Broadband Benefit Programs are Helping to Close the Digital Divide

Four Lessons for Policymakers

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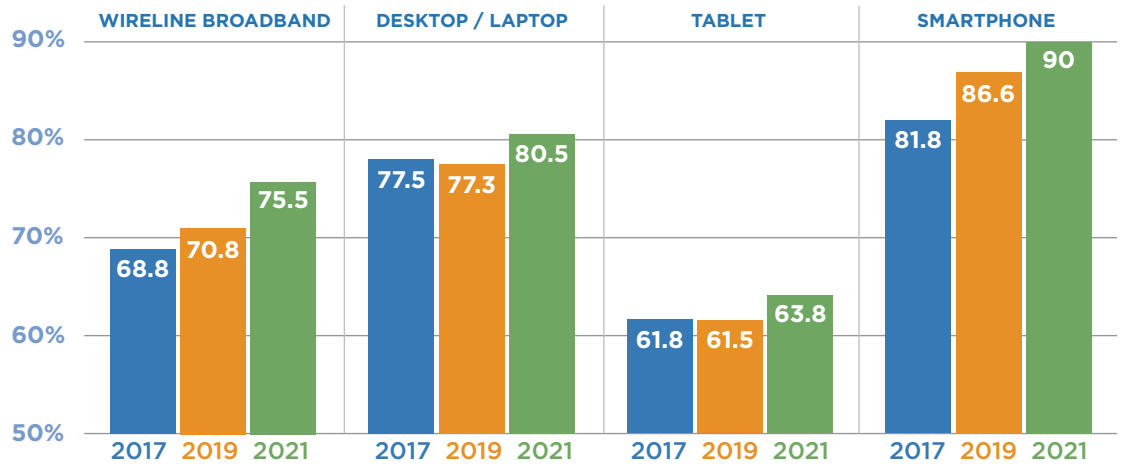
Overview: The pandemic spurred policymakers and community leaders around the country to create programs to connect those without home broadband service or computers. These programs have had an impact. New government data shows sharp increases in broadband and computer adoption in the 2019-to-2021 time frame. Initiatives such as the Affordable Connectivity Program have helped address "subscription vulnerability" for low-income households. With progress evident, it is time to extend and build on the ACP and local affordability programs.

Recently released data from the American Community Survey shows substantial increases in household wireline broadband adoption from 2019 to 2021—an increase of more than twice the rate of growth compared to the 2017-to-2019 interval. This suggests that pandemic-driven initiatives to address home adoption gaps have had an impact. Notably, increases in home broadband subscriptions have been most pronounced in cities with higher-than-average rates of poverty. Recent progress on home broadband adoption has been greatest among America's least wired cities.

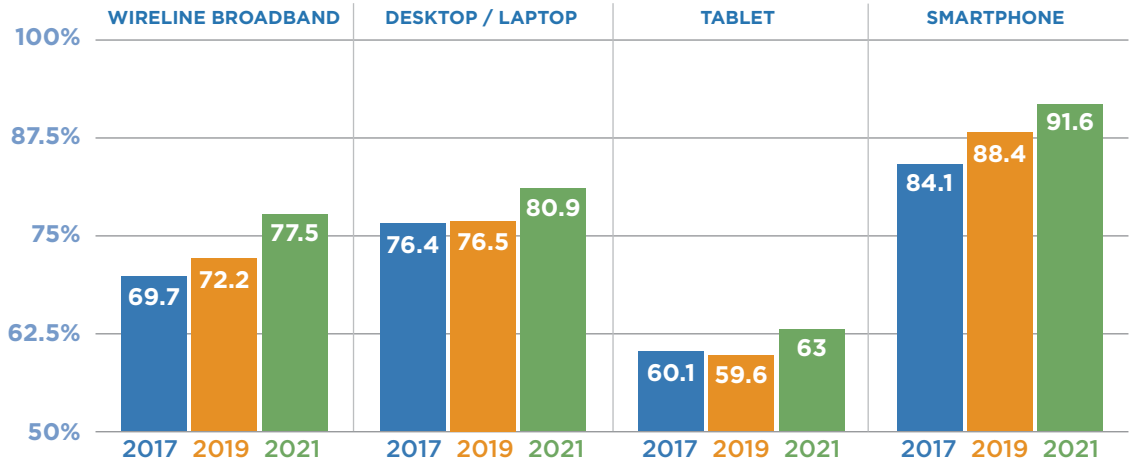
As the graphic below shows, increases in broadband, desktop and laptop ownership, and tablet computer ownership were greater in the 2019-to-2021 time frame than the 2017-to-2019 period. Wireline broadband adoption grew by 4.7 points between 2019 and 2021, more than twice the 2.0 points of growth between 2017 and 2019. Computer ownership (desktop or laptop) by household grew by 3.2 percentage points between 2019 and 2021, after falling by 0.2 points over the 2017-to-2019 time frame.

Household Adoption of Digital Tools Source: American Community Survey, all U.S. households



The changes in broadband adoption were greater in larger urban areas. Among the top 200 U.S. cities (sorted by number of households), wireline broadband adoption grew from 72.2% in 2019 to 77.5% in 2021, or a 5.3-point increase. Computer ownership grew by 4.4 percentage points among the top 200 cities from 2019 to 2021—from 76.5% to 80.9%. These 200 cities have 32.7 million households, or 26% of all U.S. households.

Household Adoption of Digital Tools Source: ACS, top 200 U.S. cities



Looking further into the data reveals additional insights

Wireline subscription growth between 2019 and 2021 has been strongest in cities with high poverty: There is a sizable (0.50) and significant correlation between the share of households at or below 125% of the federal policy level and growth in broadband adoption from 2019 to 2021. As Table 1 shows, some of the cities with the strongest growth in wireline subscriptions from 2019 to 2021, such as Detroit, Cleveland, and Baltimore, had among the highest levels of households at or below the 125% federal poverty level (FPL). The cities presented in Table 1 are the 15 cities (among the 50 most populous cities) with the highest rates of wireline broadband adoption growth from 2019 to 2021. (For Table 1 and the following tables, data on the full list of the 50 largest cities are in the appendix.)

Table 1: Wireline broadband adoption, 2017, 2019, 2021 (Top 15 U.S. cities)

City	Number of Households 2021	Percent At or Below 125% Federal Poverty Level	Wireline 2017	Wireline 2019	Wireline 2021	Wireline change 2019 to 2021
DETROIT	251,729	37.3%	45.8%	53.7%	65.8%	12.1%
CLEVELAND	171,321	34.8%	54.5%	54.0%	65.3%	11.3%
ALBUQUERQUE	243,582	20.4%	69.3%	69.1%	79.7%	10.7%
BALTIMORE	254,370	28.4%	59.3%	59.4%	69.9%	10.6%
KANSAS CITY, MO	219,020	17.4%	67.2%	68.3%	77.9%	9.7%
TUCSON	223,068	24.6%	66.9%	67.6%	77.1%	9.5%
LAS VEGAS	250,350	19.3%	66.6%	66.6%	75.8%	9.2%
OKLAHOMA CITY	275,285	20.2%	65.8%	66.7%	75.6%	8.9%
SACRAMENTO	202,093	18.9%	74.2%	74.7%	83.3%	8.5%
MILWAUKEE	232,362	30.2%	55.8%	65.9%	74.1%	8.2%
MEMPHIS	256,968	29.1%	54.2%	55.8%	63.9%	8.1%
PHOENIX	602,039	19.5%	68.3%	69.6%	77.6%	8.0%
INDIANAPOLIS	358,150	19.7%	64.4%	65.8%	73.8%	8.0%
LOUISVILLE METRO	264,336	20.8%	68.8%	66.9%	74.9%	8.0%
SAN ANTONIO	549,245	23.2%	64.9%	68.8%	76.3%	7.5%

More households have computers in 2021 than in 2019: Ownership of desktop or laptop computers grew by 3.2 percentage points from 2019 to 2021, while tablet ownership grew by 2.3 points (from 61.5% to 63.8%). Smartphone device ownership increased by 8.2 points from 2019 to 2021, with 90.0% of all Americans having such a device by 2021. Growth in smartphone ownership is strongly correlated (0.55) with the share of population at or below the 125% poverty level. That is, smartphone ownership increased most sharply in high-poverty cities. Table 2 provides detail on household ownership of desktop or laptop computers, presented by those cities with the greatest growth in computer ownership from 2019 to 2021 (showing the 15 highest-growth cities out of the nation's 50 largest cities). The appendix contains device adoption data for the 50 largest cities for tablet computers and smartphones (Tables 7 and 8).

Table 2: Desktop/Laptop Ownership, 2017, 2019, 2021 (Top 15 U.S. cities)

City	125% Federal Poverty Level	Desktop/ Laptop 2017	Desktop/ Laptop 2019	Desktop/ Laptop 2021	Desktop/ Laptop Change 2019 to 2021
DETROIT	37.3%	54.9%	53.9%	65.2%	11.4%
CLEVELAND	34.8%	57.1%	54.3%	65.3%	11.0%
BALTIMORE	28.4%	67.0%	67.5%	76.3%	8.9%
TUCSON	24.6%	74.4%	72.0%	80.5%	8.4%
MEMPHIS	29.1%	59.7%	60.3%	68.6%	8.2%
ATLANTA	20.7%	77.1%	80.1%	87.8%	7.7%
SACRAMENTO	18.9%	78.8%	78.7%	86.3%	7.7%
INDIANAPOLIS	19.7%	72.3%	71.1%	78.6%	7.6%
SAN ANTONIO	23.2%	70.9%	70.7%	77.6%	6.8%
DALLAS	21.4%	68.9%	70.9%	77.7%	6.8%
EL PASO	24.5%	70.0%	68.9%	75.7%	6.8%
NEW ORLEANS	29.7%	65.5%	66.8%	73.5%	6.7%
FRESNO	27.0%	70.0%	69.8%	76.4%	6.6%
MILWAUKEE	30.2%	61.3%	65.1%	71.3%	6.2%
OAKLAND	17.9%	78.3%	76.4%	82.7%	6.2%

There has been a reduction in the share of households relying only on cellular data plans for service from 2019 to 2021, particularly in high poverty cities: The norm in internet access for Americans today is to have both home wireline and cellular data service. In some cities, such as Detroit and Baltimore, nearly 20% of households only had online access via a cellular data plan. Yet those cities have seen substantial declines in those figures, with Baltimore seeing nearly a 7 point drop in cell only access. The correlation between share of households below 125% of the poverty line and the decrease in cell-only incidence is –0.30 across the top 200 cities.

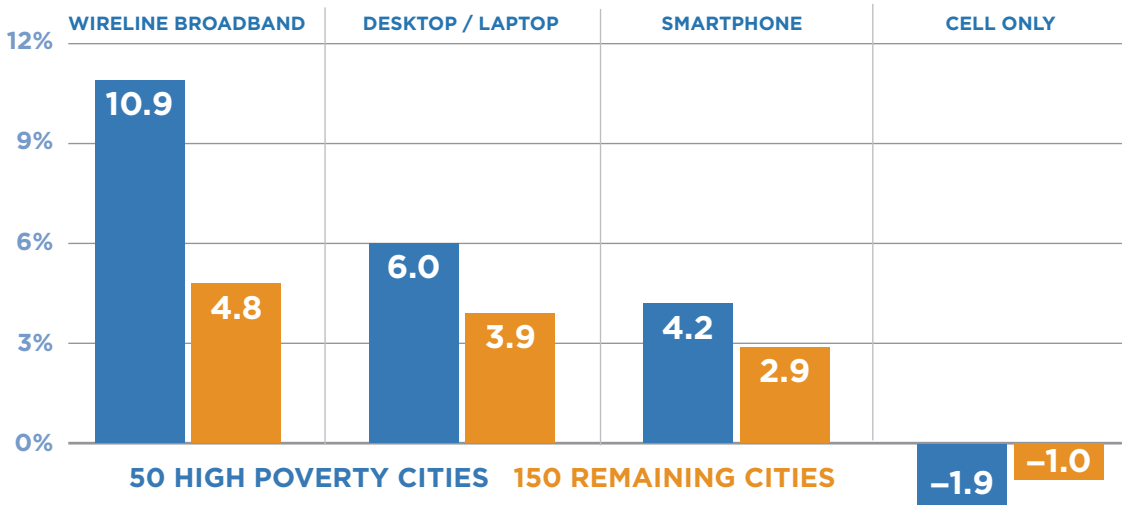
Across all 50 cities in the table, the average change in cell-only reliance between 2019 and 2021 was –1.3 percentage points. Cities experiencing above-average declines in cell-only households include those with high shares of households at or below the 125% FPL, such as Baltimore, Detroit, Fresno, and Tucson. In Table 3, progress is a negative number; that is, places with the largest drops in cell-only households top the list. As prior data show, growth in home broadband adoption and decline in cell-only have overlaps among several cities, including Baltimore, Detroit, Tucson, and Kansas City. More households have two connectivity options.

Table 3: Cellular Data Plan ONLY Households, 2017, 2019, 2021 (Top 15 cities)

City	125% Federal Poverty Level	Cell Only 2017	Cell Only 2019	Cell Only 2021	Change 2019 to 2021
BALTIMORE	28.4%	14.6%	17.4%	10.5%	–6.9%
TUCSON	24.6%	14.7%	16.3%	11.0%	–5.2%
LOUISVILLE METRO	20.8%	14.2%	17.9%	13.3%	–4.6%
JACKSONVILLE	18.9%	13.3%	17.9%	13.5%	–4.4%
DETROIT	37.3%	19.2%	19.3%	15.2%	–4.1%
SACRAMENTO	18.9%	12.2%	12.8%	8.8%	–4.0%
KANSAS CITY, MO	17.4%	12.6%	14.3%	10.3%	–4.0%
FRESNO	27.0%	13.6%	14.4%	10.5%	–3.8%
ATLANTA	20.7%	12.7%	11.8%	8.7%	–3.1%
ALBUQUERQUE	20.4%	11.7%	12.0%	9.0%	–3.0%
RALEIGH	16.6%	8.7%	10.1%	7.1%	–3.0%
EL PASO	24.5%	17.5%	14.0%	11.3%	–2.7%
OKLAHOMA CITY	20.2%	16.1%	16.0%	13.2%	–2.7%
OMAHA	19.0%	10.3%	13.1%	10.4%	–2.6%
TULSA	24.3%	14.4%	16.1%	13.5%	–2.6%

Another way to convey the link between poverty and increases in the adoption of digital tools is to compare 2019 to 2021 growth rates between high-poverty cities and those with lower rates of poverty. The graphic below does this by sorting the 200 largest U.S. cities into two categories: the 50 cities with the highest shares of households living at or below 125% of the federal poverty level, and the remaining 150 cities. In cities with above-average poverty rates, wireline broadband adoption increased from 2019 to 2021 by more than twice the rate of lower-poverty cities. As Table 9 shows (see Appendix), adoption gaps remain between lower- and higher-income cities, with wireline adoption 4 points greater in higher-income cities and desktop/laptop ownership 10 points greater in higher-income cities.

Change in Adoption from 2019 to 2021: High-Poverty Large U.S. Cities Versus the Rest



What are the implications for state and local policymakers making plans for Broadband Equity, Access, and Deployment and Digital Equity Act funding from the Infrastructure Investment and Jobs Act?

1. Discover, grow, and replicate

The data shows that progress is possible. State broadband planners should determine where it is happening, build upon it, and replicate it in other parts of the state. It is not wholly surprising that there has been a strong increase in broadband subscribership, given research to date on the digital divide during the pandemic. A **2021 Philadelphia survey** showed that 9% of Philadelphia households (and 17% of low-income ones) said they used a discount or free internet offer for service. Analysis of Census Pulse surveys in 2020 showed **increases in computer availability** for K-12 households in the first year of the pandemic. Numerous states (e.g., **Connecticut**) and cities partnered with philanthropic organizations to distribute computers to households with school-age children. Interventions to address social problems do not always go well. Yet they seem to be working for addressing the digital divide in the face of the pandemic.

2. Do not grow complacent – subscription vulnerability is a persistent problem

A key tool in promoting broadband subscribership for low-income households is the Affordable Connectivity Program (ACP)—a $14.2 billion program that provides a $30-per-month subsidy to low-income households (i.e., those whose annual incomes are at or below 200% of the federal poverty level). The program is scheduled to sunset when funding runs out—which could occur sometime in **2024**. Some states, such as **Maryland** and **New York**, have added to that subsidy level, but those funds are likely to be one-time benefits, given that they were financed by American Rescue Plan Act funds. There may be a sense among some policymakers that funds for service subsidies are a one-time assault on low-income households' affordability challenges. Surely, the argument goes, this will "solve the problem."

But the digital divide is not amenable to a one-time fix. Research shows that not all households who have a broadband subscription can maintain it. "**Subscription vulnerability**" captures how maintaining access is fragile for many households. For lower-income households (i.e., those whose annual incomes are $50,000 or less), half (49%) live near the precipice of disconnection in that they have lost connectivity due to economic hardship (during the pandemic), live at or below the poverty line, or say it is very difficult for them to fit broadband service into their household budgets. For low-income households, scarce resources often result in trade-offs that many people in the United States do not face. What goes if hours at work go down or a job layoff occurs? The internet connection at home may have to take a hiatus.

Since the economy will not be immune to recession in the future, policymakers need to have "subscription vulnerability" top of mind with respect to universal service policy. This means extending the Affordable Connectivity Program beyond its current funding limit. The ACP and its

predecessor (the Emergency Broadband Benefit, or EBB) have helped tackle service affordability problems for low-income Americans that the pandemic brought to the fore. But as the pandemic's impact on the economy fades, this does not mean that affordability issues will evaporate.

3. Focus more on affordability and less on technology

When the ACP (and its predecessor) launched, there was some concern that most of the early enrollment was for wireless service. Some 68% of EBB signups were for wireless plans, with 31% for wireline plans. Wireless carriers, it appears, converted many Lifeline customers to higher-priced wireless plans with more generous data allotments. Although undoubtedly of value to consumers, wireless plans may not be suitable for homes with multiple individuals using the internet for work and school. Perhaps the subsidy was not having one of its intended effects: to help people have robust internet access at home for video-intensive school or work applications.

However, since the early days of EBB, adoption patterns have shifted under the ACP. Through September 2022, 56% of the 13.5 million ACP enrollees are wireless users, with 43% having enrolled in wireline service. The higher share of wireline enrollments in September 2022 compared with the end of 2021 means wireline enrollment must have been comparatively strong since the ACP began in January 2022. In fact, looking at enrollment figures for ACP over the January-to-September time frame shows that, since the beginning of this year, 68% of those enrolling in the program have opted for wireline service.

These shifting adoption patterns indicate that the ACP-eligible population is using the subsidy to satisfy their affordability needs as they see them. The subscription vulnerable—those who find it very difficult to afford the service they have—may not be so vulnerable in light of the ACP subsidy, no matter which service type they choose. They may not be incremental additions to broadband subscriber figures, but they are less likely to fall off the network. And, as the robust recent wireline adoption numbers for ACP suggest, the ACP subsidy may be opening doors to home wireline service to some who have not previously had it.

4. Take a bow, but don't take a rest

We are in an era when the potential to tackle the digital divide has never been greater. Newly released ACS data show that taking square aim at the problem yields payoffs. Stakeholders leading efforts in the past several years to increase broadband adoption should pause to take credit. But not for too long. New funds for networks will not solve problems overnight and will neither necessarily nor entirely address service affordability. Subscription vulnerability will endure. Maintaining funding to help households address affordability challenges—through the Affordable Connectivity Program—is a looming concern.

APPENDIX: Digital Tool Adoption for the 50 largest U.S. Cities

Table 4: Wireline Broadband Adoption, 2017, 2019, 2021 (Top 50 U.S. cities)

City	Number of Households 2021	Percent At or Below 125% Federal Poverty Level	Wireline Change 2019 to 2021	Wireline Change 2017 to 2021	Wireline 2017	Wireline 2019	Wireline 2021
DETROIT	251,729	37.3%	12.1%	20.0%	45.8%	53.7%	65.8%
CLEVELAND	171,321	34.8%	11.3%	10.8%	54.5%	54.0%	65.3%
ALBUQUERQUE	243,582	20.4%	10.7%	10.4%	69.3%	69.1%	79.7%
BALTIMORE	254,370	28.4%	10.6%	10.7%	59.3%	59.4%	69.9%
KANSAS CITY, MO	219,020	17.4%	9.7%	10.7%	67.2%	68.3%	77.9%
TUCSON	223,068	24.6%	9.5%	10.1%	66.9%	67.6%	77.1%
LAS VEGAS	250,350	19.3%	9.2%	9.2%	66.6%	66.6%	75.8%
OKLAHOMA CITY	275,285	20.2%	8.9%	9.8%	65.8%	66.7%	75.6%
SACRAMENTO	202,093	18.9%	8.5%	9.1%	74.2%	74.7%	83.3%
MILWAUKEE	232,362	30.2%	8.2%	18.3%	55.8%	65.9%	74.1%
MEMPHIS	256,968	29.1%	8.1%	9.7%	54.2%	55.8%	63.9%
PHOENIX	602,039	19.5%	8.0%	9.3%	68.3%	69.6%	77.6%
INDIANAPOLIS	358,150	19.7%	8.0%	9.4%	64.4%	65.8%	73.8%
LOUISVILLE METRO	264,336	20.8%	8.0%	6.2%	68.8%	66.9%	74.9%
SAN ANTONIO	549,245	23.2%	7.5%	11.4%	64.9%	68.8%	76.3%
RALEIGH	194,917	16.6%	7.4%	3.9%	81.1%	77.7%	85.0%
OAKLAND	170,366	17.9%	6.8%	3.5%	75.0%	71.7%	78.5%
MIAMI	192,219	27.9%	6.7%	15.3%	52.4%	61.1%	67.8%
DALLAS	536,008	21.4%	6.6%	11.8%	61.6%	66.8%	73.4%
ATLANTA	232,720	20.7%	6.4%	10.9%	70.2%	74.7%	81.1%
MINNEAPOLIS	188,681	19.1%	6.2%	7.1%	73.3%	74.2%	80.4%
JACKSONVILLE	386,283	18.9%	5.9%	7.4%	66.3%	67.9%	73.7%
TULSA	173,943	24.3%	5.8%	9.5%	64.7%	68.4%	74.2%
EL PASO	242,529	24.5%	5.7%	12.7%	60.3%	67.3%	73.0%
NEW ORLEANS	158,827	29.7%	5.7%	11.7%	56.9%	63.0%	68.7%
FORT WORTH	334,286	18.6%	5.2%	9.3%	68.4%	72.5%	77.7%
CHICAGO	1,139,537	20.8%	5.2%	7.1%	66.3%	68.3%	73.5%
AUSTIN	449,399	15.8%	5.1%	6.8%	76.4%	78.1%	83.3%
FRESNO	181,841	27.0%	5.0%	6.5%	65.6%	67.1%	72.1%
COLUMBUS	390,605	22.3%	4.9%	8.4%	74.2%	77.7%	82.6%
CHARLOTTE	365,269	15.1%	4.8%	8.5%	74.3%	78.0%	82.8%
LOS ANGELES	1,410,594	22.0%	4.7%	6.4%	71.7%	73.3%	78.1%
COLORADO SPRINGS	197,542	12.8%	4.7%	6.1%	79.4%	80.8%	85.5%
BOSTON	271,941	23.5%	4.6%	6.4%	75.3%	77.2%	81.7%

VIRGINIA BEACH	182,775	12.3%	4.5%	4.8%	81.8%	82.1%	86.6%
OMAHA	201,469	19.0%	4.3%	6.0%	72.3%	74.0%	78.3%
NASHVILLE-DAVIDSON	305,247	19.1%	4.3%	10.1%	71.3%	77.1%	81.4%
NEW YORK CITY	3,263,895	22.5%	4.2%	4.6%	70.8%	71.3%	75.5%
LONG BEACH	172,599	20.6%	3.9%	7.5%	71.6%	75.2%	79.1%
DENVER	326,634	14.6%	3.6%	7.4%	76.0%	79.8%	83.4%
SEATTLE	351,650	13.0%	3.6%	3.2%	84.1%	83.6%	87.2%
PORTLAND, OR	286,734	15.5%	3.4%	4.8%	77.9%	79.3%	82.7%
HOUSTON	924,981	25.0%	3.1%	7.7%	63.9%	68.5%	71.6%
MESA	199,112	14.2%	2.9%	11.4%	68.3%	76.8%	79.7%
SAN FRANCISCO	350,796	14.1%	2.6%	4.0%	78.8%	80.3%	82.9%
SAN JOSE	322,881	9.7%	2.4%	3.7%	82.0%	83.4%	85.8%
TAMPA	159,925	22.6%	2.1%	5.6%	72.2%	75.7%	77.8%
PHILADELPHIA	660,921	27.3%	1.4%	11.9%	59.8%	70.4%	71.8%
SAN DIEGO	521,000	14.1%	1.3%	2.2%	82.0%	82.9%	84.2%
WASHINGTON, DC	319,565	18.3%	-1.0%	4.7%	72.2%	77.9%	76.8%

Table 5: Desktop/Laptop Ownership, 2017, 2019, 2021 (Top 50 U.S. cities)

City	125% Federal Poverty Level	Desktop/Laptop 2017	Desktop/Laptop 2019	Desktop/Laptop 2021	Desktop/ Laptop Change 2019 to 2021
DETROIT	37.3%	54.9%	53.9%	65.2%	11.4%
CLEVELAND	34.8%	57.1%	54.3%	65.3%	11.0%
BALTIMORE	28.4%	67.0%	67.5%	76.3%	8.9%
TUCSON	24.6%	74.4%	72.0%	80.5%	8.4%
MEMPHIS	29.1%	59.7%	60.3%	68.6%	8.2%
ATLANTA	20.7%	77.1%	80.1%	87.8%	7.7%
SACRAMENTO	18.9%	78.8%	78.7%	86.3%	7.7%
INDIANAPOLIS	19.7%	72.3%	71.1%	78.6%	7.6%
SAN ANTONIO	23.2%	70.9%	70.7%	77.6%	6.8%
DALLAS	21.4%	68.9%	70.9%	77.7%	6.8%
EL PASO	24.5%	70.0%	68.9%	75.7%	6.8%
NEW ORLEANS	29.7%	65.5%	66.8%	73.5%	6.7%
FRESNO	27.0%	70.0%	69.8%	76.4%	6.6%
MILWAUKEE	30.2%	61.3%	65.1%	71.3%	6.2%
OAKLAND	17.9%	78.3%	76.4%	82.7%	6.2%
MIAMI	27.9%	67.6%	66.4%	72.5%	6.1%
CHICAGO	20.8%	73.5%	75.0%	80.9%	6.0%
CHARLOTTE	15.1%	81.3%	79.8%	85.7%	5.9%
OKLAHOMA CITY	20.2%	73.8%	70.2%	76.1%	5.9%
MINNEAPOLIS	19.1%	82.2%	80.3%	85.9%	5.6%

PHOENIX	19.5%	77.2%	77.0%	82.5%	5.5%
KANSAS CITY, MO	17.4%	73.1%	73.7%	79.1%	5.4%
TULSA	24.3%	69.6%	69.5%	74.8%	5.3%
BOSTON	23.5%	79.0%	79.3%	84.6%	5.3%
PHILADELPHIA	27.3%	67.2%	71.1%	76.4%	5.3%
JACKSONVILLE	18.9%	75.1%	76.4%	81.5%	5.1%
LAS VEGAS	19.3%	76.8%	74.5%	79.2%	4.7%
ALBUQUERQUE	20.4%	78.9%	77.3%	81.9%	4.5%
LOUISVILLE METRO	20.8%	71.8%	7 1.5%	75.9%	4.5%
NASHVILLE-DAVIDSON	19.1%	79.6%	79.0%	83.3%	4.3%
LONG BEACH	20.6%	79.8%	81.2%	85.5%	4.3%
TAMPA	22.6%	77.3%	78.7%	82.8%	4.2%
DENVER	14.6%	81.5%	82.7%	86.7%	4.1%
PORTLAND, OR	15.5%	84.9%	85.8%	89.5%	3.7%
COLORADO SPRINGS	12.8%	85.8%	85.5%	89.2%	3.6%
LOS ANGELES	22.0%	79.8%	78.7%	82.2%	3.4%
COLUMBUS	22.3%	77.6%	77.7%	81.0%	3.3%
MESA	14.2%	83.0%	82.1%	85.4%	3.3%
RALEIGH	16.6%	85.9%	83.4%	86.6%	3.2%
SAN JOSE	9.7%	87.5%	87.0%	90.1%	3.2%
SAN DIEGO	14.1%	87.4%	86.1%	89.1%	3.1%
AUSTIN	15.8%	85.2%	85.6%	88.7%	3.1%
NEW YORK CITY	22.5%	76.1%	75.8%	78.8%	3.0%
VIRGINIA BEACH	12.3%	86.7%	84.4%	87.3%	2.9%
SAN FRANCISCO	14.1%	85.5%	85.2%	87.5%	2.3%
OMAHA	19.0%	77.1%	77.6%	79.7%	2.1%
FORT WORTH	18.6%	76.2%	77.2%	79.2%	2.0%
HOUSTON	25.0%	71.7%	72.4%	74.3%	1.9%
SEATTLE	13.0%	89.4%	89.7%	91.5%	1.7%
WASHINGTON, DC	18.3%	79.5%	83.4%	83.8%	0.4%

Table 6: Cellular Data Plan ONLY Households, 2017, 2019, 2021 (Top 50 cities)

City	Cell Only 2017	Cell Only 2019	Cell Only 2021	Cell Only Change 2017 to 2021	Cell Only Change 2019 to 2021	125% Federal Poverty Level
BALTIMORE	14.6%	17.4%	10.5%	–4.1%	–6.9%	28.4%
TUCSON	14.7%	16.3%	11.0%	–3.7%	–5.2%	24.6%
LOUISVILLE METRO	14.2%	17.9%	13.3%	–0.9%	–4.6%	20.8%
JACKSONVILLE	13.3%	17.9%	13.5%	0.2%	–4.4%	18.9%
DETROIT	19.2%	19.3%	15.2%	–3.9%	–4.1%	37.3%
SACRAMENTO	12.2%	12.8%	8.8%	–3.4%	–4.0%	18.9%

KANSAS CITY, MO	12.6%	14.3%	10.3%	–2.3%	–4.0%	17.4%
FRESNO	13.6%	14.4%	10.5%	–3.0%	–3.8%	27.0%
ATLANTA	12.7%	11.8%	8.7%	–4.0%	–3.1%	20.7%
ALBUQUERQUE	11.7%	12.0%	9.0%	–2.7%	–3.0%	20.4%
RALEIGH	8.7%	10.1%	7.1%	–1.5%	–3.0%	16.6%
EL PASO	17.5%	14.0%	11.3%	–6.2%	–2.7%	24.5%
OKLAHOMA CITY	16.1%	16.0%	13.2%	–2.9%	–2.7%	20.2%
OMAHA	10.3%	13.1%	10.4%	0.1%	–2.6%	19.0%
TULSA	14.4%	16.1%	13.5%	–0.9%	–2.6%	24.3%
COLORADO SPRINGS	9.1%	9.9%	7.5%	–1.6%	–2.3%	12.8%
MINNEAPOLIS	8.3%	11.0%	8.7%	0.4%	–2.3%	19.1%
DENVER	8.5%	9.4%	7.2%	–1.3%	–2.2%	14.6%
SEATTLE	6.1%	8.2%	6.1%	0.0%	–2.1%	13.0%
MILWAUKEE	15.4%	11.5%	9.6%	–5.8%	–1.9%	30.2%
CHARLOTTE	11.2%	10.1%	8.3%	–2.9%	–1.8%	15.1%
COLUMBUS	11.0%	10.3%	8.5%	–2.5%	–1.7%	22.3%
VIRGINIA BEACH	7.3%	8.8%	7.1%	–0.2%	–1.7%	12.3%
FORT WORTH	15.1%	13.9%	12.3%	–2.8%	–1.6%	18.6%
AUSTIN	11.3%	9.6%	8.1%	–3.2%	–1.5%	15.8%
PHOENIX	13.6%	12.3%	10.9%	–2.7%	–1.4%	19.5%
NASHVILLE-DAVIDSON	12.6%	10.4%	9.1%	–3.5%	–1.3%	19.1%
HOUSTON	17.1%	14.1%	13.1%	–4.0%	–1.0%	25.0%
PORTLAND	9.1%	10.6%	9.5%	0.4%	–1.0%	15.5%
BOSTON	8.8%	9.2%	8.3%	–0.5%	–0.8%	23.5%
NEW ORLEANS	15.1%	14.0%	13.2%	–1.9%	–0.8%	29.7%
CHICAGO	11.4%	12.5%	11.8%	0.4%	–0.7%	20.8%
MESA	16.4%	11.0%	10.3%	–6.1%	–0.7%	14.2%
LOS ANGELES	10.6%	12.3%	11.6%	1.0%	–0.7%	22.0%
OAKLAND	9.0%	10.0%	9.4%	0.4%	–0.6%	17.9%
SAN JOSE	7.5%	7.7%	7.5%	0.0%	–0.2%	9.7%
SAN ANTONIO	12.9%	12.4%	12.3%	–0.6%	–0.1%	23.2%
SAN FRANCISCO	6.9%	7.9%	7.9%	1.0%	0.0%	14.1%
LAS VEGAS	10.3%	11.7%	11.7%	1.5%	0.1%	19.3%
INDIANAPOLIS	13.7%	14.3%	14.5%	0.8%	0.2%	19.7%
NEW YORK CITY	10.2%	12.6%	12.8%	2.6%	0.2%	22.5%
DALLAS	15.3%	12.5%	13.2%	–2.1%	0.8%	21.4%
SAN DIEGO	7.6%	8.3%	9.1%	1.5%	0.8%	14.1%
PHILADELPHIA	10.2%	11.6%	12.4%	2.3%	0.8%	27.3%
LONG BEACH	9.3%	11.5%	12.5%	3.2%	1.0%	20.6%
TAMPA	12.0%	11.8%	12.9%	0.8%	1.0%	22.6%
CLEVELAND	12.1%	12.3%	14.0%	1.9%	1.7%	34.8%
MIAMI	11.8%	7.9%	10.2%	–1.6%	2.3%	27.9%
WASHINGTON, DC	9.0%	8.3%	11.0%	2.0%	2.7%	18.3%
MEMPHIS	15.1%	13.9%	20.3%	5.2%	6.5%	29.1%

Table 7: Tablet Computer Ownership, 2017, 2019, 2021 (Top 50 cities)

City	Tablet 2017	Tablet 2019	Tablet 2021	Tablet Change 2019 to 2021
MEMPHIS	46.9%	46.4%	58.2%	11.8%
OKLAHOMA CITY	59.1%	52.8%	62.4%	9.6%
INDIANAPOLIS	52.7%	51.1%	60.0%	8.8%
DETROIT	43.8%	45.6%	54.4%	8.8%
CLEVELAND	43.6%	44.0%	51.1%	7.2%
BALTIMORE	51.0%	52.6%	58.6%	6.0%
LONG BEACH	62.6%	58.4%	64.4%	6.0%
NASHVILLE-DAVIDSON	64.3%	60.3%	66.0%	5.7%
TUCSON	55.7%	54.2%	59.5%	5.3%
OAKLAND	58.1%	57.4%	62.6%	5.2%
PHOENIX	62.1%	59.1%	63.9%	4.8%
CHICAGO	57.4%	57.2%	61.9%	4.7%
SAN ANTONIO	56.9%	57.7%	62.4%	4.7%
BOSTON	59.5%	58.6%	63.2%	4.6%
DALLAS	53.2%	55.0%	59.6%	4.6%
MILWAUKEE	47.8%	50.7%	55.2%	4.5%
LOS ANGELES	59.9%	59.9%	64.2%	4.3%
JACKSONVILLE	56.7%	57.8%	62.0%	4.2%
MINNEAPOLIS	61.2%	60.2%	64.2%	4.0%
HOUSTON	56.8%	55.3%	58.8%	3.5%
CHARLOTTE	62.9%	64.0%	67.5%	3.5%
COLORADO SPRINGS	65.9%	68.2%	71.7%	3.4%
EL PASO	58.0%	55.9%	59.2%	3.4%
SACRAMENTO	62.4%	62.5%	65.8%	3.3%
SAN FRANCISCO	67.8%	65.5%	68.7%	3.2%
OMAHA	62.3%	62.1%	65.2%	3.1%
SAN JOSE	74.9%	70.4%	73.3%	2.9%
TAMPA	62.8%	58.5%	61.3%	2.8%
FRESNO	61.8%	58.4%	61.1%	2.8%
DENVER	61.4%	61.3%	64.0%	2.7%
NEW YORK CITY	59.2%	59.6%	62.3%	2.7%
KANSAS CITY, MO	60.6%	58.8%	61.4%	2.6%
NEW ORLEANS	46.7%	49.9%	52.5%	2.6%
RALEIGH	69.3%	65.0%	67.3%	2.4%
COLUMBUS	65.1%	62.3%	64.6%	2.3%
SAN DIEGO	70.1%	66.7%	69.0%	2.3%
PORTLAND, OR	64.1%	65.7%	67.8%	2.2%
LOUISVILLE METRO	56.2%	56.7%	58.9%	2.1%
TULSA	54.0%	55.1%	57.1%	2.0%
MESA	64.2%	63.6%	65.3%	1.7%

MIAMI	45.5%	46.0%	47.7%	1.7%
PHILADELPHIA	51.7%	58.0%	59.5%	1.5%
AUSTIN	67.6%	65.2%	66.7%	1.5%
LAS VEGAS	59.0%	56.1%	57.5%	1.4%
FORT WORTH	61.9%	64.6%	65.0%	0.4%
ATLANTA	60.5%	65.4%	65.6%	0.2%
ALBUQUERQUE	59.4%	60.3%	60.3%	0.0%
SEATTLE	69.7%	69.2%	69.0%	-0.2%
WASHINGTON, DC	62.5%	64.3%	63.4%	-0.9%
VIRGINIA BEACH	73.7%	72.1%	70.6%	-1.5%

Table 8: Smartphone Ownership, 2017, 2019, 2021 (Top 50 cities)

City	Smartphone 2017	Smartphone 2019	Smartphone 2021	Smartphone Change 2019 to 2021
MEMPHIS	74.6%	79.9%	89.5%	9.6%
INDIANAPOLIS	78.9%	82.4%	91.3%	8.9%
MILWAUKEE	73.8%	82.6%	89.1%	6.5%
BALTIMORE	79.1%	82.8%	89.3%	6.5%
ALBUQUERQUE	82.3%	87.5%	92.7%	5.1%
OAKLAND	84.5%	87.2%	91.8%	4.6%
DETROIT	75.1%	81.7%	86.2%	4.5%
COLUMBUS	86.1%	88.7%	93.3%	4.5%
HOUSTON	85.9%	88.2%	92.7%	4.5%
BOSTON	85.5%	88.3%	92.7%	4.4%
CHICAGO	82.8%	86.9%	91.2%	4.3%
DALLAS	83.5%	87.2%	91.1%	3.9%
JACKSONVILLE	83.5%	88.1%	91.8%	3.7%
MIAMI	83.8%	88.7%	92.3%	3.7%
LOUISVILLE METRO	82.5%	86.3%	89.9%	3.7%
OMAHA	81.5%	87.2%	90.7%	3.5%
CLEVELAND	73.1%	81.3%	84.8%	3.5%
WASHINGTON, DC	86.5%	89.7%	93.1%	3.4%
COLORADO SPRINGS	87.0%	91.0%	94.4%	3.4%
KANSAS CITY, MO	83.3%	88.2%	91.5%	3.3%
SACRAMENTO	86.5%	89.6%	92.9%	3.3%
SAN ANTONIO	81.9%	89.2%	92.4%	3.2%
AUSTIN	91.4%	91.5%	94.7%	3.2%
DENVER	87.2%	90.6%	93.7%	3.1%
LAS VEGAS	85.6%	86.9%	89.9%	3.1%
SAN JOSE	89.7%	92.0%	94.9%	2.9%

OKLAHOMA CITY	84.2%	88.7%	91.5%	2.8%
NEW YORK CITY	83.3%	86.7%	89.5%	2.8%
SEATTLE	89.4%	92.6%	95.4%	2.8%
TUCSON	83.2%	88.8%	91.3%	2.5%
ATLANTA	84.7%	89.8%	92.4%	2.5%
MESA	84.4%	89.8%	92.3%	2.5%
CHARLOTTE	88.5%	91.5%	94.0%	2.5%
RALEIGH	90.3%	92.0%	94.5%	2.4%
MINNEAPOLIS	85.2%	90.6%	93.0%	2.4%
LONG BEACH	87.4%	91.9%	94.2%	2.3%
TULSA	83.0%	88.1%	90.4%	2.3%
FORT WORTH	88.0%	92.1%	94.2%	2.2%
TAMPA	86.8%	91.9%	94.0%	2.1%
PORTLAND. OR	87.4%	91.7%	93.8%	2.0%
SAN DIEGO	90.6%	92.4%	94.4%	2.0%
LOS ANGELES	86.0%	90.8%	92.7%	1.9%
NASHVILLE-DAVIDSON	86.6%	90.3%	92.1%	1.8%
EL PASO	81.2%	87.3%	89.0%	1.7%
PHILADELPHIA	73.2%	84.6%	86.3%	1.7%
FRESNO	83.4%	88.4%	89.9%	1.5%
VIRGINIA BEACH	88.8%	91.6%	92.9%	1.3%
PHOENIX	85.8%	91.2%	92.5%	1.2%
SAN FRANCISCO	87.8%	91.7%	92.4%	0.7%
NEW ORLEANS	78.1%	86.1%	85.3%	-0.8%

Table 9: Adoption of Digital Tools, 2017, 2019, 2021

	WIRELINE		DESKTOP/LAPTOP		SMARTPHONE		CELL ONLY	
	High Poverty (50 cities)	Remaining (150 cities)	High Poverty (50 cities)	Remaining (150 cities)	High Poverty (50 cities)	Remaining (150 cities)	High Poverty (50 cities)	Remaining (150 cities)
2017	56.8%	72.5%	66.6%	79.2%	79.2%	85.6%	14.3%	10.6%
2019	64.4%	74.5%	67.1%	79.2%	85.1%	89.4%	14.4%	11.4%
2021	75.3%	79.3%	73.1%	83.1%	89.3%	92.3%	12.5%	10.4%

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