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COMMUNITY DEVELOPMENT

# BROADBAND AFFORDABILITY:
## Assessing the Cost of Broadband for Low-and-Moderate Income Communities in Cities

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**September 2025**

## Key Takeaways

- This study introduces a new community-level measure of broadband affordability that considers local median monthly household income and costs of living relative to local costs for broadband.
- Low- and moderate-income communities pay a notably higher share of their income for broadband—2.43% compared to 0.51% in wealthier areas—exceeding the FCC's 2% affordability benchmark.
- In cities where broadband is less affordable, households are more likely to use slower or lower-quality plans due to cost or limited infrastructure. In areas with the least affordable broadband, 26.7% of households rely solely on mobile devices, limiting access to jobs, financial services, and other key resources.
- Data on broadband pricing is still scarce in small and rural areas, limiting the ability for businesses, government, and community anchor institutions to understand the economic costs and benefits of broadband infrastructure. This underscores the need for localized pricing data to support digital access research.

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# Introduction to Broadband Affordability

Research from the Brookings Institution coined broadband as "essential infrastructure," which captures the idea that healthy neighborhoods have 1) universal access to connected devices, 2) a population equipped with digital skills, and 3) affordable subscription prices.[1] However, cost remains a primary barrier preventing many households—particularly those with low and moderate incomes (LMI)—from getting and staying connected. According to the Pew Research Institute's Broadband Access Initiative, income constraints have proven to be the most significant final barrier to broadband adoption for low-and-moderate income and middle-income families.[2] Research by Education Superhighway[3] indicates that of the 28.2 million American households who do not have high-speed broadband, 18 million households are offline because they cannot afford the cost of an at-home internet connection.[4] Ultimately, what leads a household to adopt broadband is not their willingness to pay for broadband but their ability to pay.[5]

While national and state-level analyses have helped highlight the digital divide, or the gap between those who have ready access to the Internet and those who do not, measures of broadband affordability at the community level are limited. This paper introduces a novel measure of relative broadband affordability which can be used to compare a community's[6] broadband affordability relative to other communities in the same city. This measure equips policymakers and funders with the information necessary to address local broadband affordability gaps. The findings from analyzing broadband affordability using a community-level measure of price relative to local median household income illuminate how affordability challenges are distributed across cities, how broadband costs compare to other essentials in the household budget, and how acutely broadband affordability impacts urban low-and-moderate income neighborhoods.

[1] https://www.brookings.edu/articles/digital-prosperity-how-broadband-can-deliver-health-and-equity-to-all-communities/
[2] https://www.pew.org/en/research-and-analysis/articles/2024/10/04/every-state-identifies-broadband-affordability-as-primary-barrier-to-closing-digital-divide
[3] A non-profit organization founded in 2012 that focuses on connecting all public school classrooms in the US to high-speed internet.
[4] https://www.educationsuperhighway.org/no-home-left-offline/
[5] Rhinesmith, C., Reisdorf, B., & Bishop, M. (2019). The ability to pay for broadband. *Communication Research and Practice*, *5*(2), 121–138. https://doi.org/10.1080/22041451.2019.1601491
[6] For this study, a community will be a census tract.

# Defining Affordable Broadband

In 2016, the Federal Communications Commission (FCC) set a broadband affordability benchmark of 2% of monthly household income as a preliminary standard for policymakers and Internet service providers, intended as "a clear yardstick for charting changes, not as an inherently meaningful level."[7] While a helpful benchmark, the 2% measure does not consider local costs of living and median household income, which influences the ability of a household to pay for broadband.

One-third (34%) of low-income households say that the "typical" price of $60 per month is too expensive for their household budgets and 56% say $75 or more is too much. Yet, half of low-income households pay more than $60 per month for service, indicating that for many that service fee imposes a strain on the household budget.

The table below shows the strain faced by families in low- and moderate-income census tracts relative to middle- and high-income census tracts. The average monthly price of a broadband connection is relatively standard across each census tract type hovering at a price of about $60.00 according to data from The Markup.

| CENSUS TRACT INCOME RANGE[8] | LOWEST AVERAGE MONTHLY BROADBAND PRICE | AVERAGE AFFORDABILITY AS A % OF MEDIAN MONTHLY HOUSEHOLD INCOME |
|---|---|---|
| **Low-and-Moderate Income** | **$58.50** | **2.43%** |
| **Middle-and-High Income** | **$61.74** | **0.51%** |
| **Overall** | **$59.35** | **0.58%** |

Source: FRBNY Author's calculations using data from The Markup (2022) and 2022 American Community Survey 5-year estimates.

However, low- and moderate-income households pay over four times more as a share of their monthly median household income on a broadband connection relative to middle- and high-income families. Considering that the average American household generally spends about 3% of their monthly budget on utilities,[9] 2.43% is a significant monthly cost for low- and moderate-income families to dedicate to broadband alone and surpasses the 2% affordability threshold set by the FCC.

[7] https://docs.fcc.gov/public/attachments/FCC-16-38A1.pdf

[8] Low-and-moderate income (LMI) is defined as households that make a median household income that is 80% or less of area median income, while middle-and-high income is defined as households that make a median household income of greater than 80% of area median income. An LMI census tract is designated when 50% or greater of its population is LMI.

[9] Utilities are defined here as a combination of water, heat, electricity, and gas.

## Relative Broadband Affordability: A New Measure of Broadband Access

Average prices for broadband across the data used in this study range from anywhere between $39 to $101 per plan but largely range between $50 and $65 in most census tracts.[10] However, to determine relative broadband affordability experienced by communities, it is important to understand monthly broadband prices as a *share* of median household income, as this measure is more reflective of a household's *ability to pay* for broadband, particularly in the context of their existing income constraints. This is particularly true for cities. Broadband prices may not be significantly different in adjacent or nearby census tracts, but these prices as a share of household income in a low-and-moderate income census tract relative to a middle-and-high income census tract will likely influence whether a household is likely to adopt broadband while balancing other important household costs.

To measure Relative Broadband Affordability, this study uses address-level internet service plan pricing data from The Markup's dataset, "How We Uncovered Disparities in Internet Deals." Address-level pricing data is aggregated and averaged at the census tract and census place levels for this analysis. Please refer to the Data Appendix at the end of this paper to learn more about the data on broadband pricing used for this study from The Markup, as well as the use of socioeconomic and geographic data from the Census Bureau's American Community Survey and the Bureau of Labor Statistics.

**Relative Broadband Affordability** is measured as follows, calculated at the census tract or census place level:

$$\frac{\text{Average Monthly Broadband Price}}{\text{Median Monthly Household Income}} \times 100 = \text{Relative Broadband Affordability}$$

The numerator is the average price for the cheapest internet service plans offered by providers in the geography, and the denominator is the median monthly household income for the geography. This is

[10] This is based off a distributional analysis of the data from The MarkUp and the FCC Urban Rate Survey, pulling thresholds for the 25th and 75th percentiles of the data.

multiplied by 100 to create a percentage measure of Relative Broadband Affordability experienced by households in a given geography.

Relative Broadband Affordability is helpful for understanding the ability of households within a census tract or census place to pay for broadband relative to their median household income. However, to understand just how affordable broadband is to a community, it is important to compare it to other communities within their city.

To do so, this study organizes communities by their relative broadband affordability into quartiles that indicate whether they have the most to the least *relative* broadband affordability within their city, as indicated by the categories in the table below. This approach accounts for local costs of living, as quartiles are computed using only data points from the city being examined.

The following table illustrates how quartiles are constructed using each city's data, meaning that each city's quartiles will look different depending on the local costs of broadband, local median incomes as well as local costs of living. For example, the threshold for communities in New York City who experience the lowest relative broadband affordability ranges from 1.89 to 2.45%, while in Detroit, the same threshold ranges from 3.15% to 6.10%.

| QUARTILE[11] | AFFORDABILITY RELATIVE TO MONTHLY MEDIAN HOUSEHOLD INCOME | Detroit's Relative Broadband Affordability Ranges | New York City's Relative Broadband Affordability Ranges |
|---|---|---|---|
| 25th percentile or lower | Most Affordable | 0 – 0.78% | 0 - 0.31% |
| 25th – 50th percentile | More Affordable | 0.78 – 1.22% | 0.31 – 0.74% |
| 50th – 75th percentile | Less Affordable | 1.22 – 3.15% | 0.74 – 1.89% |
| 75th – 100th percentile | Least Affordable | 3.15 – 6.10% | 1.89 – 4.45% |

Source: FRBNY Author's calculations using data from The Markup (2022) and 2022 American Community Survey 5-year estimates.

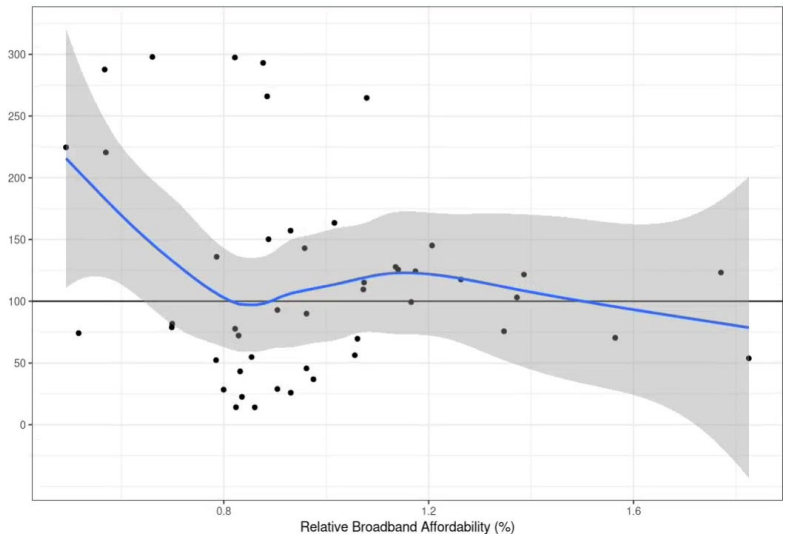
This is why communities in NYC and Detroit must be examined within the context of their cities. If their quartiles were constructed using both cities' data points, it is likely that those in NYC who are currently indexed to the lower tiers of affordability would be reassigned to a more affordable tier, which would mischaracterize the real cost they face relative to their local costs of living.

[11] Note: The quartiles shown in this table are computed using census-tract level percentages of broadband affordability, which is the lowest average monthly broadband price as a share of monthly median household income.

## Broadband Affordability, Speed, and Quality in Cities

Overall, the less affordable broadband is, the more likely consumers in cities will have poorer quality plans. This may be for one of two reasons: one, households are opting for poorer quality plans simply to be able to afford them, or, two, their neighborhoods may offer only lower quality broadband technology at a less affordable price. The Figure Appendix at the end of this paper highlights the relationship between broadband technology and broadband pricing, where fixed wireless and DSL offer the lowest speeds, cable offers middle-range speeds, and fiber offers the highest speeds. However, fiber remains the highest costing option (though its price has fallen in recent years), followed by fixed wireless, then cable, then DSL. Low-and-moderate income households that choose to purchase a monthly broadband subscription may opt for cheaper, lower quality plans that rely on poorer performing technologies like DSL or copper to be able to afford it given existing budgetary constraints.

### Figure 1: Relative Broadband Affordability and Average Download Speeds




Source: FRBNY Author's calculations using data from The Markup (2022) and 2022 American Community Survey 5-year estimates.

This trend is illustrated in Figure 1, where each point represents a city in the data and its respective average download speed as well as its average relative broadband affordability. Cities with less affordable broadband relative to their monthly median household income often experience lower download speeds, particularly in their low-and-moderate income census tracts. In other words, broadly speaking, low-and-moderate income households in urban areas often face the two-pronged issue of lower quality broadband and higher prices relative to their monthly median incomes.

The following table examines a selection of Northeastern cities more closely, by their median monthly broadband prices, relative broadband affordability, and primary technology offered. Of these cities, Bridgeport, Connecticut has the least affordable broadband. This is notable because residents experience higher monthly median prices even though they are limited to copper DSL broadband technology, a poorer performing technology. This is likely reflective of the second scenario mentioned above: Bridgeport lacks an Internet service provider marketplace that is robust and competitive, keeping prices high and quality of service low, in a city that is primarily low-and-moderate income.

The table below illustrates how income influences affordability even while prices remain consistent. Newark and Philadelphia have lower median household incomes as compared to Boston and therefore experience lower relative broadband affordability.

## Figure 2: Cities and Broadband Affordability

| CITY | STATE | LOWEST PRICE OFFERED ($) | RELATIVE BROADBAND AFFORDABILITY | ANNUAL MEDIAN HOUSEHOLD INCOME |
|---|---|---|---|---|
| **Boston** | **MA** | **39.99** | **0.63** | **$96,931** |
| **Bridgeport** | **CT** | **49.95** | **1.52** | **$58,515** |
| **Newark** | **NJ** | **39.99** | **1.34** | **$53,818** |
| **Philadelphia** | **PA** | **39.99** | **1.09** | **$60,302** |
| **Providence** | **RI** | **39.99** | **0.97** | **$65,206** |
| **Wilmington** | **DE** | **39.99** | **1.06** | **$50,420** |

Source: FRBNY Author's calculations using data from The Markup (2022) and 2022 American Community Survey 5-year estimates.

## Broadband Affordability: Choosing Broadband or Mobile Only?

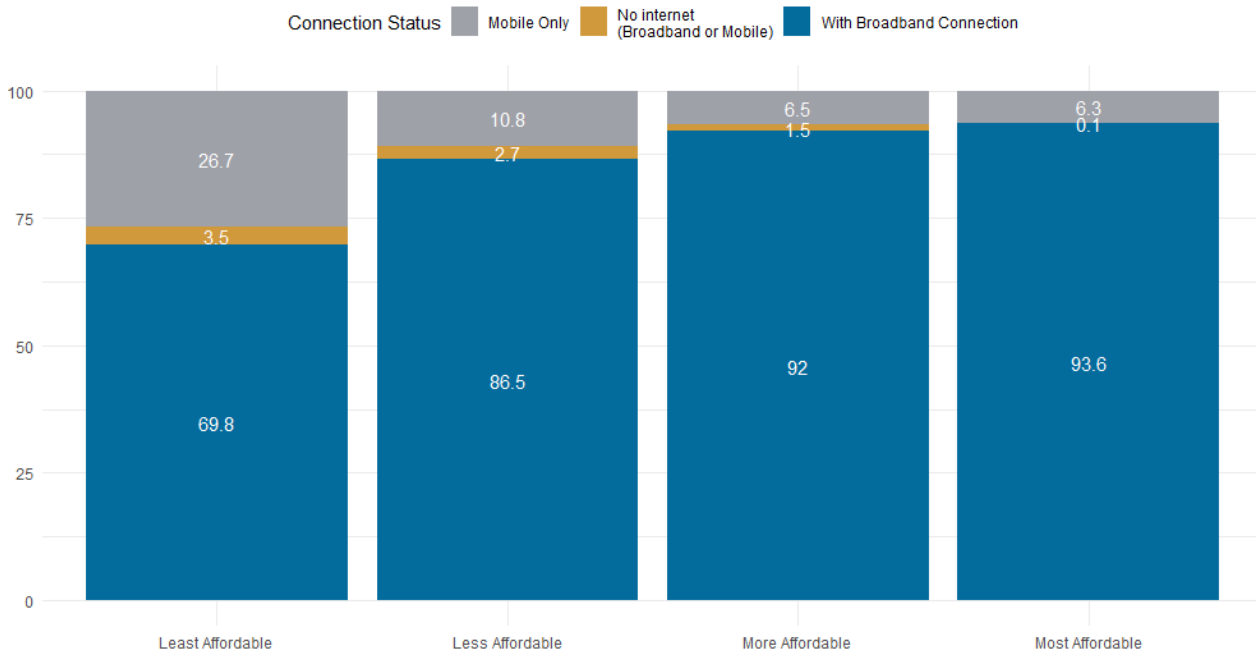
Broadband affordability may also influence whether households opt to be exclusively dependent on their mobile devices for Internet connection or choose to take on a broadband subscription. Figure 3 shows that in census tracts where broadband is the least affordable for households, 26.7% of households opt to use only their mobile device for Internet connection and 3.5% of households have no Internet connection at all.

Opting to use only a mobile device is a very common alternative to broadband for low- and moderate-income individuals, particularly with the advancement of app-based services that make it easier to transact and communicate with just a mobile phone. However, exclusive reliance on a mobile phone can often limit low- and moderate-income individuals from reliably accessing vital services and opportunities for economic and professional advancement. Mobile connections typically come with data caps, slower speeds, and less reliable service, making it difficult to complete tasks like applying

for jobs, accessing remote education, attending telehealth appointments, or using online banking and financial tools.[12]

## Figure 3: Relative Broadband Affordability and Subscription Type

Percent of Population in Each Relative Broadband Affordability Quartile




Source: FRBNY Author's calculations using data from The Markup (2022) and 2022 American Community Survey 5-year estimates.

## How does Broadband Affordability Compare to Costs in Cities?

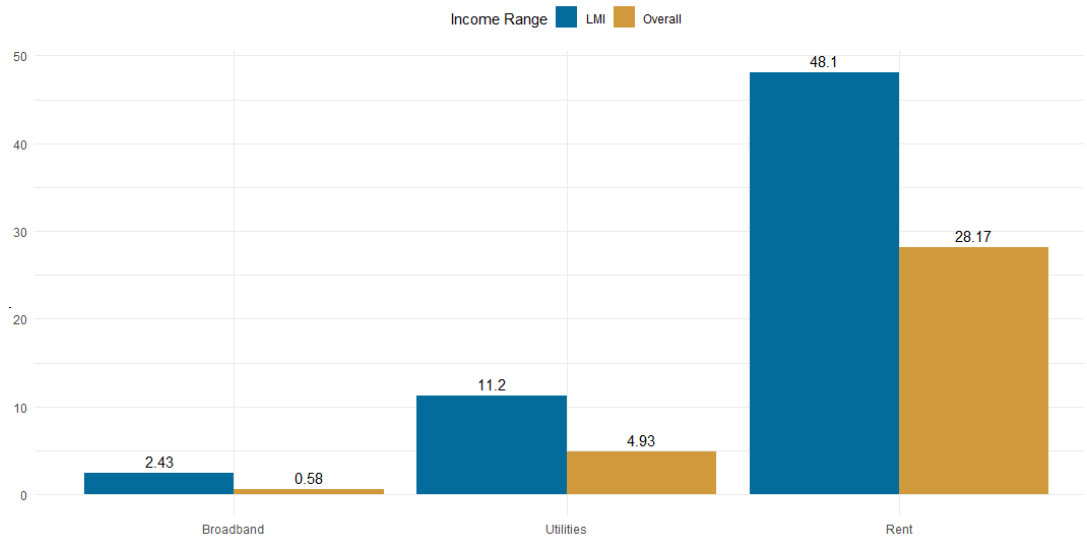
Broadband costs generally make up a higher percentage of the household budget for low-and-moderate income households, but pale in comparison to other costs in the household budget, such as utilities and rent. Figure 4 shows the costs faced by urban households in low-and-moderate income census tracts relative to the overall population.

Compared to the overall population in metropolitan areas, low-and-moderate income households pay more as a share of their income for broadband and other utilities. Particularly, they pay over four times as much for broadband, more than twice as much for utilities, and almost twice as much for rent, as illustrated in Figure 4.

[12] https://www.pewresearch.org/internet/2021/06/03/mobile-technology-and-home-broadband-2021/

## Figure 4: Broadband Price Relative to Other Household Costs in Cities

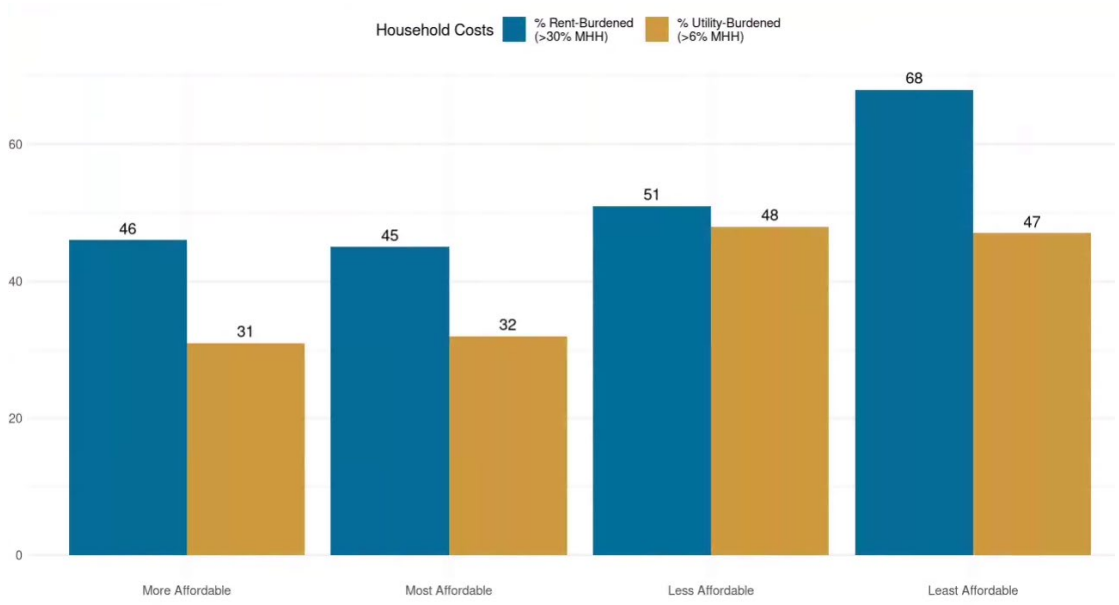
Percent of Population Across Cities




Source: FRBNY Author's calculations using data from The Markup (2022), 2022 American Community Survey 5-year estimates, and the Bureau of Labor Statistics' Consumer Price Index.

## Figure 5: Share of Cost-Burdened Populations and Broadband Affordability Quartiles

Percent of Population Across Cities




Source: FRBNY Author's calculations using data from The Markup (2022) and 2022 American Community Survey 5-year estimates, and the Bureau of Labor Statistics' Consumer Price Index.

Figure 5 examines these costs as well as the share of the population living under the poverty threshold in the context of relative broadband affordability. In addition, 48% and 47% of census tracts which are either below average or the least affordable for broadband are utility burdened, respectively.[13] Sixty-eight percent of the population experiencing the least affordable broadband are also rent burdened or pay 30% or more of their income in rent. This further adds to the evidence that those who are least able to afford broadband are also less likely to afford other services.

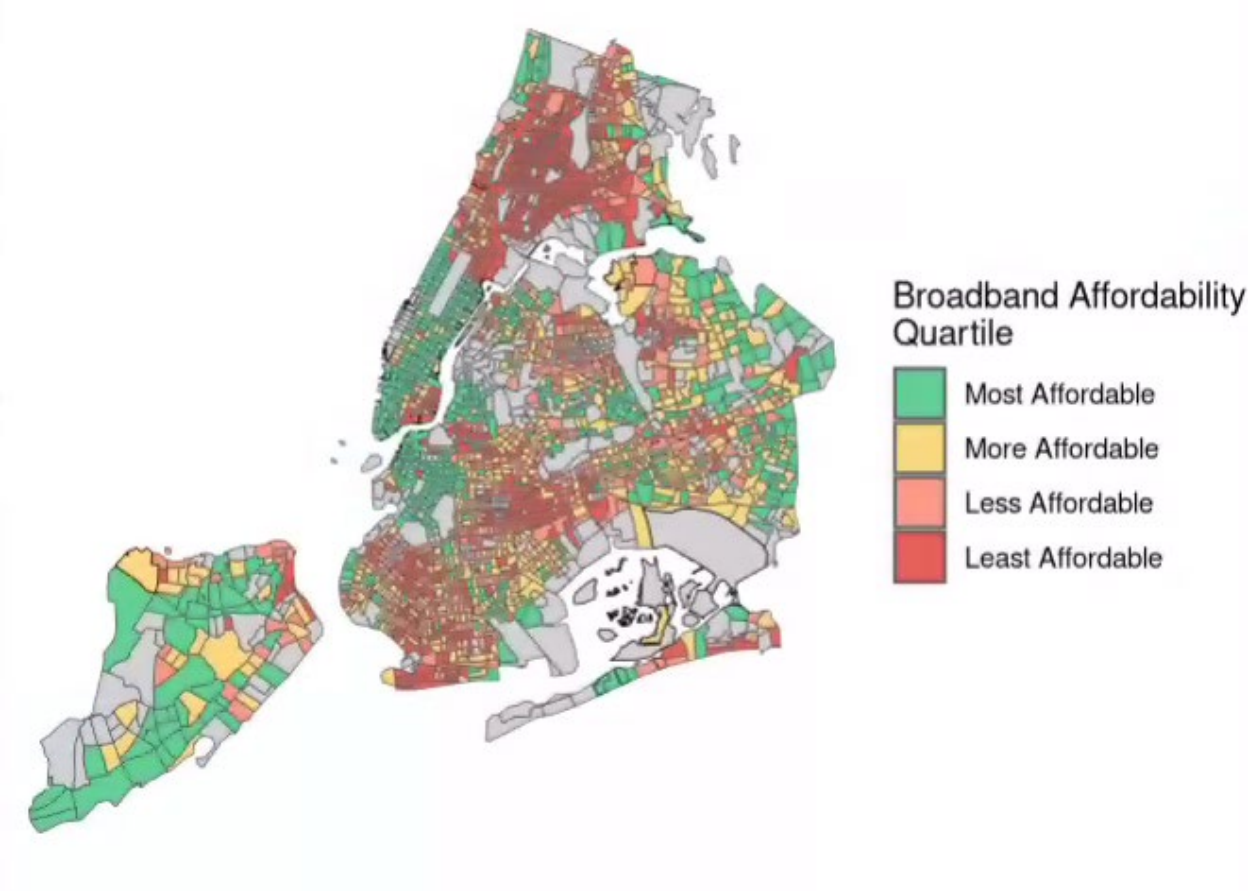
[13] Generally, an energy burden of 6% or more of household income is considered high. A severe energy burden is often defined as 10% or more. These figures indicate the proportion of income spent on energy costs, with higher percentages indicating a greater financial strain on the household.

# Examination of Cities and Broadband Affordability

This section explores broadband affordability in low- and moderate-income communities by examining the cost of broadband as a share of median household income at the census tract level. Using case studies from New York City, Newark, New Jersey, and Bridgeport, Connecticut, it highlights how affordability varies across neighborhoods and how these disparities can limit access to essential digital resources. These cities provide important context for understanding broader affordability challenges in urban low-and-moderate income areas and ongoing local efforts to improve affordability for LMI communities.

## New York City

Figure 6: Relative Broadband Affordability by Census Tract in New York City




Source: FRBNY Author's calculations using data from The Markup (2022) and 2022 American Community Survey 5-year estimates.
Note: Gray areas indicate data unavailability.

As of 2023, approximately 75% of New York City households had a broadband Internet subscription.[14] This marks progress since the start of the COVID-19 pandemic, but it still means that roughly one in four households in New York City remains unconnected. The digital divide is especially severe in low-income communities in New York City, where broadband adoption lags significantly.

Affordability is one of the biggest challenges facing households in New York City, primarily due to the price for broadband being higher in boroughs with higher populations of low-and-moderate income New Yorkers. The lowest relative broadband affordability in NYC is felt in upper Manhattan, the Bronx, Southern and Eastern Brooklyn, and Queens. These areas are largely low-and-moderate income communities of color, with aging housing infrastructure.

For many residents, high-quality broadband infrastructure is available, but the cost is too high. In some cases, families pay hundreds of dollars per month for subpar service, with plans offering 50 Mbps (megabits per second) speeds costing as much as $299/month. This affordability issue is more prevalent in neighborhoods with high poverty rates, particularly in South and Central Bronx.[15]

As shown in the following table, the Bronx faces the highest average price and the lowest relative broadband affordability due to its lower median household income relative to the rest of the city. As of 2023, the Bronx also had the highest share of households with income below the federal poverty level in New York City, with no broadband access and with access using cellular plans only.[16] Brooklyn is next, with the second-highest share of households without broadband access.

## Figure 7: NYC Boroughs and Broadband Affordability

| NYC BOROUGH | LOWEST AVERAGE PRICE OFFERED ($)[17] | RELATIVE BROADBAND AFFORDABILITY | ANNUAL MEDIAN HOUSEHOLD INCOME |
|---|---|---|---|
| **Manhattan** | **$49.99** | **0.53** | **$101,078** |
| **Bronx** | **$68.99** | **2.08** | **$46,838** |
| **Brooklyn** | **$53.89** | **0.92** | **$76,912** |
| **Queens** | **$51.99** | **0.68** | **$81,929** |
| **Staten Island** | **$52.99** | **0.55** | **$95.543** |

Source: FRBNY Author's calculations using data from The MarkUp (2022) and 2022 American Community Survey 5-year Estimates

To address these disparities, New York City has initiated several efforts to improve access to free and affordable broadband throughout the city. Namely, community-led broadband solutions have gained traction. NYC Mesh, for example, is a nonprofit building an open, affordable wireless network

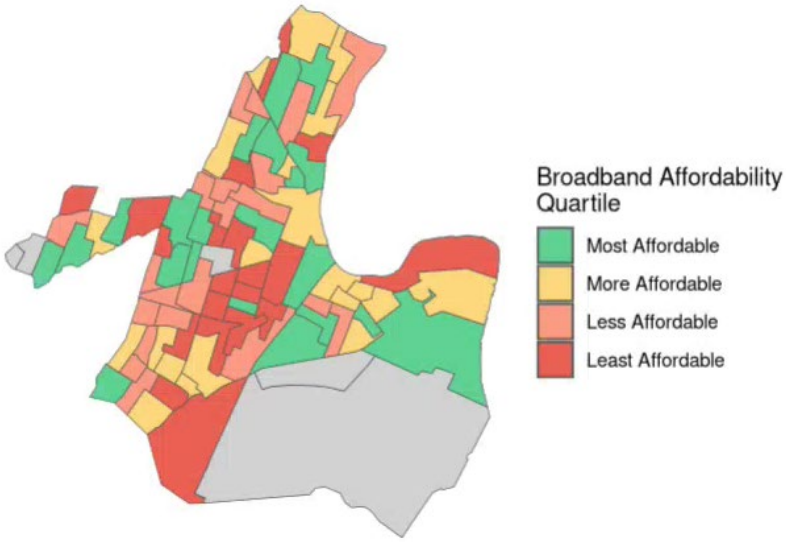
[14] https://www.osc.ny.gov/files/reports/pdf/report-20-2025.pdf
[15] https://nycfuture.org/research/understanding-and-overcoming-the-bronx-digital-divide
[16] https://www.osc.ny.gov/files/reports/pdf/report-20-2025.pdf
[17] Note: Average price is the average of lowest priced plan reported at the census tract level for each city.

across the city that is now the largest community-based network in the United States.[18] LinkNYC also provides free high-speed Wi-Fi via public kiosks, and speed test data from Ookla has shown that LinkNYC has offered faster average download and upload speeds than NYC's average download and upload speeds over mobile Wi-Fi (74% and 165% respectively).[19] In addition, local initiatives like the Red Hook Initiative have installed mesh networks in public housing to help bridge the gap for underserved residents in the wake of Hurricane Sandy.[20] Additionally, LibertyLink is an initiative that offers free Internet for households in Section 8 housing that meet certain eligibility criteria through existing participation in income-based welfare programs.[21]

## Newark

Newark, New Jersey is the state's largest and oldest urban center. Nearly 24.6% of residents live below the poverty line, and the median household income—approximately $41,335—remains well below the New Jersey average of over $89,000.[22] The city's neighborhoods reflect a socioeconomic divide, with areas like the South and Central Wards facing underinvestment and higher housing cost burdens.

### Figure 8: Relative Broadband Affordability by Census Tract in Newark




Source: FRBNY Author's calculations using data from The Markup (2022) and 2022 American Community Survey 5-year estimates.
Note: Gray areas indicate data unavailability.

[18] https://www.nycmesh.net/
[19] https://www.ookla.com/articles/linknyc-2017
[20] https://www.inverse.com/article/46269-brooklyn-community-red-hook-created-a-free-wireless-network-after-sandy
[21] https://www.nyc.gov/office-of-the-mayor/news/544-25/mayor-adams-hpd-nypl-new-program-deliver-free-low-cost-wi-fi-thousands-of#/0
[22] Calculated using Census Bureau American Community Survey 5-year estimates, 2022

Figure 8 shows there is relative broadband affordability in Newark across the city, but areas where broadband is the least affordable are concentrated in primarily low-and-moderate income areas. The least affordable areas are concentrated in the south and central wards, as well as parts of West and Upper Clinton Hill. These areas are historically lower income, have higher poverty rates relative to the rest of the city, and are largely Black and Hispanic communities.

More affordable areas in Newark appear in the North Ironbound district, Forest Hill, and parts of the West Ward. These neighborhoods have slightly higher household incomes and lower poverty rates. There remain areas throughout the city, however, where affordability varies block by block, showing intra-neighborhood disparities—which is likely a product of uneven investments in housing and infrastructure deployment in rapidly changing neighborhoods.

Newark has taken a number of steps to address broadband affordability constraints, including expanding a municipally run network called Newark Fiber[23] that initially served anchor institutions like libraries and community health centers but has now expanded to residential areas, including public housing.[24] The network includes 12 public housing buildings where residents can access Internet for $20 a month, impacting about 1,600 low-and-moderate income families.[25]

## Bridgeport

Bridgeport, Connecticut is the state's largest city, located along the Long Island Sound in Fairfield County. As of the 2022 American Community Survey, over 22% of Bridgeport residents live below the poverty line, and the median household income, around $52,811, remains far lower than the Fairfield County median of over $100,000.[26]

Digital access is one of the most recent dimensions of this inequality. Although broadband infrastructure reaches most homes, the cost and quality of service remains a significant barrier for many Bridgeport households. As of 2021, 11% of the population in Bridgeport lacked an at-home broadband connection.[27]

Additionally, until recently, many Bridgeport residents who accessed broadband were reliant on slower, older forms of technology like copper, which offer reduced speeds relative to the cost of their plans. The table below compares low-and-moderate income census tracts with middle-income ones

[23] https://investnewark.org/newark-fiber/
[24] https://communitynetworks.org/taxonomy/term/7909
[25] https://www.njspotlightnews.org/video/low-cost-internet-for-more-newark-families/
[26] Calculated using Census Bureau American Community Survey 5-year estimates, 2022.
[27] https://ctdatahaven.org/sites/ctdatahaven/files/bridgeport_equity_2023.pdf

in Bridgeport. Despite paying a lower average price ($49.50 versus $64.20), low- and moderate-income households experience far worse affordability and speed. An average upload speed of 5.04 Mbps and download speed of 14.04 Mbps is far lower than the FCC's broadband speed threshold of 100/20 Mbps for a family of five.

## Figure 9: Broadband Affordability and Quality in Bridgeport

| CENSUS TRACT INCOME RANGE | LOWEST AVERAGE PRICE OFFERED ($) | AVERAGE UPLOAD/DOWNLOAD SPEEDS (MBPS) | AVERAGE AFFORDABILITY AS % OF MHI |
|---|---|---|---|
| **Low-and-Moderate Income** | **$49.95** | **5.04/14.04** | **2.53%** |
| **Middle Income** | **$64.20** | **197/201** | **1.01%** |

Source: FRBNY Author's calculations using data from The Markup (2022) and 2022 American Community Survey 5-year estimates.

Broadband costs consume 2.53% of median household income (MHI) in low-income tracts, over twice the 1.01% share in middle-income ones. This differential illustrates the premium low-and-moderate income households must pay in Bridgeport because of high broadband prices relative to income, for significantly worse service. Many are also likely to rely on older, slower technologies like DSL or copper infrastructure, which remain in use in underinvested areas.

To address the two-pronged issue of poor service quality and higher prices for broadband, Bridgeport has made commitments through public-private partnerships to expand access to high-speed internet services to 62,000 households, as part of a broader effort to expand access to fiber-based broadband in Fairfield County.[28]

[28] https://patch.com/connecticut/bridgeport/high-speed-internet-expansion-underway-bridgeport

# Conclusion

Broadband adoption brings economic and social returns to households, particularly low-and-moderate income households. Internet access provides opportunities for economic mobility through job seeking and professional development, and access to vital services such as online banking and telehealth. In many places, particularly low-and-moderate income metropolitan neighborhoods, broadband affordability is the final barrier to broadband adoption. This means that interventions that bring down the cost of broadband for low-and-moderate income families can have compounding social and economic returns to low-and-moderate income households and communities.

It is important to understand monthly broadband prices as a share of median household income. The measurement introduced in this study of Relative Broadband Affordability is more reflective of a household's ability to pay for broadband, particularly in the context of existing income constraints. In cities, broadband prices may not be significantly different in adjacent or nearby census tracts, but these prices as a share of household income in a low-and-moderate income census tract will likely influence whether a household adopts and sustains a broadband connection while balancing other important household costs.

Data on broadband pricing continues to be limited for smaller geographies and rural areas, which highlights the need for local, state, and national data collection efforts on broadband price offers at the community level to advance research on broadband pricing and accessibility, especially for low-and-moderate income populations.

# Data Appendix

## About the Data: Using Broadband Pricing Data in this Study

Existing data on broadband pricing is often limited to aggregate price estimates at the state level or for metropolitan areas. The FCC Urban Rate Survey, an annual survey of the fixed voice and broadband service rates offered to consumers in urban areas, aims to provide reasonable comparability benchmarks for fixed voice and broadband rates for universal service purposes.[29] The data provides information about providers in each state and the average rates offered for different broadband technologies, plans, and speeds, but does not offer information about serviced geographies within each state for each provider.[30]

This report uses the FCC Urban Rate Survey to illustrate associations between broadband speeds, technology type, and price. However, the broader analysis utilizes data from The Markup's point-in-time estimates of address-level broadband pricing data from cities,[31] the "How We Uncovered Disparities in Internet Deals" dataset used to conduct a report on disparities in Internet speeds offered for the same price in low-income versus middle-and-high income neighborhoods[32] The data, collected in 2022, uses information from 800,000 Internet plans from four Internet service providers. Pricing information from these plans, representing the lowest price offered by each plan, is available at the address level for 38 cities and provides information about average download and upload speeds offered for each plan.

There are limitations that come with using the Internet plan pricing data provided by The Markup. One, data is sampled from only one year (2022) and therefore cannot be used to illustrate changes in price over time. Two, the data often only contains pricing information for one or two providers per city, a phenomenon which is consistent with the way internet service providers often cover distinct geographies, however, it reduces variation in the data. The data, as it is used in this study, is only intended to provide illustrative, quantitative information on what broadband prices look like relative to median household income in cities but may or may not be representative.

[29] https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources
[30] BroadbandNow also offers data on low-cost broadband options at the zip code level, but this data is as of 2019, and the costs for broadband plans have varied significantly since then.
[31] https://github.com/the-markup/investigation-isp/blob/main/data/output/tables/table1_disparities_by_city.csv
[32] https://themarkup.org/still-loading/2022/10/19/dollars-to-megabits-you-may-be-paying-400-times-as-much-as-your-neighbor-for-internet-service

## Socioeconomic Data

This study also uses data from the Census Bureau's 2022 American Community Survey 5-year estimates for data on median household income, rent burden, and broadband subscription type at the census tract level. Please view the table below for a summary of the data tables used for this study:

| CENSUS TABLE | TOPIC AND VARIABLES |
|---|---|
| **B19013** | **Median Household Income** |
| **B25058** | **Median Contract Rent** |
| **B28002** | **Presence and Types of Internet Subscriptions in Households**<br>• **With an Internet Subscription**<br>• **Broadband such as cable, fiber optic, or DSL**<br>• **Cellular data plan with no other type of Internet Subscription**<br>• **No Internet access** |

Additionally, for estimates on the cost of utilities in cities, the study used data from the Bureau of Labor Statistics' Consumer Price Index Series for Metropolitan Statistical Areas and Urban Consumers.[33] The cost of utilities was computed by aggregating the average cost of electricity, fuel, heat, and water for all urban consumers in an MSA.

[33] https://www.bls.gov/cpi/

# Figure Appendix

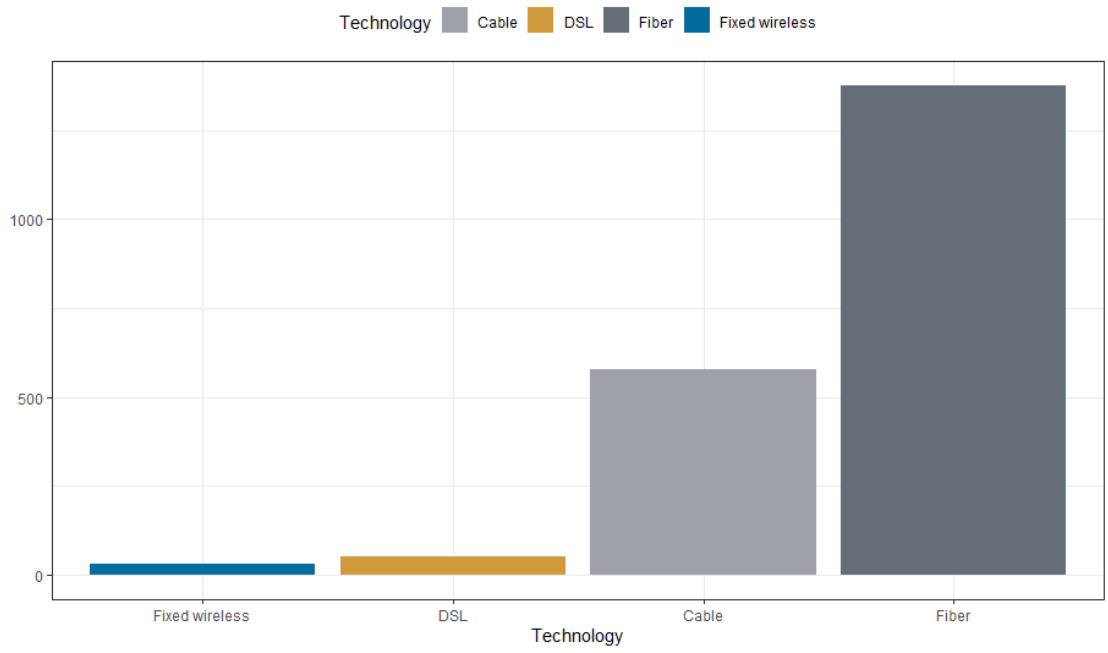
## Broadband Affordability, Technology, and Speed

Broadband pricing is often closely related to both broadband technology type serviced as well as the quality of download and upload speeds offered. According to the FCC, an adequate broadband connection for a household is defined as 100 Mbps download speeds and 20 Mbps upload speeds. Price and technology type are key determinants of whether a household can access a broadband plan that meets this speed and quality threshold.

When broken down by technology type, DSL continues to be the most affordable historically but is largely considered among the lowest-performing broadband connection type in speed.[34] The bulk of DSL plans are offered in areas where there are few alternative broadband technology options, such as rural areas. As shown in Figures A and B, DSL is the cheapest technology but offers on average less than 100 Mbps download speeds.

### Figure A: Broadband Technology and Average Download Speed

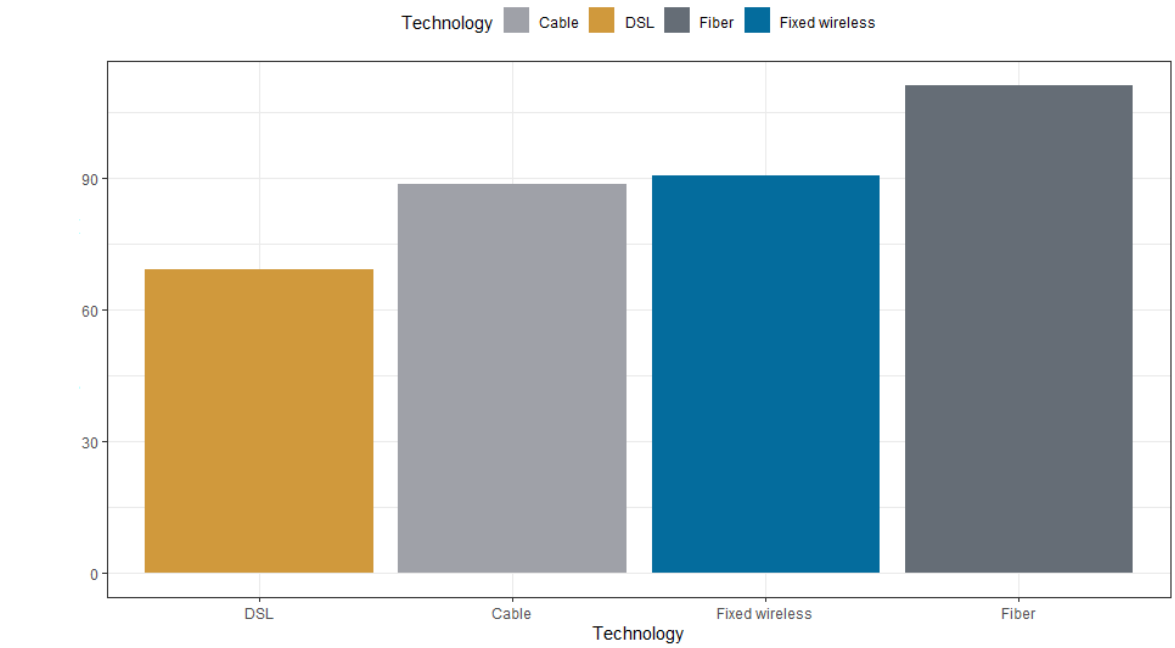
Monthly Broadband Price ($)




Source: FCC Urban Rate Survey, 2022 American Community Survey 5-year estimates.

[34] https://broadbandnow.com/research/broadband-pricing-trends

## Figure B: Broadband Technology and Average Monthly Broadband Price




Source: FCC Urban Rate Survey, 2022 American Community Survey 5-year estimates.

Fiber is the highest performing broadband technology in terms of speed. While fiber has decreased in price over time, it remains the most expensive technology for users. Cable internet has been one of the most dominant mediums for connectivity (alongside DSL) for decades. It offers a fairly accessible option for broadband connectivity that offers adequate download speeds.

Satellite, not pictured above, is one of the most widely available Internet connections overall[35] and was priced anywhere between $20 to $250, as of 2021. However, its speeds, on average, do not compete with some wired connections like cable and fiber. According to BroadbandNow, while satellite Internet can reach a maximum speed of 220 Mbps, fiber and cable can reach a maximum speed of 10 Gbps and 1.2 Gbps respectively.[36]

[35] https://broadbandnow.com/Satellite
[36] https://broadbandnow.com/guides/internet-contracts-and-fees-explained

# Table Appendix

| CITY | Relative Broadband Affordability | Average Download Speed | Average Upload Speed | Average Monthly Price ($) | Median Annual Household Income ($) | Median Monthly Household Income ($) |
|---|---|---|---|---|---|---|
| Detroit, MI | 1.8 | 54 | 28 | 57.43 | 37,761 | 3,146.75 |
| Cleveland, OH | 1.8 | 123 | 111 | 55.00 | 37,271 | 3,105.92 |
| Jackson, MS | 1.6 | 70 | 42 | 55.00 | 42,193 | 3,516.08 |
| Milwaukee, WI | 1.4 | 122 | 99 | 57.45 | 49,733 | 4,144.42 |
| Memphis, TN | 1.4 | 103 | 80 | 55.00 | 48,090 | 4,007.50 |
| New Orleans, LA | 1.3 | 76 | 69 | 57.38 | 51,116 | 4,259.67 |
| Bridgeport, CT | 1.3 | 118 | 111 | 57.30 | 54,440 | 4,536.67 |
| Charleston, WV | 1.2 | 145 | 140 | 59.23 | 58,902 | 4,908.50 |
| Little Rock, AR | 1.2 | 124 | 110 | 57.43 | 58,697 | 4,891.42 |
| Indianapolis, IN | 1.2 | 99 | 77 | 57.43 | 59,110 | 4,925.83 |
| Houston, TX | 1.1 | 126 | 108 | 57.45 | 60,440 | 5,036.67 |
| Wichita, KS | 1.1 | 128 | 114 | 57.45 | 60,712 | 5,059.33 |
| Newark, NJ | 1.1 | 265 | 264 | 41.78 | 46,460 | 3,871.67 |
| Jacksonville, FL | 1.1 | 115 | 94 | 57.40 | 64,138 | 5,344.83 |
| Oklahoma City, OK | 1.1 | 110 | 99 | 57.42 | 64,251 | 5,354.25 |
| Columbus, OH | 1.1 | 70 | 50 | 55.70 | 62,994 | 5,249.50 |
| Kansas City, MO | 1.1 | 56 | 32 | 57.42 | 65,256 | 5,438.00 |
| Huntsville, AL | 1.0 | 163 | 161 | 57.47 | 67,874 | 5,656.17 |
| Albuquerque, NM | 1.0 | 37 | 4 | 49.98 | 61,503 | 5,125.25 |
| Chicago, IL | 1.0 | 90 | 58 | 57.43 | 71,673 | 5,972.75 |
| Des Moines, IA | 1.0 | 46 | 27 | 49.98 | 62,378 | 5,198.17 |
| Nashville, TN | 1.0 | 143 | 137 | 56.94 | 71,328 | 5,944.00 |
| Fargo, ND | 0.9 | 26 | 4 | 49.98 | 64,432 | 5,369.33 |
| Charlotte, NC | 0.9 | 157 | 148 | 57.43 | 74,070 | 6,172.50 |
| Los Angeles, CA | 0.9 | 93 | 75 | 57.49 | 76,244 | 6,353.67 |
| Las Vegas, NV | 0.9 | 29 | 10 | 50.03 | 66,356 | 5,529.67 |
| Atlanta, GA | 0.9 | 150 | 141 | 57.42 | 77,655 | 6,471.25 |
| Wilmington, DE | 0.9 | 266 | 266 | 40.35 | 54,731 | 4,560.92 |
| Philadelphia, PA | 0.9 | 293 | 293 | 42.04 | 57,537 | 4,794.75 |
| Billings, MT | 0.9 | 14 | 2 | 49.98 | 69,692 | 5,807.67 |
| Omaha, NE | 0.9 | 55 | 41 | 49.98 | 70,202 | 5,850.17 |
| Sioux Falls, SD | 0.8 | 23 | 6 | 49.98 | 71,785 | 5,982.08 |
| Phoenix, AZ | 0.8 | 43 | 15 | 49.98 | 72,092 | 6,007.67 |
| Salt Lake City, UT | 0.8 | 72 | 59 | 49.98 | 72,357 | 6,029.75 |
| Baltimore, MD | 0.8 | 14 | 6 | 40.06 | 58,349 | 4,862.42 |
| Charleston, SC | 0.8 | 78 | 54 | 57.47 | 83,891 | 6,990.92 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Providence, RI | 0.8 | 297 | 297 | 42.02 | 61,365 | 5,113.75 |
| Cheyenne, WY | 0.8 | 28 | 5 | 49.98 | 74,989 | 6,249.08 |
| Minneapolis, MN | 0.8 | 136 | 118 | 50.00 | 76,332 | 6,361.00 |
| Boise, ID | 0.8 | 52 | 24 | 49.98 | 76,402 | 6,366.83 |
| Portland, OR | 0.7 | 82 | 74 | 50.05 | 85,876 | 7,156.33 |
| Denver, CO | 0.7 | 79 | 64 | 49.98 | 85,853 | 7,154.42 |
| New York, NY | 0.7 | 298 | 298 | 42.17 | 76,607 | 6,383.92 |
| Virginia Beach, VA | 0.6 | 221 | 218 | 41.56 | 87,544 | 7,295.33 |
| Boston, MA | 0.6 | 288 | 287 | 42.19 | 89,212 | 7,434.33 |
| Seattle, WA | 0.5 | 174 | 65 | 49.98 | 116,068 | 9,672.33 |
| Washington, DC | 0.5 | 225 | 223 | 41.71 | 101,722 | 8,476.83 |