband are especially true for students, workers, and larger households through the pandemic.

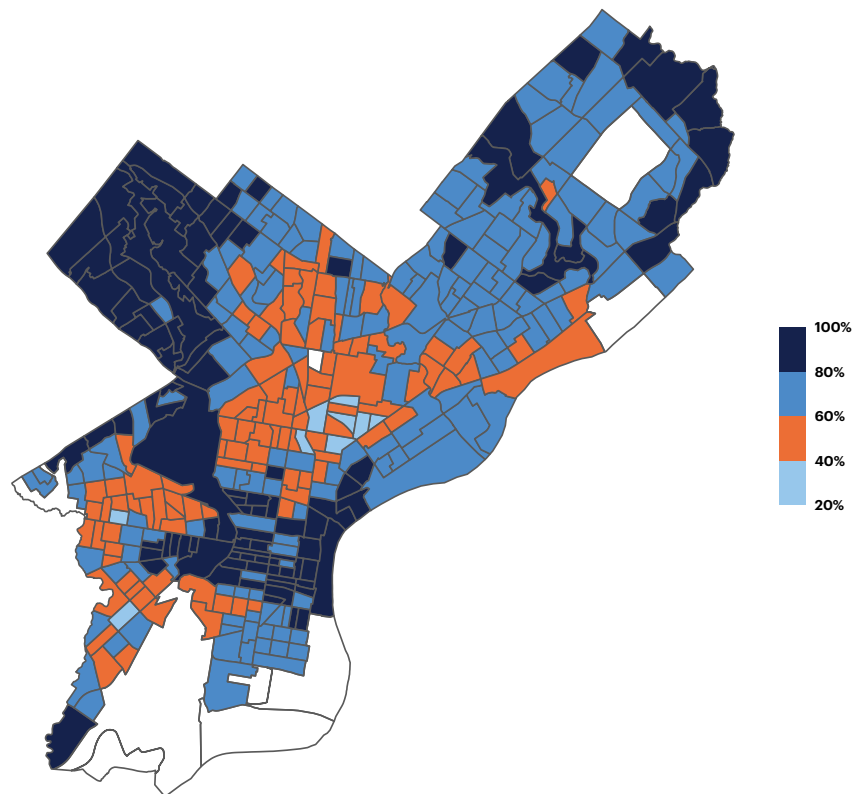
As the COVID-19 outbreak forces workers and students to rely increasingly on internet connectivity for daily tasks, identifying neighborhoods with low broadband subscription rates and computer use will help determine who will be most affected by the digital divide. **Figure 2** shows a tract-level map of Philadelphia, with the legend and shading representing the range of household broadband subscriptions. Most neighborhoods throughout Philadelphia fall within the 40 percent to 80 percent range of the distribution, however lower (light blue) and higher (dark blue) subscription rates are concentrated in certain areas. Moreover, Figure 2 displays clear disparities in broadband access by place. The neighborhoods that show the highest subscription rates are concentrated in the center and northwest parts of Philadelphia, which are generally upper-income and predominantly white tracts. **Low subscription rates appear to be concentrated in West, Southwest, and central North Philadelphia, which are lower-income, high-poverty, and predominantly Black and Latinx neighborhoods.**

Figure 2. Household Broadband Subscription Rates in Philadelphia Neighborhoods



Source: Authors' calculations using ACS 5-Year Estimates (2014–2018). Subscription rates are based on a connection to a fixed wireline broadband service, defined as an internet connection via DSL, cable, or fiber optic to the home.

Figure 3. Household Computer Use in Philadelphia Neighborhoods



Source: Authors' calculations using ACS 5-Year Estimates (2014–2018).

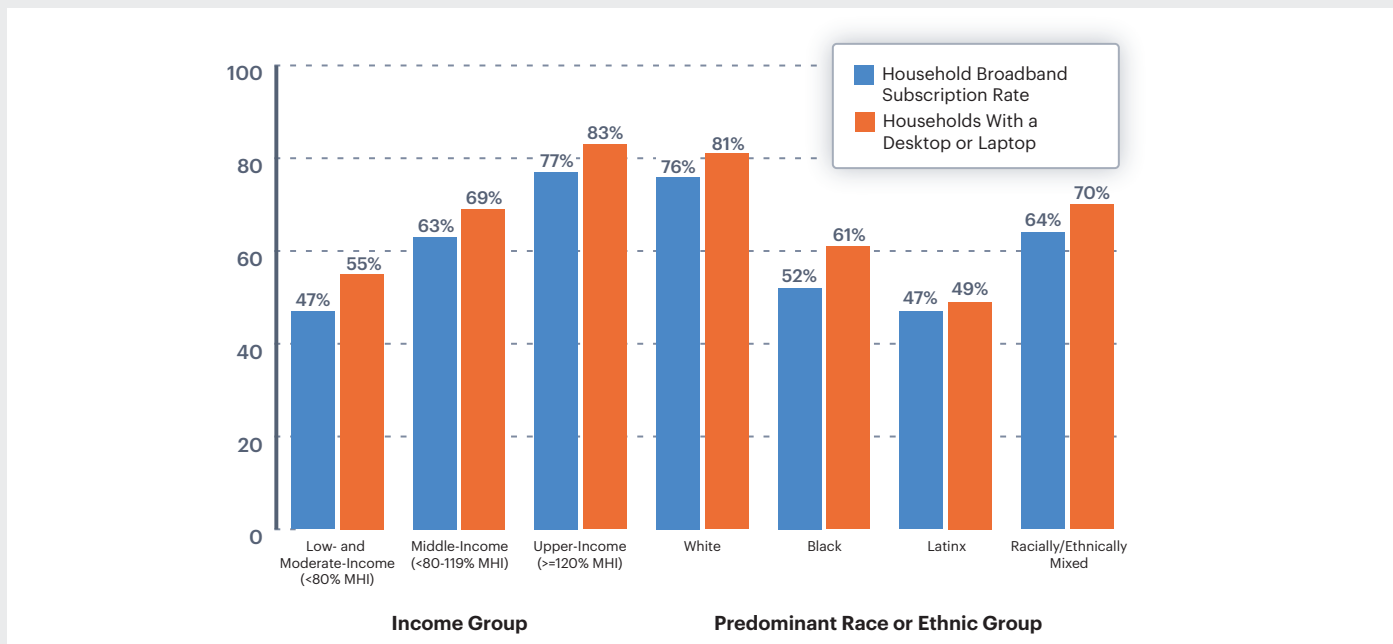
Figure 3 shows the share of households that have a desktop or laptop in Philadelphia. There is a clear place-based pattern of computer use and computer inaccessibility. The neighborhoods where more than 80 percent (dark blue) of households own a desktop or laptop are the upper-income and predominantly white areas of the city, concentrated in the center and northwest areas. **West, Southwest, and central North Philadelphia show a greater share of households with lower levels of computer use.** It is important to note, once again, that these areas are lower-income, high-poverty, and predominantly Black and Latinx neighborhoods.

In **Figure 4**, we disaggregate broadband subscription and computer use rates for neighborhood income groups and the predominant racial and ethnic population of a tract. There are clear disparities in broadband subscription rates between income groups. **Just 47 percent of households in Philadelphia’s low- and moderate-income (LMI) tracts subscribe to broadband, well below the rates**

for households in middle-income and upper-income neighborhoods (63 percent and 77 percent, respectively). Furthermore, in LMI neighborhoods, 55 percent of households have an in-home computer, which falls below the rate in middle-income (69 percent) and upper-income tracts (83 percent).

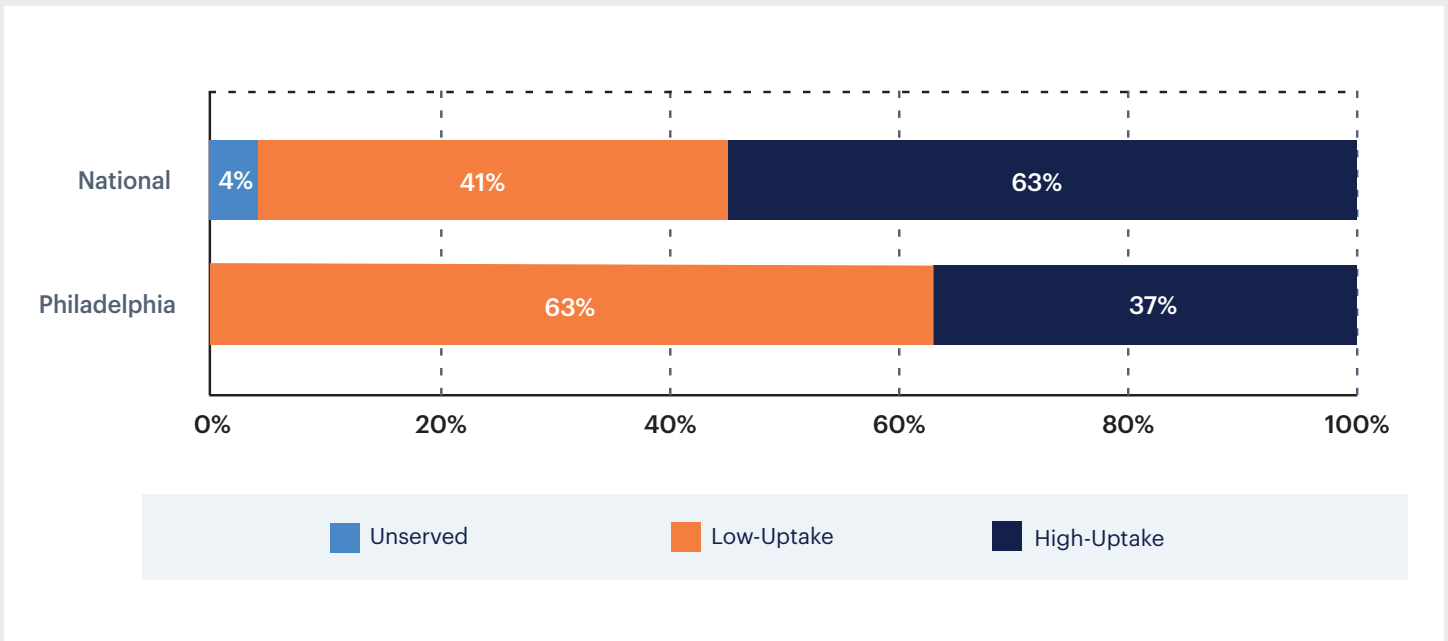
Disparities by the predominant race or ethnic group of a tract are also apparent. **Households in predominantly Latinx neighborhoods have the lowest subscription rates (47 percent) of all racial and ethnic groups, followed by 52 percent of households in predominantly Black neighborhoods and 64 percent of households in racially or ethnically mixed tracts.** Households in predominantly Black and Latinx neighborhoods also show lower rates of computer ownership (61 percent and 49 percent, respectively). Predominantly white neighborhoods have the highest rate of both broadband subscription (76 percent) and household computer use (81 percent) of any group.

Figure 4. Internet Connectivity in Philadelphia for Neighborhood Income and Predominant Racial and Ethnic Groups



Source: Authors’ calculations using ACS 5-Year Estimates (2014–2018). Fixed wireline broadband is defined as an internet connection via DSL, cable, or fiber optic to the home. Census tracts with median household income data are sorted into three groups: low- and moderate-income (LMI), middle-income, and upper-income. A tract is considered LMI if its median household income (MHI) falls below 80 percent of Philadelphia’s MHI (\$43,744, in 2018 inflation-adjusted dollars), middle-income if its MHI is 80–119 percent of the city MHI, and upper-income if its MHI is 120 percent or more of the city MHI. If 50 percent or more of a tract’s residents were part of a certain racial or ethnic group, then that tract is listed as having that group as the predominant population; otherwise, the tract is considered racially and/or ethnically mixed.

Figure 5. Share of Population by Broadband Typology



Source: Authors' calculations using ACS 5-Year Estimates (2014–2018) and FCC Form 477 data.

The Digital Divide and the Labor Force in Philadelphia

In a previous Federal Reserve Bank of Philadelphia study,⁷ the author sorted neighborhoods into a broadband typology to more carefully analyze trends in access that are due to differences in availability and adoption of high-speed internet. We adapt the typology in this brief to examine broadband access as an indicator for attachment to the labor force. Three types of neighborhoods are included in the typology. First, unserved neighborhoods are census tracts in which fixed wireline broadband (DSL, cable, and fiber optic to the home) at 25 megabits per second (Mbps) download and 3 Mbps upload speeds is not available to at least half of residents.⁸ Second, low-uptake neighborhoods are census tracts where broadband is available to at least half of residents but household subscription rates are below the national average (68 percent). Last, high-uptake neighborhoods are places where an extensive broadband infrastructure is available to at least half of residents and household subscription rates exceed the national average.

Nationally, 4 percent of the population live in areas that are unserved by fixed wireline broadband, but zero percent of Philadelphians are unserved. A substantial majority (63 percent) of Philadelphia residents live in low-uptake neighborhoods, compared with 41 percent of the national population. Most Americans (55 percent) live in high-uptake neighborhoods, but just 37 percent of Philadelphia residents live in high-uptake neighborhoods. The absence of unserved neighborhoods in Philadelphia is consistent with previous

findings that show that they primarily exist in rural areas. This also indicates that lower broadband subscription in certain neighborhoods is likely not attributable to internet service not being physically present. The large share of Philadelphia residents living in low-uptake neighborhoods reflects a substantial concentration of households that do not subscribe to broadband in certain neighborhoods. For some households in low-uptake neighborhoods, this relates to the financial burden of a monthly home broadband subscription.⁹

Linking Neighborhood-Level Labor Force Participation, Unemployment Rates, and Broadband Typology

In order to glean insights into the coexisting societal issues related to the interneighborhood digital divide, we study how neighborhood labor market outcomes (via labor force participation and unemployment) correlate with broadband access across the city and in the nation between 2014 and 2018. The labor force participation rate measures the percentage of the population that are employed or unemployed but actively seeking employment. A variety of factors influence the labor force participation rate such as demographics (e.g., the share of non-working-age population), economic conditions, and personal circumstances (e.g., disability, care for children or elderly family members, a history of incarceration).¹⁰ However, holding these factors constant, a higher labor force participation rate signals a healthier labor market.¹¹ In **Figure 6**, the mean labor force participation rates across

Figure 6. Labor Force Participation Rate Means by Broadband Classified Census Tracts

Series Type	Series	Philadelphia		United States	
		Low-Uptake	High-Uptake	Low-Uptake	High-Uptake
Age	20–64	68	79	73	81
	30–34	78	88	80	85
	35–44	76	85	79	86
	45–54	66	80	75	84
	55–59	57	73	65	77
	60–64	40	59	50	61
Race	White	53	66	59	66
	Black	58	66	58	67
	Hispanic/Latinx	60	68	65	71
Education	Less than High School	46	49	57	62
	High School	64	69	70	75
	Bachelor’s or Higher	85	88	84	87
Other	Poverty	41	43	48	51
	Disability	33	45	38	49

Source: Authors’ calculations using ACS 5-Year Estimates (2014–2018) and FCC Form 477 Data.

Figure 7: Unemployment Rate Means by Broadband Classified Census Tracts

Series Type	Series	Philadelphia		United States	
		Low-Uptake	High-Uptake	Low-Uptake	High-Uptake
Age	16+	14	6	8	5
	30–34	13	6	8	4
	35–44	11	5	7	4
	45–54	10	6	6	4
	55–59	10	6	5	4
	60–64	8	4	5	4
Race	White	11	6	7	5
	Black	16	10	12	8
	Hispanic/Latinx	15	7	8	6
Education	Less than High School	20	13	12	8
	High School	15	10	8	6
	Bachelor’s or Higher	6	3	4	3
Other	Poverty	34	26	24	21
	Disability	24	14	15	11

Source: Authors’ calculations using ACS 5-Year Estimates (2014–2018) and FCC Form 477 Data.

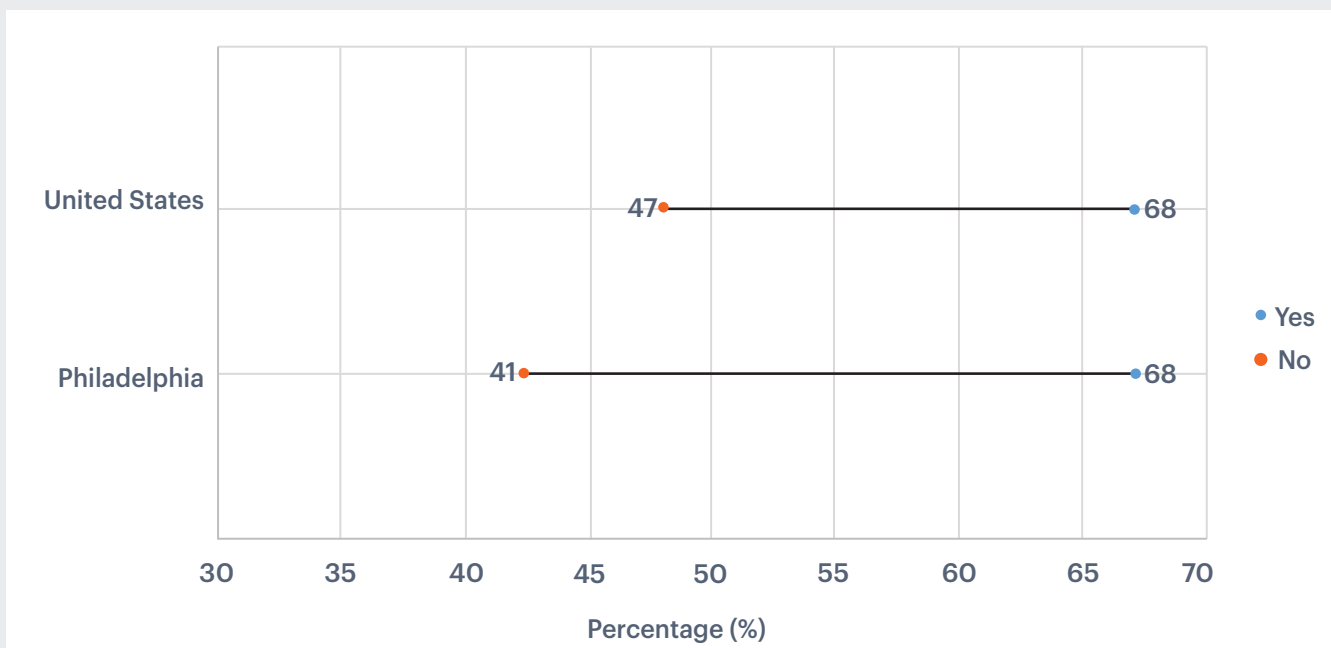
demographic groups are explored across census tracts by broadband access. Measuring the rates that specific demographic groups participate in the labor force across broadband-classified census tracts informs us that **the labor force participation rate is higher in high-uptake neighborhoods for every group examined at the city and national level.** Furthermore, the gaps between labor force participation rates measured by broadband access tend to be higher in Philadelphia than in the nation for every demographic group. **At the city level, we see the largest gaps between participation rates in workers aged 45 and over, white workers, and workers with a disability.**

Figure 7 examines the mean unemployment rates across demographic groups by broadband access. The unemployment rate indicates the number of workers unemployed out of the labor force (which comprises employed and unemployed individuals), where a lower unemployment rate represents a healthier labor market. We see that the unemployment rate is lower in high-uptake neighborhoods for every group examined at the city and national level. As with the labor force participation rates, the gaps between unemployment rates measured by broadband access tend to be higher in Philadelphia than

in the nation for every demographic group. **At the city level, the largest gaps exist for workers aged 30 to 44, Hispanic workers, workers with less than a high school education, and workers living below the poverty line or with a disability.**

In examining differences in labor market indicators within demographic groups and between neighborhood broadband access levels, the gaps for unemployment rates and labor force participation are not always consistent. For example, while we find similar labor force participation among those with poverty status in low- and high-uptake areas (41 percent versus 43 percent), we see a larger disparity for unemployment rates (34 percent versus 26 percent). Regarding the age distribution, we see larger labor force participation disparities across neighborhood broadband access levels for older workers than for younger workers, but the opposite pattern holds regarding unemployment rates. These inconsistent gaps between broadband access levels but within demographic groups perhaps reflect the respective indicators' differing sensitivity to underlying neighborhood characteristics, one of which might be broadband access.

Figure 8: Labor Force Participation Rates by At-Home Computer-Broadband Access
 “Do you have a computer with broadband access at home?”



Source: Authors' calculations using ACS 5-Year Estimates (2014–2018).

In Figures 6 and 7, we used neighborhood broadband access as a proxy for whether people in those neighborhoods actually have access to a computer with broadband at home and how that might signal their attachment to the labor force.

Although those two figures give us a sense of gaps in labor market indicators across census tracts by broadband access in a neighborhood population, they do not tell us which of these workers actually have access to a computer with a broadband connection at home. For that, we utilize a separate survey question in the ACS that asks respondents about their status in the labor force in addition to, “Do you have a computer with broadband access at home?” Using these survey questions, we are able to explore the labor outcome gaps in both the city and the nation based on respondents’ at-home access to a broadband computer.

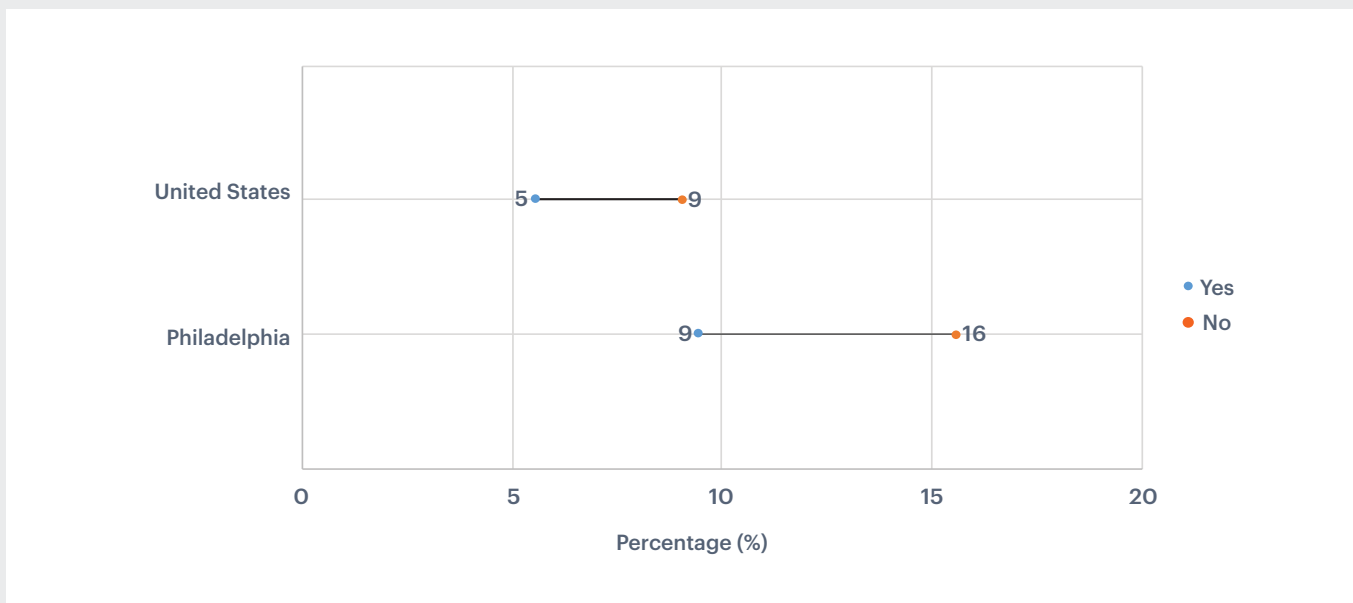
Figure 8 shows that residents in Philadelphia without an at-home computer with broadband tend to participate in the labor force at a rate of 41 percent, whereas those with a computer with broadband participate at 68 percent. **Therefore, we see a gap of 27 percentage points in the**

labor force participation rate between workers with and without a computer with broadband in Philadelphia. This gap is larger in Philadelphia than in the nation, where the difference is only 21 percentage points. In Figure 9, we see that **the unemployment rate is 7 points higher for workers without a computer with broadband at home (16 percent versus 9 percent).** This unemployment rate gap is also larger in Philadelphia than in the nation, where the difference is only 4 percentage points.

Implications and Takeaways

The analysis presented in this brief affirms previous digital equity research, showing a strong relationship between household broadband subscription, computer access, and labor market disparities between certain neighborhood groups. Our findings indicate that lower-income, high-poverty, and predominantly Black and Latinx neighborhoods are at a greater risk of living without fixed wireline high-speed internet and broadband-enabled devices. Moreover, we find clear disparities in labor market attachment by age, racial and ethnic groups, and educational attainment when disaggregated by relative levels of broadband access. Our results do not determine

Figure 9: Unemployment Rates by At-Home Computer-Broadband Access
“Do you have a computer with broadband access at home?”



Source: Authors’ calculations using ACS 5-Year Estimates (2014–2018).

whether low levels of broadband access cause negative labor market outcomes or if adverse labor market outcomes cause broadband inaccessibility. However, the observable results imply that broadband is an additional component of economic well-being.

As the pandemic forces both employers and workers to rely on high-speed internet and broadband-enabled devices, many other Americans will rely on these same technologies to find, train for, or create job opportunities. According to the Pew Research Center, 53 percent of Americans say the internet has been essential to them during the COVID-19 outbreak.¹² However, certain groups — older, nonwhite, lower-income, rural, and less educated Americans — stand at a preexisting socioeconomic disadvantage during the pandemic, during which the digital divide has only been exacerbated. Local and state digital equity strategies have begun to chart a path forward for connecting workers and students from disadvantaged groups to high-speed internet. Still, promoting broadband device access and digital literacy training to households where an individual may have lost employment is crucial to ensuring people remain attached to the labor market following such an event.

More research is needed to discern the ongoing impacts of COVID-19 on broadband access, especially related to labor market opportunities. Future studies should also attempt to disentangle the relationship between broadband access and labor market outcomes, conditional on observable factors. Furthermore, policymakers, researchers, and community leaders must come together to share solutions and consider best practices for their own regions. There will be an increased need for cross-sector partnership and collaboration to bridge the digital divide, especially in a time of economic downturn. Robust digital equity plans are at the center of resilient economies.

What Can You Do?

Read: [Disconnected: Seven Lessons on Fixing the Digital Divide](#), [Toward Digital Inclusion: Broadband Access in the Third Federal Reserve District](#), [Closing the Digital Divide: A Framework for Meeting CRA Obligations](#)

Access Other Resources: [Free and Low-Cost Internet Plans](#): [National Digital Inclusion Alliance](#), [School District of Philadelphia: Chromebook News and Updates](#), [Technical.ly Philly: Five Places in Philly to Donate Electronics](#)

Reach Out: How is your community working toward bridging the digital divide during the COVID-19 outbreak? Share with us online: #JobEquityCOVID.

Endnotes

- 1 See Mark Muro, Sifan Liu, Jacob Whiton, and Siddharth Kulkarni (2017), *Digitalization and the American Workforce*, Washington, D.C.: The Brookings Institution, available at www.brookings.edu/research/digitalization-and-the-american-workforce/.
- 2 See Kashan Prizada and Fouzia Khan (2013), “Measuring Relationship Between Digital Skills and Employability,” *European Journal of Business and Management* 5:24, available at papers.ssrn.com/sol3/papers.cfm?abstract_id=2382939.
- 3 A study of unemployed Germans found that broadband availability increases reemployment rates after one month of unemployment; see Nicole Gürtzgen, André Nolte, Laura Pohlan, and Gerard J. van den Berg (2018), “Do Digital Information Technologies Help Unemployed Job Seekers Find a Job? Evidence from the Broadband Internet Expansion in Germany,” *IZA Discussion Papers* 11555, Institute of Labor Economics (IZA), available at ideas.repec.org/p/iza/izadps/dp11555.html.
- 4 Broadband use at home or in a public place such as a library reduces the probability that an unemployed person will stop their job search entirely by 50 percent relative to people who are unemployed and do not use internet; see T. Randolph Beard, George S. Ford, Richard P. Saba, and Richard A. Seals Jr. (2012), “Internet Use and Job Search,” *Telecommunications Policy* 36:4, pp. 260–73, available at www.sciencedirect.com/science/article/abs/pii/S0308596111002217?via%3Dihub.
- 5 A qualitative research study by the Social Science Research Council, commissioned by the Federal Communications Commission, analyzed factors that shape low home-based broadband adoption in low-income communities. The results found broadband access is considered a prerequisite of socioeconomic inclusion for individuals in low-income communities, with nonadopters of high-speed internet indicating its importance in finding and applying for jobs, educating children, and interacting with government agencies online: webarchive.ssrc.org/pdfs/Broadband_Adoption_v1.1.pdf.
- 6 The Pew Research Center found that about one in four lower-income adults are smartphone-only internet users: www.pewresearch.org/internet/2019/06/13/mobile-technology-and-home-broadband-2019/.
- 7 For a full discussion of the neighborhood broadband typology, please see Alvaro Sanchez (2020), “Toward Digital Inclusion: Broadband Access in the Third Federal Reserve District,” *Federal Reserve Bank of Philadelphia Cascade Focus*, available at www.philadelphiafed.org/-/media/egmp/resources/reports/toward-digital-inclusion-broadband-access-in-the-third-federal-reserve-district.pdf.
- 8 This bandwidth threshold represents the FCC’s definition that an internet service must meet or exceed to be considered broadband. Prior to 2015, the FCC benchmarked broadband at 4 Mbps download and 1 Mbps upload speeds. Although the current definition of broadband reflects a reconsideration of the data processing needs of households by the FCC, higher speeds are necessary for larger households and various institutions: www.fcc.gov/reports-research/reports/broadband-progress-reports/2015-broadband-progress-report.
- 9 A survey by Pew Research Center found that 33 percent of Americans without a home broadband connection cited cost constraints associated with monthly subscription rates. Moreover, 66 percent of all nonadopters reported that either the monthly fees associated with a broadband subscription or the cost of a computer was a barrier to adoption: www.pewresearch.org/internet/2015/12/21/3-barriers-to-broadband-adoption-cost-is-now-a-substantial-challenge-for-many-non-users/.
- 10 For a more comprehensive explanation of factors affecting labor force participation, see this report from the Congressional Budget Office: www.cbo.gov/system/files/115th-congress-2017-2018/reports/53452-lfpr.pdf.
- 11 For a comprehensive analysis of regional unemployment rates, see Adam Scavette (2019), “Regional Spotlight: Evaluating Metro Unemployment Rates Throughout the Business Cycle,” *Federal Reserve Bank of Philadelphia Economic Insights* (Fourth Quarter 2019), pp. 12–18, available at www.philadelphiafed.org/-/media/research-and-data/publications/economic-insights/2019/q4/eiq419_rs-evaluating-unemployment-rates.pdf?la=en.
- 12 The Pew Research Center’s survey of Americans using broadband also found Hispanic and lower-income workers, in particular, were worried about paying their home broadband and cell phone bills: www.pewresearch.org/internet/2020/04/30/53-of-americans-say-the-internet-has-been-essential-during-the-covid-19-outbreak/.