



Broadband Pricing Trends in California, 2024 Report

Implications of broadband pricing in achieving universal access to fixed broadband

The Public Advocates Office
California Public Utilities Commission

Authors:

Elizabeth Louie
Eileen Odell

Project Supervisor:

Charlotte Perrault

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Executive Summary

Broadband is essential for accessing emergency services, healthcare, employment, education, and social services.¹ Demand for fixed broadband services has increased since the COVID-19 pandemic.² The price of broadband service is one of the key barriers to broadband adoption.³ This white paper presents analyses by the Public Advocates Office at the California Public Utilities Commission (commonly referred to as Cal Advocates in proceedings) on broadband pricing trends in California. This white paper informs the dialogue about the price of broadband and its role in achieving or inhibiting universal access to affordable broadband in California.

The Public Advocates Office relied on California-specific broadband pricing data collected from fixed broadband⁴ service providers (via the Public Advocates Office's Annual Broadband Pricing Data Requests),⁵ data collected via the Federal Communications Commission's (FCC) Urban Rate Survey (URS), and other publicly available information to perform the analyses presented in this white paper.

The main findings of these analyses are as follows:

- Across urban and rural areas of California, monthly prices for standalone broadband plans vary widely across speed tiers and across the range of technologies over which services are delivered.

Pricing information collected via the Public Advocates Office's Annual Broadband Pricing Data Requests indicates that average broadband prices have increased since 2022 for plans offering speeds of less than or equal to 25 Mbps as well as for plans offering speeds of greater than or equal to 100 Mbps up through 1000 Mbps. Increases to prices for these plans are significant because these are the buckets that represent the slowest speeds available and the speeds subscribed to by most households in the United States (of those that subscribe to broadband service), respectively.

- According to responses to the Public Advocates Office's 2023 Annual Broadband Pricing Data Request, fixed wireless broadband service rates increased by 197% from 2021 to January 2023. Fixed wireless broadband service rates continue to be some of the most expensive broadband service rates available in California when both urban and rural areas are considered, with an average monthly price of \$171.16 for fixed wireless access plans offering less than or equal to 100 Mbps and \$195.04 across all speed tiers. This finding contrasts with trends identified in the FCC URS data for

2022, which shows significant decreases to average fixed wireless access broadband rates reported for urban areas in California between 2021 and 2022. This highlights the potential that significantly higher fixed wireless access broadband rates are charged in rural areas than in urban areas.

- Municipal broadband providers in California offer rates for fiber to the home (FTTH) broadband service that are similar in price to those offered by the largest internet service providers (ISPs).
- In its report to the legislature on the California Advanced Services Fund (CASF), published in 2022, the California Public Utilities Commission (CPUC) estimated that in 2020, 83.3% of households with access to broadband service offering speeds of at least 25 Mbps download and 3 Mbps upload (25/3 Mbps) at home subscribed to such service. However, after the CPUC received more granular subscription data from ISPs, its CASF report published in 2023 estimated that in 2021, only 68.5% of California households with access to 25/3 Mbps service subscribed to such service.
- While problems relating to limited benefits as well as limited success in enrolling eligible households dampened the success of the Affordable Connectivity Program (ACP), the failure to extend the program will exacerbate the digital divide. The FCC announced on January 12, 2024 that, due to exhaustion of the program’s funding, it was beginning to wind down the ACP and would soon cease accepting applications for new beneficiaries.⁶ By the time the program stopped accepting new enrollees, just half of those California households eligible for ACP benefits had enrolled in the program.⁷ The FCC conducted a survey and found that more than 75% of ACP participants reported that “losing ACP support would disrupt their service by making them change their plan or cause them to drop internet service entirely.”⁸

Please note that the plan prices described in this report may not be available at all provider locations. Not all plans noted are available across providers’ stated service territories and customers should not rely on the information for specific plan availability in a given area. Some prices provided represent averages of a number of plan prices, rather than specific provider offerings. Please contact service providers to verify plan and price availability.

Household Broadband Guide⁹

	Light Use Basic functions: email, browsing, basic video, VoIP, Internet radio	Moderate Use Basic functions plus one high-demand application: streaming HD video, multiparty video conferencing, online gaming, telecommuting	High Use Basic functions plus more than one high-demand application running at the same time
1 user on 1 device	3-8 Mbps	3-8 Mbps	12-25 Mbps
2 users or devices at a time	3-8 Mbps	12-25 Mbps	12-25 Mbps/More than 25 Mbps
3 users or devices at a time	12-25 Mbps	12-25 Mbps	More than 25 Mbps
4 users or devices at a time	12-25 Mbps	More than 25 Mbps	More than 25 Mbps

Glossary

Broadband	<p>High-speed Internet access that allows users to access the Internet and Internet-related services at significantly higher speeds than those available through “dial-up” services. The Federal Communications Commission (FCC) set the national broadband speed benchmark at 25/3 Mbps in 2015. In March 2024, the FCC increased the national broadband speed benchmark to 100/20 Mbps.</p> <p>See FCC, Getting Broadband Q&A, https://www.fcc.gov/consumers/guides/getting-broadband-qa. See also FCC, 2024 Section 706 Report, FCC 24-27, https://docs.fcc.gov/public/attachments/FCC-24-27A1.pdf.</p>
Broadband adoption	<p>Broadband adoption is the subscription to broadband service when such service and infrastructure are available. As such, adoption is often depicted as a subscription rate, measured by dividing the number of broadband subscribers in an area by the number of households with access to broadband service.</p>
Broadband Equity, Access, and Deployment Program	<p>The Broadband Equity, Access, and Deployment (BEAD) Program is a broadband deployment grant program created by the federal Infrastructure Investment and Jobs Act in 2022. As of April 2024, the CPUC is in the process of creating BEAD program rules, which will distribute roughly \$1.86 billion dollars to bring broadband service to locations that lack access to speeds of 25/3 Mbps and, if funding allows, to locations that lack access to speeds of 100/20 Mbps.</p> <p>See CPUC, California Broadband Equity, Access, and Deployment Program website, https://www.cpuc.ca.gov/beadprogram</p>
Broadband subscription rate	<p>The percentage of total population with access to broadband service that subscribes to a broadband service.</p>
California Advanced Services Fund	<p>The California Advanced Services Fund (CASF) is a broadband deployment and adoption grant program implemented by the CPUC. The CASF has multiple subaccounts targeting various broadband-related purposes. Started in late 2007, the program has distributed over \$340 million for infrastructure projects and over \$22 million for adoption projects, with additional amounts distributed via other subaccounts, including the Broadband Consortia Account and the Broadband Public Housing Account.</p> <p>See CPUC, California Advanced Services Fund (CASF) website, https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund and CASF Performance and Financial Audit Reports, https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/casf-performance-and-financial-audit-reports.</p>

Glossary

California High-Cost Fund-A	<p>The California High-Cost Fund-A (CHCF-A) is a state universal service subsidy that provides support for small, independent local exchange carriers operating in high-cost areas across the state. Funded by a surcharge on phone service, the CHCF-A was created to ensure the continued affordability and widespread availability of safe, reliable, high-quality communications services in rural areas of the state.</p> <p>See California Public Utilities Code section 275.6; see also CPUC, CHCF-A website, https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-high-cost-fund-a</p>
Federal Communications Commission Urban Rate Survey	<p>The Federal Communications Commission (FCC) conducts an annual survey of standalone fixed broadband service rates charged by a representative sample of fixed broadband service providers in urban census tracts.</p> <p>See FCC, 2024 Urban Rate Survey Broadband Methodology Report, https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources</p>
Last Mile Federal Funding Account	<p>The Last Mile Federal Funding Account (Federal Funding Account or FFA) is another CPUC-administered broadband deployment grant program. The FFA funds broadband deployment projects, prioritizing those that will deploy fiber infrastructure, to locations that lack reliable wireline service delivering speeds of at least 25/3 Mbps. Created in 2021 by Senate Bill (SB) 156, the program has nearly \$2 billion available for grant awards, but as of April 2024, has yet to award any project funding.</p> <p>See CPUC, Last Mile Federal Funding Account website, https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-implementation-for-california/last-mile-federal-funding-account</p>
Rack Rate	<p>“Rack rate” refers to the monthly price of a retail broadband service plan or subscription, excluding any taxes, surcharges, fees, discounts or promotions.</p>
Small LEC	<p>Small local exchange carriers (Small LECs) are the small independent telephone corporations that provide local exchange services in high-cost areas in California. Ten out of California’s 13 Small LECs elect to receive subsidies from the CHCF-A.</p> <p>See CPUC, CHCF-A website, https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-high-cost-fund-a</p>

Introduction

Broadband is an essential service.¹⁰ Broadband internet access service (broadband) is necessary for work, to attend school, to access social services, to access healthcare portals and telehealth services, and to participate in democracy. Public investment in broadband deployment has increased substantially at the state and national levels since the beginning of the COVID-19 pandemic. President Biden noted that access to high-speed service is no longer a luxury, but a necessity.¹¹ In 2021, the United States (U.S.) Census Bureau's American Community Survey (ACS) five-year estimates indicate that 17.9% of households across the nation lacked a fixed (non-cellular) broadband subscription, down from nearly 23% in 2020.¹² However, the same source indicated that in 2022, the number of American households that lacked a non-cellular broadband connection increased again to nearly 20%.¹³ While broadband is now understood as an essential service,¹⁴ and access to this service increased during the height of the COVID-19 pandemic, progress has since waned and millions continue to lack access to this service in the U.S. This is particularly concerning as one major pandemic-era aid for access to affordable broadband service - the consumer-subsidy known as the Affordable Connectivity Program (ACP) - has run out of funding (as of March 2024) and the last fully-funded month customers received the ACP benefit was April 2024.¹⁵ Prospects for re-funding the program are uncertain.

Regarding California-specific broadband adoption estimates, improved data collection methodologies indicate that California's adoption levels are lower than previously estimated. In 2023, the California Public Utilities Commission (CPUC) estimated that in 2021, just over 4 million households did not subscribe to broadband at speeds of greater than 25 Mbps download and 3 Mbps upload (25/3 Mbps), even though service at that speed was physically available to those households.¹⁶ However, the CPUC had previously reported that in 2020, only 2.2 million households with access to 25/3 Mbps service did not subscribe to services offering at least these speeds.¹⁷ This results in a lower estimated adoption rate for 2021 than was estimated for 2020, down from 83.3% of households with access to 25/3 Mbps service to only 68.5% of California households with access to such service.¹⁸ The CPUC updated its adoption estimate after receiving more granular subscription data from internet service providers (ISPs).¹⁹

As noted in the Public Advocates Office's prior Broadband Pricing White Paper ([The Public Advocates Office 2023 Broadband Pricing White Paper](#)),²⁰ the challenge for connecting

households to broadband service is not solely the lack of broadband infrastructure in a community but the equally important barrier posed by lack of *affordable* broadband service available in the area. The price of broadband service is a key barrier to broadband adoption.²¹

California-specific broadband price analysis continues to be an urgent task, particularly to ensure that recent large public investments in broadband deployment deliver public benefits, including affordable broadband service. The state has begun to implement its historic \$6 billion broadband investment, enacted via Senate Bill (SB) 156 (2021),²² including breaking ground on the statewide middle mile network²³ and accepting applications for the Last Mile Federal Funding Account (FFA).²⁴

While implementing these measures, California is also preparing to distribute its federal Broadband Equity, Access, and Deployment (BEAD) program allocation: an additional \$1.86 billion authorized pursuant to the federal Infrastructure Investment and Jobs Act (IIJA) for broadband deployment projects to unserved and underserved residents.^{25,26} Federal BEAD program rules require the CPUC to define at least one low-cost broadband service option that all grant recipients must offer on BEAD-funded networks.²⁷ BEAD program rules also require the CPUC to adopt a plan to address middle-class affordability “to ensure that *all* consumers have access to *affordable* high-speed internet.”²⁸ Detailed information on broadband pricing in California is critical to inform these processes, to assess whether ultimate efforts to ensure all consumers have access to affordable high-speed internet are successful, and to ensure that the billions of public dollars spent on broadband infrastructure investment will benefit the public, particularly those facing the greatest barriers to broadband adoption.²⁹

This white paper informs the dialogue about the price of broadband and its role in achieving or inhibiting universal access to affordable broadband in California. The key question guiding the analysis in this white paper is: **What are the pricing trends for fixed broadband service plans across broadband service providers, technology types, and broadband service speeds in California?** In answering this question, this paper provides an overview of the trends in fixed broadband prices in California. The white paper is structured as follows:

- **Broadband pricing trends:** Findings related to the pricing trends for fixed broadband plans in California.
- **Broadband adoption trends:** Broadband adoption levels in California.

- **Conclusions:** A summary of findings.

This white paper is accompanied by two focused discussions – one on fixed wireless broadband service and trends, and the other on non-profit broadband service providers, particularly municipal providers. [Appendix A](#) provides a detailed explanation of this white paper’s methodology. [Appendix B](#) explains the broadband delivery technologies discussed in this paper. [Appendix C](#) provides tables illustrating weighted and unweighted average broadband pricing data from the FCC Urban Rate Survey in California and nationwide.

Broadband Pricing Trends in California: Urban and Rural Areas

Broadband rates in California varied widely across different speed tiers, service technologies, and provider-types.

California-specific data collected through the Public Advocates Office’s Annual Broadband Pricing Data Requests for residential broadband plans offered as of January 31, 2023, reveals that monthly broadband prices in 2023 varied widely across speed tiers, technology types, and company types. Figure 1, below, illustrates annual unweighted average California broadband prices across speed tiers, averaging the monthly broadband “rack rates” reported in each speed tier for plans provided over cable service, digital subscriber line (DSL) service, fixed wireless access broadband service, and fiber to the home (FTTH) broadband service. A “rack rate” is a monthly, non-promotional broadband price for standalone broadband plans, not including taxes, fees, or surcharges. These rates are not weighted by potential customer base, actual number of subscribers, or any other factor. They present a simple average of rates in urban and rural areas across California.

Figure 1: Unweighted Average Monthly Prices for Standalone Broadband Service Across California by Speed Tier, 2021-2023, Public Advocates Office Annual Broadband Pricing Data Request Responses

Speed tier	2021 CA Avg Standalone Rate (Cable, DSL, FWA, FTTH)	2022 CA Avg Standalone Rate (Cable, DSL, FWA, FTTH)	2023 CA Avg Standalone Rate (Cable, DSL, FWA, FTTH)
≤25 Mbps	\$105.71	\$111.93	\$118.31
≥26-50 Mbps	\$191.13	\$205.81	\$183.88
≥51-100 Mbps	\$312.03	\$273.55	\$210.90
≥101-1000 Mbps	\$457.93	\$181.17	\$253.36
≥1001+ Mbps	\$166.65	\$141.66	\$115.33

As shown in Figure 1, above, unweighted average broadband prices reported to the Public Advocates Office have varied from year to year, with average pricing decreasing in the ≥51-100 Mbps and ≥1001 Mbps speed tiers and average pricing increasing in the ≤25 Mbps and the ≥101-1000 Mbps speed tiers. The 2022-2023 increase in prices for plans in the ≥101-1000 Mbps speed tier is significant, as these are the speeds that most households in the United States (with broadband subscriptions) subscribed to in 2022.³⁰

This trend, as well as the increasing trend in average prices for the slowest speeds offered across California - those offering less than or equal to 25 Mbps - follow similar trends in the FCC Urban Rate Survey (URS) data.³¹ Data collected via the FCC URS differs from data collected via the Public Advocates Office's Annual Broadband Pricing Data Request in some ways, foremost of which is that the FCC URS collects data on pricing for broadband plans offered in urban areas,³² while the Annual Broadband Pricing Data Requests collect information on broadband plans available in both urban and rural areas across the state. FCC URS data is analyzed further below.

Figure 2, below, compares broadband plan prices, as reported to the Public Advocates Office, across technologies and company types. The five providers with the largest fixed residential broadband deployment footprints in California (Comcast, Charter, Frontier, AT&T and Cox)³³ are grouped as the "Big 5." Small local exchange carriers (Small LECS) that receive subsidies from the California High-Cost Fund-A are grouped as "CHCF-A Small LECs," while those small local exchange carriers that do not receive CHCF-A subsidies are grouped as the "non CHCF-A Small LECs." Municipal and cooperatively owned providers are grouped as "Municipal," and all other providers, including most fixed wireless broadband providers, are grouped as "Others."

Figure 2: California Monthly Recurring Broadband Plan Prices by Company Type and Technology for the ≥ 51 -100 Mbps Download Speed Tier, Jan. 2023

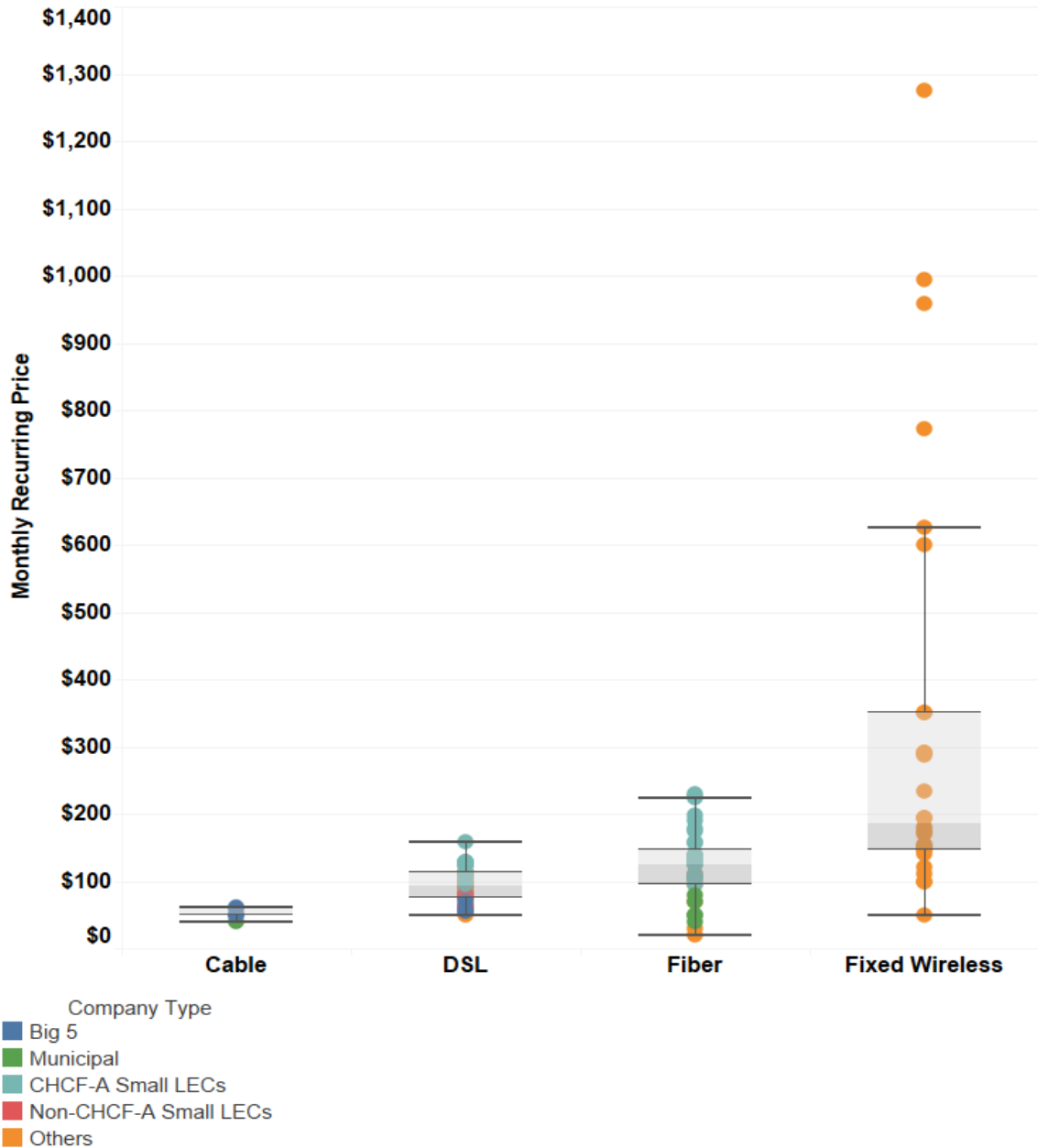


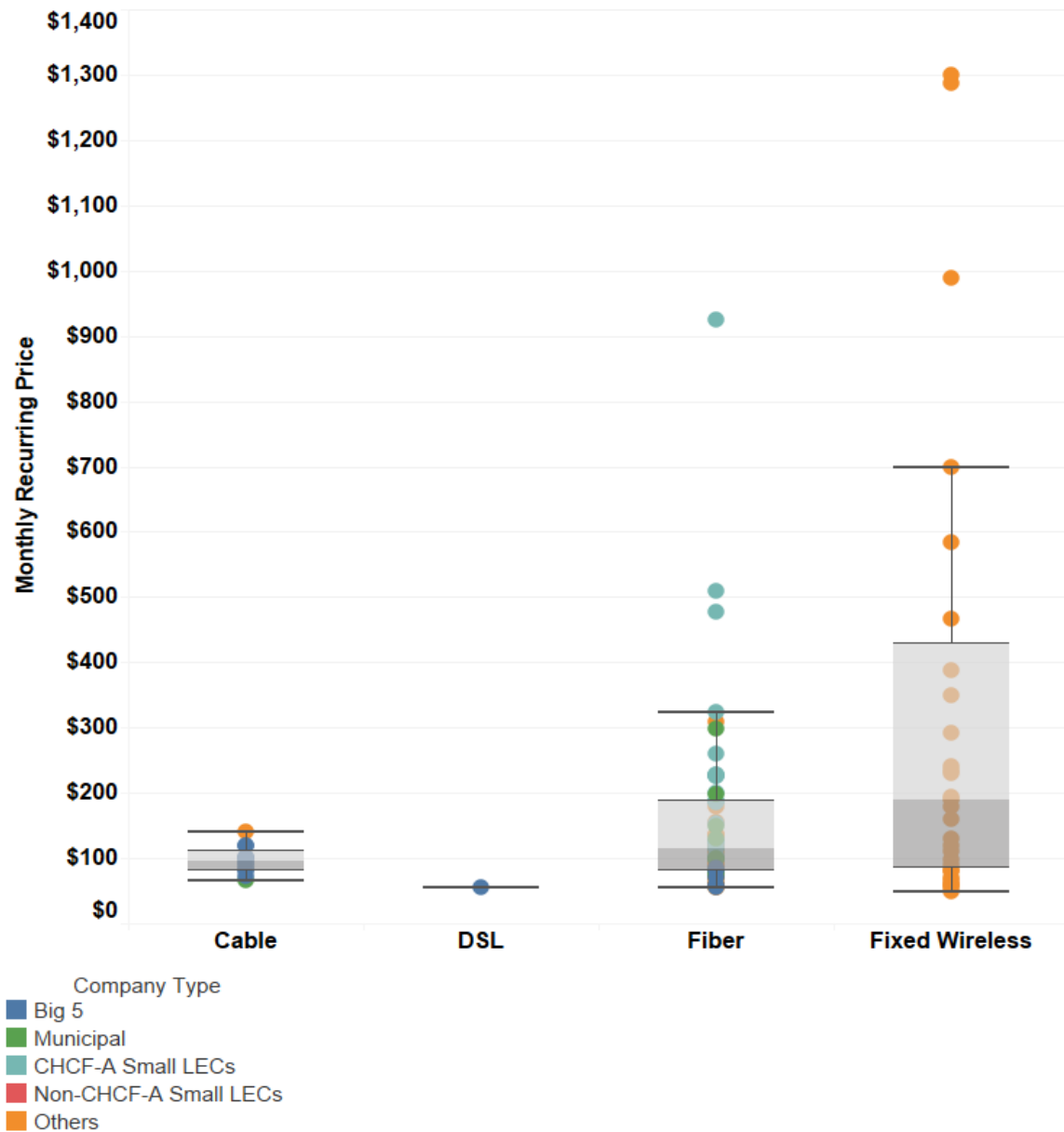
Figure 2 illustrates the wide variation in plan prices for broadband service delivered over fixed wireless access. Though the FCC’s URS survey results, addressed below, showed significant decreases in weighted average urban fixed wireless access broadband rates in 2022, both the FCC URS data and data reported to the Public Advocates Office indicate that fixed wireless access plans can still be the most expensive options available. For example, when examining the speed tier of ≥ 51 -100 Mbps (illustrated in Figure 2, above), monthly broadband prices across

urban and rural California ranged from \$40 to \$61 for cable plans, \$49.95 to \$157.45 for DSL plans and \$20 to \$229 for fiber plans. For fixed wireless broadband plans, prices ranged from \$50 to \$1,275.

The same trend of wide-ranging fixed wireless rates is found when looking at rates for plans offering broadband speeds in the ≥ 101 -1000 Mbps speed tier, shown in Figure 3, below. By way of example, one gigabit (1 G) fixed wireless access broadband plan noted on Figure 3 is available for \$70 per month, while another, also offering 1 G speeds over fixed wireless access broadband service, costs \$1,300 per month.

The trend in monthly broadband prices for fixed wireless access broadband service in the ≥ 101 -1000 Mbps speed tier reported in urban and rural areas diverges from the trend apparent in rates available in only urban areas. While the FCC's URS data show a 10.8% decrease in weighted average fixed wireless access broadband rates in the ≥ 101 -1000 Mbps speed tier in urban California, when both urban and rural California rates are considered, average rates for fixed wireless access plans in this speed tier actually *increased* by 197% from 2021 to January 2023. In fact, the Public Advocates Office's data indicates that fixed wireless access broadband plans were among the most expensive offered across all speed tiers. Plans offered over fixed wireless service represented 30% of all plans offered in California by respondents to the Public Advocates Office's 2023 Pricing Data Request. However, 47% of the plans making up the top quarter percentile in price in this data set were fixed wireless broadband plans, indicating that fixed wireless provided plans are overrepresented (disproportionately present) among the most expensive plans in the Public Advocates Office data set.³⁴

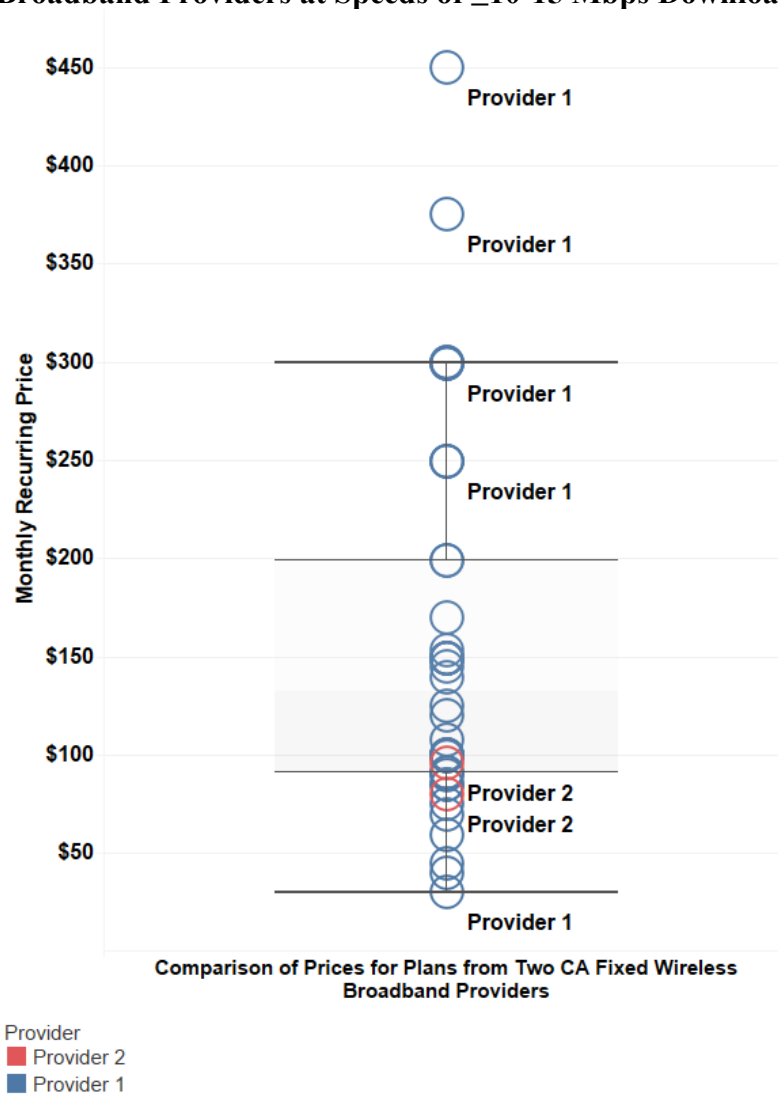
Figure 3: California Monthly Recurring Plan Prices by Company Type and Technology for the Download Speed Tier of $\geq 101-1000$ Mbps, Jan. 2023



The wide variation in the price of fixed wireless broadband plans is occasionally evident even on the scale of single providers. Providers may offer vastly different pricing to different areas of their service territories or to customers who were acquired from other providers and whose broadband plans are retained by, or “grandfathered” into the acquiring providers’ existing pricing scheme. To illustrate this point, the monthly rates for California broadband plans offering speeds of just 10-15 Mbps download offered by two fixed wireless access broadband providers are depicted in Figure 4, below. The first provider, illustrated in blue, operates in both rural and

urban areas, and reported offering 45 different broadband plans that provided download speeds within the 10-15 Mbps range. These plans offered upload speeds ranging from 2-12 Mbps. The range of prices offered spanned from \$30 per month to \$450 per month. This is contrasted with another fixed wireless access provider, illustrated in red, that operates primarily in rural areas, and offers two broadband plans within the 10-15 Mbps download range, coupled with upload speeds of 2-5 Mbps. The monthly recurring prices for these two plans are \$80 and \$96. Fixed wireless access broadband providers and the technological changes that are taking place to deliver fixed wireless access broadband service are discussed in Attachment 1: Focus on Fixed Wireless Access.

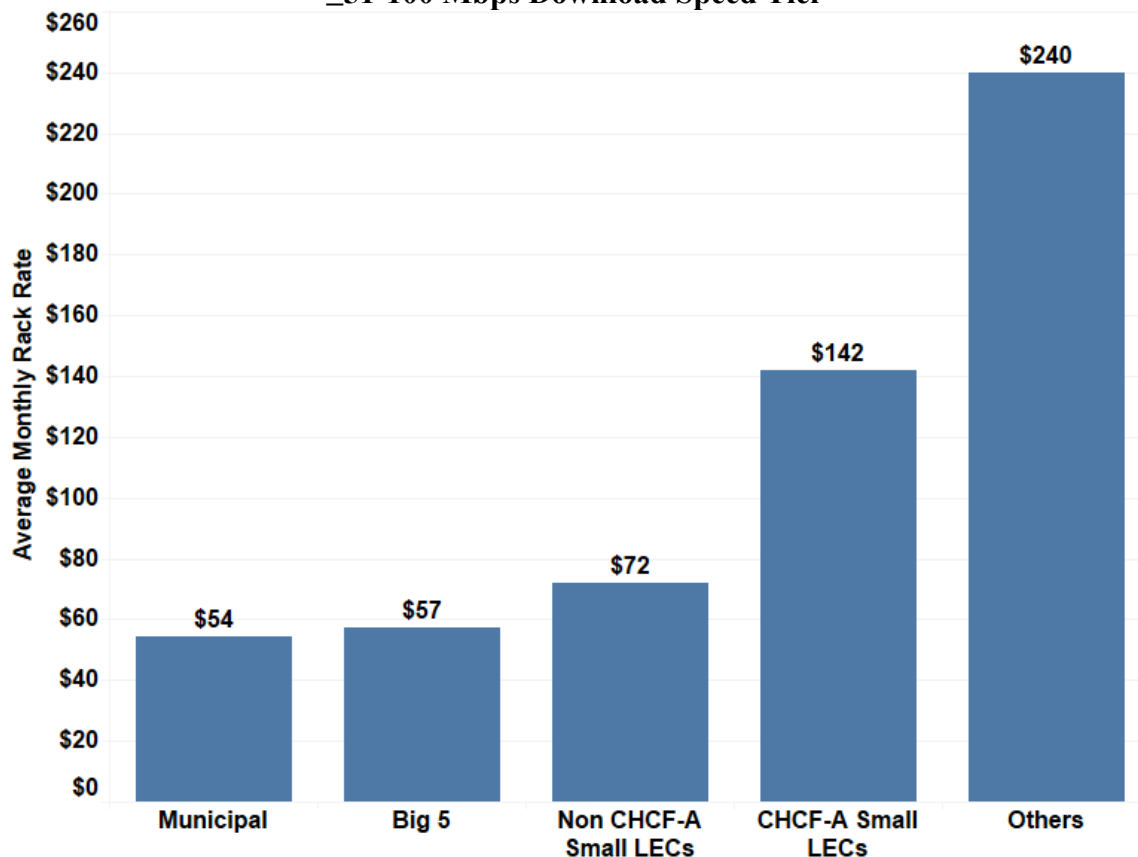
Figure 4: Monthly Recurring Prices of Plans Offered by Two Fixed Wireless Access Broadband Providers at Speeds of ≥ 10 -15 Mbps Download



When rates are aggregated based on provider types, municipal providers, the Big 5, and non-CHCF-A Small Local Exchange Carriers tend to offer the lowest rates for plans in the ≥ 51 -100 speed tier.

As illustrated in Figure 5 below, prices for broadband vary based on provider type. The Public Advocates Office’s collected data shows that when all broadband technologies are considered, municipal providers offer service at the ≥ 51 -100 speed tier at an average of \$54 per month, \$3 per month less than the average price offered by the largest five companies in California: AT&T, Charter, Comcast, Cox, and Frontier. This relative comparability between municipal and Big 5 provider prices is consistent in all speed tiers for plans offering less than or equal to 100 Mbps. Average prices start to diverge for municipal and Big 5 providers for broadband plans offering speeds of greater than or equal to 101-1000 Mbps, for which Big 5 Providers offer less expensive average monthly rates than municipal providers (\$85 vs. \$133). Municipal and other non-profit ISPs are described more fully in Attachment 2: Focus on Non-Profit Providers.

Figure 5: Unweighted Average Monthly Recurring Price of Plans by Company Type in the ≥ 51 -100 Mbps Download Speed Tier



Small Local Exchange Carriers that receive California High-Cost Fund-A subsidies offer some of the highest average rates of all provider types.

Conversely, despite most Small LECs receiving subsidies from the California High-Cost Fund-A Program (CHCF-A),³⁵ the Small LECs that do receive these subsidies consistently offered some of the highest broadband prices across multiple technologies and speed tiers. As shown in Figures 2 and 3, above, the CHCF-A Small LECs offer the highest prices for FTTH broadband plans in the ≥ 101 -1000 speed tier, and the highest prices for both DSL and FTTH plans in the ≥ 51 -100 Mbps speed tier. Broadband prices charged by California's Small LECs are examined in detail in the companion focus paper released with this report, [Focus: Pricing Trends for California's Small Local Exchange Carriers, 2024 Report](#).

Recent Pricing Trends for Broadband Services Offered in California by the Big 5

To further ground this discussion of pricing activity across provider types, it is useful to break out and summarize, at a high level, the major changes in pricing for broadband plans offered by the Big 5, as reported to the Public Advocates Office via Annual Broadband Pricing Data Request responses.

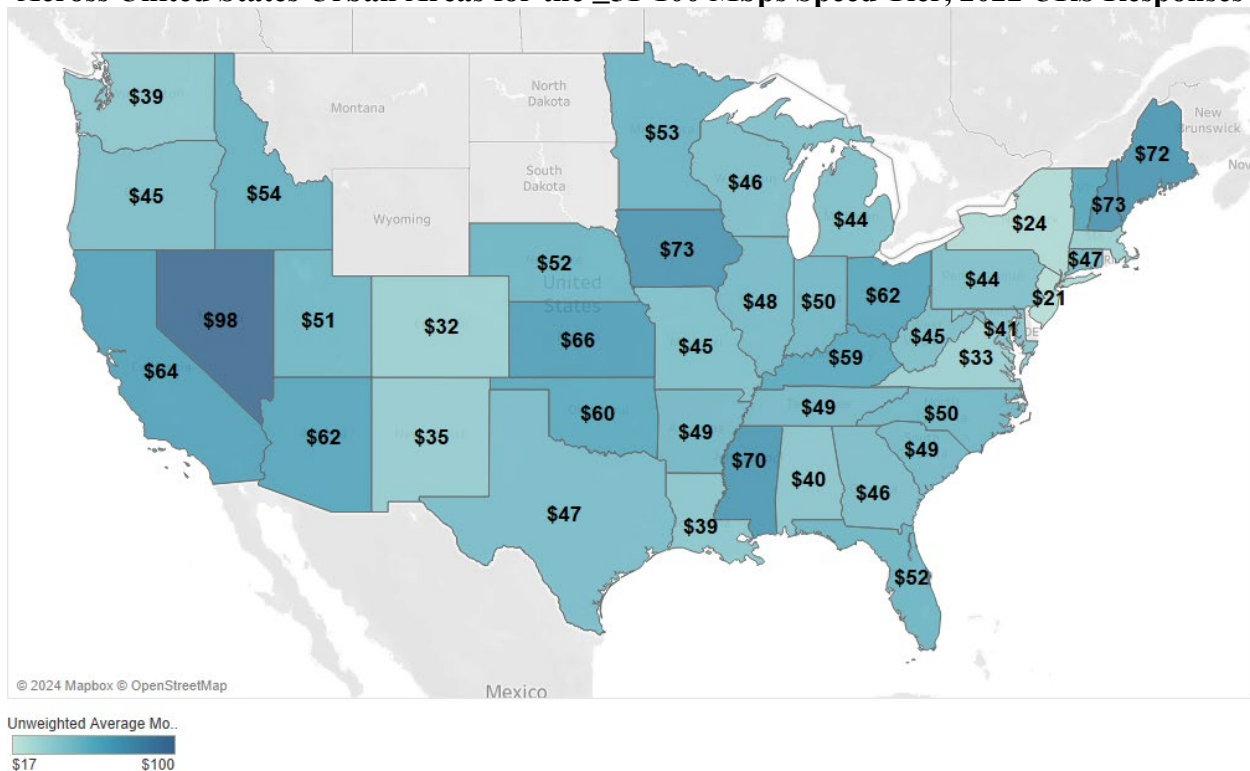
- AT&T did not report to the Public Advocates Office any changes to its broadband plan rates between its January 2022 and January 2023 responses.
- Charter reported increasing most plan prices by about \$5, while increasing speeds for midrange tiers; Charter increased its low-income plan rate by \$2 without increasing speeds (after decreasing this rate by \$2 between 2021 and 2022), and increased installation and self-installation fees across the board.
- Comcast's pricing changes were more varied, occasionally increasing rates while increasing speeds or decreasing rates while also decreasing offered speeds. Comcast's low-income plan rates stayed the same while download speeds increased for its Internet Essentials+ plan; Comcast increased its modem rental fee by \$1.
- Cox increased generally-available (i.e., not income contingent) broadband plan rates only for a mid-tier plan, for which it also increased speeds. Cox also increased speeds offered for low-income plans without increasing rates.
- Frontier provided data indicating the most changes to its rates, flattening its tiers, and thus increasing rates on slower plans: the highest rate for a 500/500 Mbps plan in 2022 was \$54.99, though the same plan was offered for less in some circumstances. All slower plans were \$54.99 or less. However, in 2023, Frontier reported offering fewer speed combinations and all plans 500 Mbps download or slower were priced at \$54.99.

Broadband Pricing Trends in Urban Areas in California and Nationwide

According to the Federal Communications Commission’s 2023 Urban Rate Survey data, the overall unweighted average urban broadband service rates decreased in California between 2021 and 2022.

According to the Federal Communications Commission’s (FCC) Urban Rate Survey data, in 2022, California’s average unweighted monthly recurring broadband price, (i.e., the “rack rate” defined as the monthly prices for broadband service, exclusive of additional fees, taxes, charges, or promotions) decreased drastically in urban areas for certain speed tiers. California’s unweighted average monthly price for broadband service was no longer the highest in the continental U.S. for broadband plans in the ≥ 26 -50 Mbps (download) speed tier or the ≥ 51 -100 Mbps tier.³⁶ While the unweighted plan prices are a simple average, the prices provide a snapshot of plans available to customers in urban areas.

Figure 6: Unweighted Average Monthly Recurring Price for Fixed Broadband Across United States Urban Areas for the ≥ 51 -100 Mbps Speed Tier, 2022 URS Responses

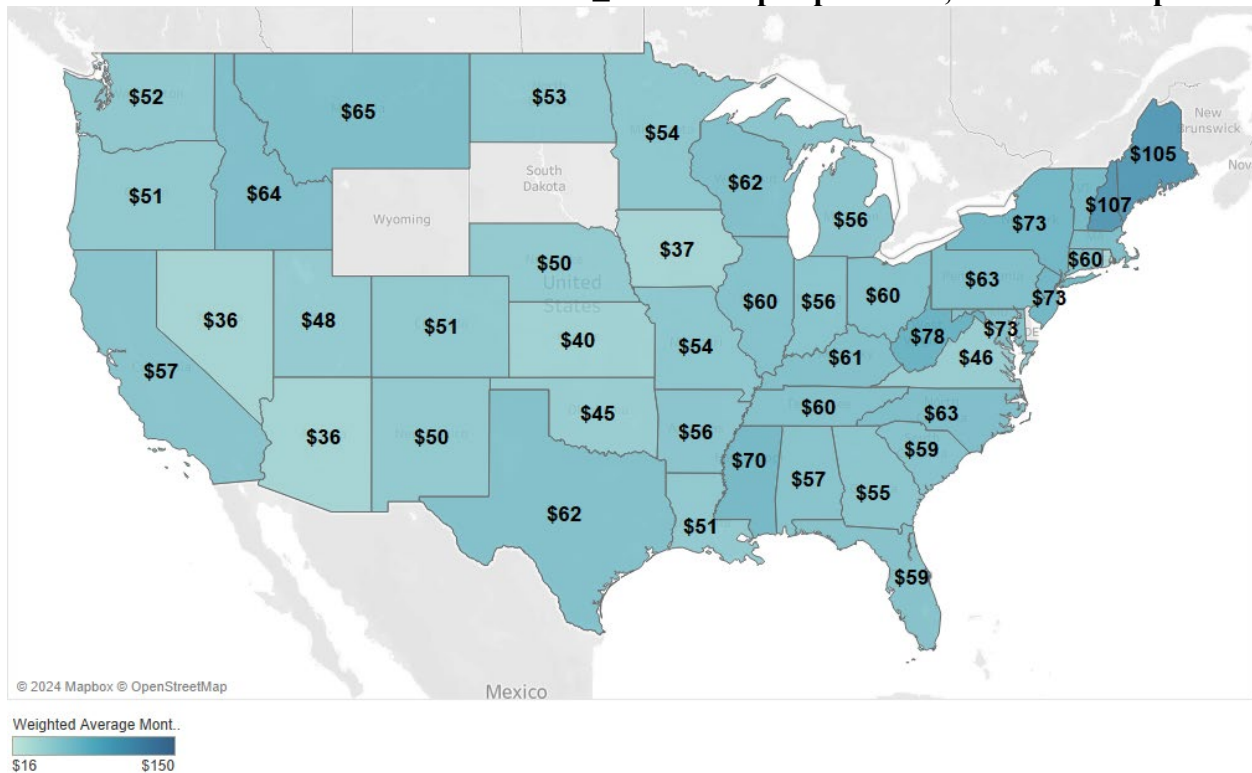


As discussed in the Public Advocates Office’s pricing white paper released in May 2023 ([The Public Advocates Office 2023 Broadband Pricing White Paper](#)) that analyzed rates current

through 2021, California had some of the highest prices in the nation in 2021, with average unweighted plan prices reaching \$157 per month for speeds of greater than or equal to 26-50 Mbps and \$180 for speeds greater than or equal to 51-100 Mbps. However, between 2021 and 2022, California’s unweighted average monthly recurring prices decreased significantly to roughly \$64 in both tiers, driven by decreases in unweighted average rates for cable broadband services. The decrease in overall unweighted average monthly recurring prices in urban areas was consistent among most, though not all, other states.

California’s *weighted* average urban rates dropped from \$65 in the ≥ 51 -100 Mbps speed tier in 2021 to \$57 in 2022 (Figure 7, below). California’s ≥ 26 -50 Mbps weighted average monthly price for broadband service decreased from \$40 in 2021 to \$34 in 2022.

Figure 7: Weighted Average Monthly Recurring Price for Fixed Broadband Across United States Urban Areas for the ≥ 51 -100 Mbps Speed Tier, 2022 URS Responses

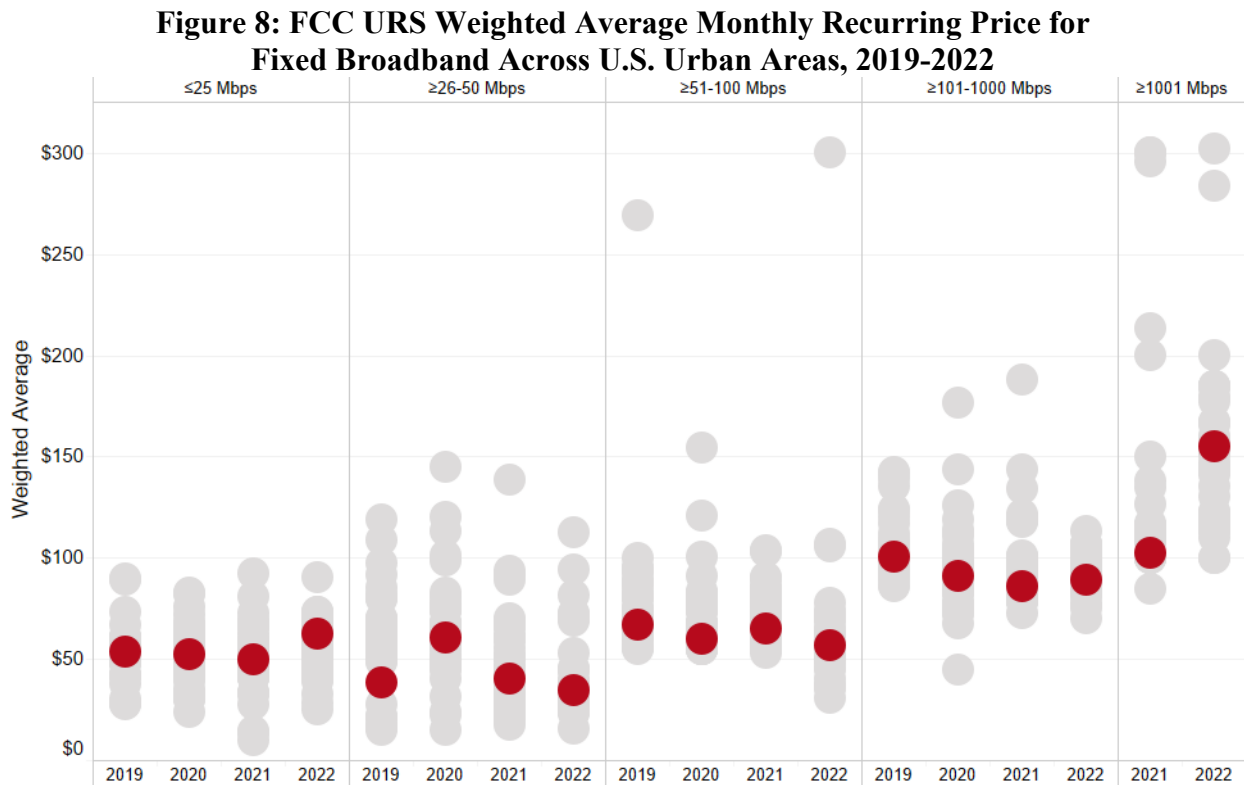


The weights applied to FCC URS data reflect five weighting components: (1) the probability that provider and census tract would be selected for the survey, (2) reflection of any non-responses to the survey, (3) to reflect when one plan rate is offered with multiple service levels or over multiple technologies in a given surveyed census tract, (4) to account for a provider that

advertises multiple rates for the same service level, via different technologies and/or service names and finally, (5) the number of potential subscribers to whom a surveyed provider advertises its services.³⁷ However, because the FCC does not release the full survey responses and data that inform the weights identified for each reported rate plan, we cannot identify which of the weighting components contributes the most to the differences between the weighted and unweighted averages. Tables illustrating the full scope of weighted and unweighted average urban rates by speed tier and technology reported for 2021 and 2022 are available in Appendix C of this report.

The FCC’s URS weighted average rates in urban areas in California increased for plans offering less than or equal to 25 Mbps and for plans offering between 101 and 1000 Mbps, inclusive.

Figure 8, below, illustrates trends in the weighted average broadband plan prices across all technologies and at various speed tiers, depicting the weighted averages for each continental state other than California in gray, California data is highlighted in red.



Between 2021 and 2022, weighted average monthly prices in urban areas of California increased for plans in the ≤25 Mbps, ≥101-1000 Mbps, and, most drastically, in the ≥1001 Mbps speed

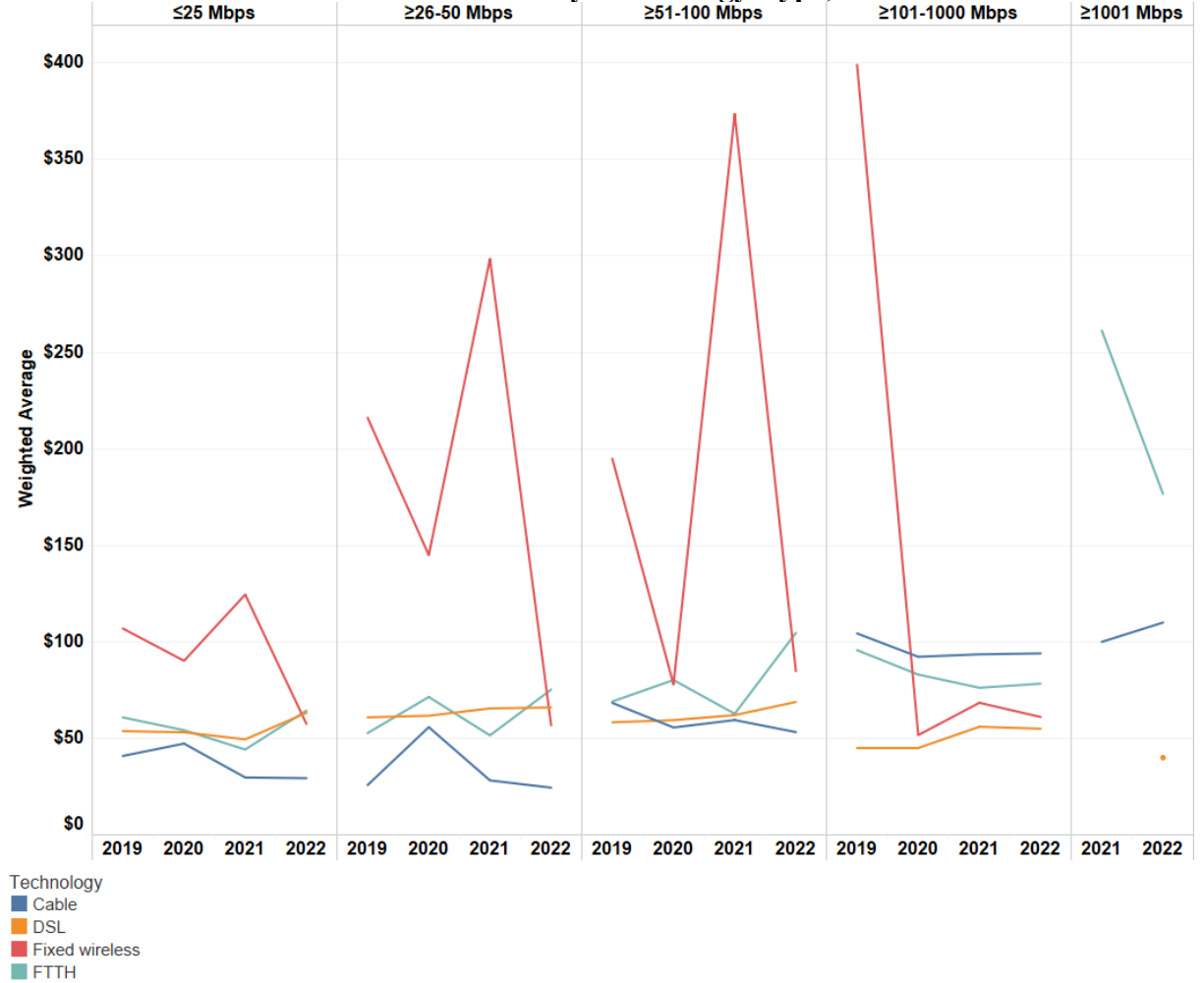
tiers. Increases to rates in these speed tiers are significant because the ≤ 25 Mbps represents the slowest speeds available; customers without access to broadband infrastructure capable of delivering faster speeds may have been left with no option but to pay more for these slower speeds. The ≥ 101 -1000 speed tier captures the plans that most households in the United States (with broadband subscriptions) subscribed to in 2022.³⁸ Increases in weighted average rates in these speed tiers likely impacted a large number of customers, including those who may not have the choice to subscribe to faster service.

While largely similar with regard to the trends of weighted average prices in the other speed tiers, an analysis of *unweighted* average urban rates in California diverges from the results of an analysis of *weighted* average urban rates in California in one respect, a decrease in average rates in the ≤ 25 Mbps speed tier between 2021 and 2022.³⁹

The FCC's URS weighted average urban California price trends varied by speed tier and technology between 2021 and 2022.

Between 2021 and 2022, weighted average prices in urban areas in California decreased for some technology-speed tier buckets. This is particularly true for cable and fixed wireless broadband plans in the ≤ 25 Mbps, ≥ 26 -50 Mbps, and ≥ 51 -100 Mbps download speed tiers. The same trend is apparent in the same technology/speed tier buckets when unweighted rates are analyzed. Conversely, the average price of FTTH plans increased between 2021 and 2022 in California in the same technology/speed tier buckets, as well as in the ≥ 101 -1000 speed tier, under both a weighted and unweighted analysis. Unweighted and weighted average FTTH broadband rates decreased only for those subscribing to the highest speeds (greater than or equal to 1001 Mbps), in urban areas in California. Figure 9, below, provides the 2021-2022 changes in California's weighted average urban broadband rates, summarized by speed tier and technology.

Figure 9: FCC URS Weighted Average Monthly Recurring Price for Broadband Plans in Urban California Areas by Technology Type, 2019-2022



Broadband Adoption Trends in California

Broadband adoption levels in California are lower than previously estimated.

Broadband adoption is often depicted as a subscription rate. It is calculated by dividing the number of broadband subscribers in an area by the number of households with access to broadband service. As noted in the introduction, California’s broadband adoption levels are lower than previously estimated.⁴⁰ The CPUC’s 2022 annual report to the legislature on the California Advanced Services Fund (CASF) program estimates that in 2021, just over four million households did not subscribe to broadband at served speeds of greater than 25 Mbps download and 3 Mbps upload (25/3 Mbps), even though they had access to such service.⁴¹ This means that nearly two million *fewer* households are estimated to have subscribed to broadband at

served speeds in 2021 than in 2020.⁴² The proportion of California households estimated to subscribe to broadband decreased from 83.3% to only 68.5% of California households.

Barriers to accessing affordable broadband plans persist, despite increasing enrollment in subsidy programs such as the Affordable Connectivity Program (ACP).

The price of broadband service is a barrier to broadband adoption. One recent study notes that nearly half of those without a home broadband subscription state that they go without in part because broadband services are too expensive.⁴³ Subsidies on consumer connections, notably the Affordable Connectivity Program (ACP), have been a primary tool that policymakers have used to address the affordability gap. The pace of California enrollment in the ACP increased in the first half of 2023, when an average of nearly 80,000 net new subscribers enrolled each month. This exceeds the 2022 monthly average net additions of about 57,400 per month.⁴⁴ Despite an increased pace of enrollment in 2023 as compared with 2022, almost 3.4 million eligible California households, more than half of all households estimated to be eligible, were not enrolled in the program as of September 15, 2023.⁴⁵

The Public Advocates Office 2023 Broadband Pricing White Paper provides insights on the limitations of low-income broadband adoption for those who need the low-income plans most. These limitations include: (1) varying eligibility requirements, (2) a lack of awareness of plans among eligible subscribers, and (3) the price of devices which may limit the ability of low-income households to subscribe to low-income plans available where they live.⁴⁶ The 2023 Broadband Pricing White Paper also notes that the current income threshold used by many income-contingent plans or subsidies may be too low. This leaves households that cannot afford broadband because they earn too much to qualify for assistance, unsupported.⁴⁷ These concerns remain.

Recent workshops conducted by the California Department of Technology and the CPUC gathered information on additional barriers to accessing low-income plans, particularly the ACP. For instance, in addition to recommending simplified eligibility requirements and new eligibility income thresholds that reflect the cost of living in California, participants in these workshops recommended allowing more than one resident in a household to sign up for discounted services.⁴⁸ This recommendation, which was made despite the fact that the ACP discount may be used by more than one member in a residence provided that they do not share incomes,

suggests a low awareness of program rules on the part of the public, providers, or both.⁴⁹ Residents in these workshops also reported that an additional enrollment process to receive reduced cost or subsidized service is itself a barrier to accessing affordable service, due to the complexity of the process or residents' reticence to share personal information.⁵⁰ Finally, consistent with conclusions noted in the Public Advocates Office 2023 Broadband Pricing White Paper, residents report that the subsidies offered for monthly service and devices could still be insufficient to make broadband access affordable.⁵¹ Policymakers should consider these barriers when shaping comprehensive plans to address broadband affordability. These barriers shine a light on the need for policy makers to approach the issue of affordability with more tools than just subsidized plans.

Summary of Low-Income Qualified Broadband Plans Offered by the Big 5 Telecommunications Providers

Several major broadband providers offer low-cost broadband plans to qualifying low-income households in California (see Figure 10, below), some of which are subsidized by the ACP. However, as noted in the Public Advocates Office's 2023 Broadband Pricing White Paper, rate increases in these plans undercut the benefits to low-income subscribers. For example, the Public Advocates Office's 2023 Broadband Pricing White Paper notes that AT&T increased its low-income broadband plan price by \$20 following the implementation of ACP. Separately, while Charter decreased the cost of its low-income plan between 2021 and 2022, from \$19.99 to \$17.99,⁵² it increased the rate back to \$19.99 in 2023 without increasing offered speeds.⁵³ This price increase decreased the benefit to low-income customers that Charter instituted with its price decrease in 2022.

The Biden-Harris administration encouraged providers to offer ACP-subsidized plans of at least 100/20 Mbps for \$30 or less, such that there would be no cost to consumers after the subsidy is applied.⁵⁴ However, this was a voluntary commitment that not all major service providers made and, without explicit rules to the contrary, providers may increase rates or otherwise blunt the impact of their offerings unilaterally. When low-income plans are subsidized or required of providers, clear standards for these affordable plans continue to be needed to ensure the benefits of affordable access to high-speed broadband services reach the intended beneficiaries.

Figure 10: Low-Income Broadband Plans Prior to ACP Implementation and as of August 15, 2023

Plan & Company Name	Plan details as of October 20, 2021		Plan details as of August 15, 2023	
	Monthly Rate Without Taxes/Fees	Speed	Monthly Rate Without Taxes/Fees	Speed
Internet Essentials from Comcast ⁵⁵	\$9.95	Up to 50/5 Mbps	\$9.95	Up to 50/10 Mbps
Internet Essential+ from Comcast	n/a	n/a	\$29.95	Up to 100/20 Mbps
Access from AT&T ⁵⁶	\$10	Up to 25 Mbps download**	\$30	Up to 100 Mbps download
Connect2Compete from Cox ⁵⁷	\$9.95	Up to 50/3 Mbps	\$9.95	Up to 100/5 Mbps
Spectrum Internet Assist from Charter ⁵⁸	\$19.99	30 Mbps download	\$19.99	Up to 30/4 Mbps
Frontier Fundamental Internet ⁵⁹	\$19.99*	3-50/1-50 Mbps***	\$19.99*	Not provided

*Includes a \$5 monthly router charge.

**Maximum speed depends on availability at the customer's address. For a limited time, Access from AT&T customers at locations with available AT&T Internet speeds above 10Mbps were eligible for a speed upgrade up to 25Mbps.

***Maximum speed depends on availability at the customer's address.

Conclusions

The Public Advocates Office's 2023 Annual Broadband Pricing Data Request responses indicate that average broadband rates increased for plans offering the slowest speeds (≤ 25 Mbps) as well as for plans offering the speeds subscribed to by most Californians (≥ 101 -1000 Mbps).

Weighted average rates in urban areas of California also increased in these speed tiers between 2021 and 2022, per the FCC URS results.

However, price change trends were not consistent across technologies. Urban areas in California saw double-digit percent decreases compared to weighted average rates for broadband delivered over fixed wireless access in every speed tier in which providers reported providing the service. This should be contrasted with fixed wireless access rate data collected for urban *and* rural areas in California where some fixed wireless access broadband service providers charge the highest rates for broadband service reported to the Public Advocates Office.

Municipal broadband providers in California offer broadband rates for fiber-to-home broadband service that are similar in price to those offered by the largest internet service providers. Lastly, California's Small LECs continue to charge some of the highest rates surveyed for fiber broadband service.

The CPUC estimates that more households lacked broadband subscriptions in 2022 than were previously estimated. Lack of awareness of and the exhaustion of funding for direct broadband subsidy programs, here, in particular, the ACP, hamper their ability to meaningfully address the digital divide.

Attachment 1: Focus on Fixed Wireless Access

As shown in Figure 9, above, the FCC’s URS responses indicate that prices for broadband service in the ≤ 25 Mbps, $\geq 26-50$, and $\geq 51-100$ Mbps speed tiers delivered over fixed wireless access infrastructure declined drastically in urban areas in California between 2021 and 2022. The price decreases highlight an increasing relevance of fixed wireless access broadband availability; while cable and traditional wireline telephone providers experienced a net loss of broadband subscribers in 2023 (losing a combined ~140,000 subscribers), fixed wireless access broadband providers gained over 3.6 million net subscribers in 2023.⁶⁰ However, as illustrated in Figures 2 and 3, when rates from non-urban areas are considered, fixed wireless access broadband rates vary greatly, and can be some of the most expensive plans available. Figures 2 and 3 illustrate the variation in rates, by technology, for plans offered by the 38 providers whose rates the Public Advocates Office surveyed as of January 31, 2023. Att. Table 1, below, further illustrates this data highlighting fixed wireless service.

Att. Table 1: Variations in Selected Fixed Wireless Access Rates Across Speed Tiers

Provider ⁶¹	Plan Speed Range	Price Range ⁶²
Webpass, Inc.*	100/100 Mbps-500/500 Mbps	\$50 (all)
	1000/1000 Mbps	\$70
Starry, Inc.*	100/50 Mbps	\$30
	200/100 Mbps-200/200 Mbps	\$50 (all)
	500/250 Mbps	\$65
Cal.net	25/4 Mbps-50/50 Mbps	\$19.23-\$875
	100/20 Mbps-500/40 Mbps	\$100-\$1443
California Internet LP, dba Geolinks	25/3 Mbps-50/50 Mbps	\$69.95-\$625.16
	75/75 Mbps-100/100 Mbps	\$771-\$958
South Valley Internet	30/3 Mbps-50/10 Mbps	\$149.95-\$229.95
	100/20 Mbps-350/40 Mbps	\$149.95-\$239.95
	1000/1000 Mbps	\$99-\$1000
T-Mobile USA, Inc.*	25/3 Mbps	\$61.16 (all)
Frontier Communications Corp.*	45/3 Mbps	\$54.99 (all)
Verizon Communications Inc.	50/4 Mbps	\$60 (all)
	300/10 Mbps-1000/50 Mbps	\$80 (all)
Anza Electric Cooperative	50/50 Mbps	\$49

Data request responses indicate that prices vary drastically within and across providers based on a number of factors, including download and upload speeds. Whether the network over which service is deployed is subsidized by state or federal grants or whether the network was acquired by another provider who maintained the prior networks' pricing for preexisting customers may also impact the spread of prices offered by a single provider. Some of the lowest prices for fixed wireless service appear to be available from providers, like Webpass, Inc., that focus on serving multi-residential housing and businesses in urban areas. Prices for fixed wireless access broadband from large cellular companies (here, Verizon and T-Mobile) are also generally lower than the prices of smaller, more rural-focused providers. Given that these in-home broadband services rely on each carrier's cellular (mobile phone) network, customer experience of service quality over such connections will not be stagnant and will vary based on factors similar to those that will impact cellular phone service, including proximity to cell towers and network capacity, among many other factors.

Overall, the FCC 2022 Broadband Marketplace Report indicates that the proportion of the U.S. population "covered by" terrestrial fixed wireless access broadband at speeds of >25 Mbps download has increased from just 20% in 2017 to 80% in December 2021.⁶³ Specifically, in 2022, fixed wireless subscriber additions accounted for 90% of net broadband subscriber additions for the largest providers across all technologies, with cellular companies T-Mobile and Verizon adding the largest shares.⁶⁴ However, in 2021 fixed wireless access broadband connections still made up less than 3% of all end-user broadband subscriptions nationwide.⁶⁵

Until recently, fixed wireless access broadband deployment has been concentrated in rural and suburban areas. These traditional WISP business models differ from cellular fixed wireless access service in part in that they benefit from relatively under-utilized unlicensed spectrum, essentially "free infrastructure".⁶⁶ The Wireless Internet Service Provider Association (WISPA) notes that fixed wireless access broadband's relatively lower initial deployment costs have made it a preferable technology in areas where low density would make deployment of wireline infrastructure cost-prohibitive.⁶⁷ However, despite its lower initial deployment costs, delivering broadband over fixed wireless access broadband technology has historically not been favored in urban areas due to a number of factors. These factors include the increased rate of interference experienced on unlicensed spectrum in high-density areas (and lack of available licensed

spectrum) and technological limitations on the number of customers that can be served by each fixed wireless access broadband base station without degrading service to other users.⁶⁸ The need for a direct line of sight and the presence of other physical obstructions like foliage, building walls, or weather can also impede the performance of some fixed wireless access broadband technologies. Simply put, the service was not fast or reliable enough to pull many urban customers away from wireline broadband services delivered over DSL, cable, or fiber networks.

While these constraints still exist to varying degrees, technological advancements (including those allowing for the use of millimeter wave (mmWave) spectrum) have, in some circumstances, improved fixed wireless access broadband performance in urban areas and increased the speeds available from fixed wireless access broadband service.⁶⁹ While mmWave technology can deliver faster speeds than older fixed wireless access broadband technologies, it is limited in range, and so likely unsuitable for rural networks.⁷⁰ However, providers like Starry, Inc.⁷¹ and Webpass, Inc.⁷² have used this tech to provide fixed wireless access broadband services in urban areas. The rollout of 5G technology has spurred mobile network operators like T-Mobile and Verizon to offer in-home broadband over their existing cellular networks, often using the mobile carriers' licensed spectrum.⁷³

The performance of fixed wireless access broadband service has spurred policy debate over the extent to which the technology should be considered in deployment grant programs intended to bridge the digital divide in a “technology-neutral” fashion. For example, federal BEAD program rules require states and territories to prioritize all-fiber builds, but also require states to set an “extremely high-cost threshold” for per-location costs, above which all-fiber builds need not be prioritized.⁷⁴ Where that threshold is set will dictate in part how much BEAD funding will flow to fixed wireless access broadband providers. Fixed wireless companies tout the relatively lower initial investment required by fixed wireless access broadband networks and the speed of rollout for such networks as points in its favor, advocating for lower extremely high-cost per location thresholds.⁷⁵ Fiber proponents speak to the greater capacity and speed capabilities of fiber technology, longer expected life of core network components, and the ease of upgrades to fiber networks to address increasing bandwidth needs as compared to more frequent and extensive upgrades required for fixed wireless access broadband networks.⁷⁶ Some advocates argue that

(given concerns with the frequency of fixed wireless access broadband network upgrades, costs, and overall capacity limitations), in most situations the long term construction and operation costs of fixed wireless access broadband vs. fiber networks indicate that subsidizing fiber builds is the most prudent use of public funds.⁷⁷

Attachment 2: Focus on Non-Profit Internet Service Providers

As shown in Figures 2 and 3, publicly or cooperatively owned broadband providers participate in the residential fiber to the home (FTTH) market in California, often at price points comparable to those of privately owned providers. A number of locations across the country have created non-profit broadband networks, which may be publicly owned (and are often operated)⁷⁸ by local agencies and tribes or customer cooperatives.⁷⁹ Traditional broadband service providers may leave residents unconnected or under-connected in rural areas, where low population density renders wired broadband network construction or upgrades prohibitively expensive or results in low returns on investment. However, market failure may also occur in urban areas, particularly in historically redlined or other low-income areas, where private providers don't see installing or upgrading communications infrastructure as profitable.⁸⁰

Localities may choose to own or operate networks under several configurations: the spectrum of owner/operator models runs from full public owner-operatorship through situations where the network may be publicly owned but operated by a private entity or owned on an open-access basis, to varying levels of public-private partnership.⁸¹ A 2020 white paper from US Ignite & Altman Solon describes this spectrum of business models and notes that which model municipalities choose often depends on the following factors: whether the municipality has ready access to capital, good existing utility infrastructure, any viable ISP partners in the areas, and where the community objectives and risk tolerance intersect.⁸² Municipal networks face challenges (such as relatively high start-up costs, or a lack of human capacity and institutional knowledge), and may choose a given business model based in part on overcoming these challenges. Political headwinds may also run against municipal broadband action; as of April 2023, the Institute for Local Self Reliance's Community Networks project estimates that 17 states still have legislation explicitly or functionally blocking municipal networks from operating.⁸³ Even when local network plans are legally allowed but require a vote, incumbent interests may fund lobbying or directly lobby against the prospect of competition.⁸⁴

ConnectCalifornia⁸⁵ lists 17 "municipal" providers in California.⁸⁶ ConnectCalifornia notes that six of these providers serve or intend to serve residential customers,⁸⁷ while the remaining providers offer dark or lit fiber services and may serve only businesses, anchor institutions, and/or publicly owned buildings.⁸⁸ The Public Advocates Office was able to verify that four of

the six public providers noted by ConnectCalifornia *currently* offer residential services to Californians: Loma Linda Connected Community, San Bruno Municipal Cable TV, ConnectAnza (an ISP owned and operated by Anza Electric Cooperative, Inc.),⁸⁹ and Plumas Sierra Telecommunications.

ConnectAnza is an example of a rural ISP owned and operated by an electric cooperative, here, Anza Electric Cooperative. Utility cooperatives, electrical and telephone, were crucial in bringing services to rural America in the 1930s-50s.⁹⁰ Their access to utility infrastructure and local ownership may make them particularly well positioned to deploy non-profit broadband networks. ConnectAnza, the Anza Electric Cooperative's broadband initiative, primarily serves customers with fiber-to-the-home services and but does provide fixed wireless access to a limited number of households in certain more-remote areas of its service territory. In 2015 and again in 2018, the California Public Utilities Commission awarded the Anza Electric Cooperative California Advanced Services Fund grants to deploy broadband in unserved and underserved areas in Riverside County California, defraying costs to its members.⁹¹ ConnectAnza is also a Rural Digital Opportunity Fund awardee. While Frontier successfully challenged portions of the 2018 grant application, arguing that it intended to upgrade its DSL service in some project census blocks, ConnectAnza is most if not all of its customers' only option for service delivered over fiber networks.

Appendix A: Methodology

Broadband Pricing Data

The Public Advocates Office has issued Annual Broadband Pricing Data Requests (DRs) to broadband service providers regarding fixed broadband service offerings since 2019. In part, the DRs ask providers to list all of their plans available to California residents as of a given point in time. The 2023 DR was sent to a total of 39 broadband providers and asked for plan information as of January 31, 2023. Thirty-eight broadband providers returned substantive responses to the DR. Respondents included the five largest broadband providers (Big 5), Small Local Exchange Carriers (Small LECs), and other companies.

We created a dataset with the fixed broadband service plans of the 38 respondents (2023 Broadband Pricing Datasheet). The 2023 Broadband Pricing Datasheet collates the data that was collected on the following broadband plan elements:⁹²

- Plan Service Description.
- Advertised Download and Upload Speed: Several providers did not include their advertised speeds, particularly upload speeds. The Public Advocates Office addressed the missing data issues based on advertised speed information available on the company's website. In cases where upload speed information was also not available on a company's website, the Public Advocates Office listed the speed in the database as "not provided."
- Monthly Data Caps.
- Technology Type.
- Monthly Recurring Price Without Promotions, Surcharges, Taxes, Equipment Fees: Several Small LECs required customers to purchase a voice line to sign up for broadband service. However, in their response, these companies did not include the price of a required voice line with broadband in the monthly recurring price. In these cases, The Public Advocates Office manually added the price of the voice line to the cost of broadband plans since examining the cost of broadband alone for such plans would underestimate the cost to the customer. Mandatory fees charged in lieu of purchasing voice were also manually added to provided broadband rates.
- Price of Standalone Broadband Within Bundle.
- Cost of Device.
- Installation Fees.
- Overage Fees, where available.
- Information on discounts applicable to each plan.

In addition to the broadband plan elements above, the Public Advocates Office created a coded field in the 2023 Broadband Pricing Datasheet based on the plan service description. This coded field was used to identify whether a plan was offered on a standalone basis or bundled with voice and/or TV. The approach used in collecting and collating data for the 2023 Data Request means that the results do not include all the related costs that a consumer must pay for internet access. For instance, regulatory charges and taxes are not captured in the price database.

Additionally, the study created multi-year databases to analyze prices for select companies for the years 2019-2023 and 2021-2023. For 2019-2023, the study compiled *minimum* monthly recurring pricing from the surveyed broadband providers, including the Big 5 companies and Small LECs. For the 2019 and 2020 Data Requests, only minimum monthly recurring prices were requested in specified speed tiers. The Public Advocates Office therefore used minimum monthly recurring prices for comparison across the speed tiers specified in the 2019/2020 Data Request, to ensure consistency in comparison of prices across 2019 through 2023.

Data Analysis⁹³

Comparative analysis of broadband plan prices is challenging given the complex structure of plans and prices, technologies used in the delivery of service, and lack of standardization of plan elements. To tackle these challenges, the analysis primarily analyzed broadband service plan rack rates, defined as the plans' monthly recurring prices, which do not include promotions, surcharges, taxes, and equipment fees. Although promotions are commonplace in the broadband residential service markets, these promotional prices are typically term-limited. Non-promotional monthly recurring prices, on the other hand, provide a closer measure of what customers pay in the long run for service. The analysis excluded installation fees or device fees, as these vary widely across providers and plans. To the extent a price other than the rack rate is used in the analysis, that fact is identified explicitly in the findings.

Broadband plan prices within the same technology of service delivery and, in most instances, within the same speed tiers were compared. The analysis focuses on Cable, DSL, Fiber, and Fixed Wireless. Different technologies of service delivery have variable service quality elements, e.g., speed. Additionally, different technologies may have varying infrastructure costs and be in distinct stages of investment recuperation (e.g., DSL compared to Fiber). Therefore, comparing plans within and across enables the examination of like-to-like. It also helps reveal

any trends between prices and network investments. Analysis within similar technologies is also important because Small LECs offer similar plans over different technologies (DSL and Fiber). When Small LECs reported offering plans over two technologies and the Small LEC did *not* list the same plan twice to reflect the different technologies, the data was adjusted to reflect the existence of the plan over more than one technology. As a result, comparing within technology minimizes the potential to skew averages and medians.

We examined broadband plans in five speed tiers of advertised download speed: ≤ 25 Mbps, ≥ 26 -50 Mbps, ≥ 51 -100 Mbps, ≥ 101 -1000 Mbps, ≥ 1001 Mbps. The analysis focused primarily on advertised download speed, since advertised upload speeds were not available for all providers and plans. That said, to account for broadband plan price variations as a result of upload speeds, the analyses included select case comparisons where both upload and download speeds were available.

In comparing the broadband plans themselves, the analysis codes the plans in two categories: standalone and bundled. Current research on broadband pricing typically examines the price of standalone broadband service. This only provides data on broadband without any additional features such as voice and/or television service.⁹⁴ Examining standalone plans by themselves does not provide a complete picture of the residential broadband market where bundles are ubiquitous. Comparing prices within and across each category helps reveal trends in pricing based on plan marketing. To the extent the Public Advocates Office assessed trends across all plans offered by a single/multiple provider(s), a note was made if the findings are based on analyzing all plans rather than each category of plan. Small LECs reported that they don't offer "bundles" of plans. However, several Small LEC plans "require" customers to purchase a voice service to sign up for broadband service. Since a voice line was "required" to access broadband service, i.e., broadband could not be purchased without voice, the Public Advocates Office coded and analyzed these plans as bundled. Other Small LECs charge a fee if voice service is not purchased with broadband service. Because this is a company-determined mandatory fee for broadband service, this fee is added to monthly rates.

Our analysis excluded fixed broadband service plans available solely to low-income customers. While these plans serve an important role in keeping low-income households connected, they do not represent the universe of plans available to the general population or even low-income

customers who may not qualify for the means-tested offerings. The aggregated analyses focus on fixed broadband service plans available to the general population only. That said, the analysis touches upon the fixed broadband service plans available to low-income customers while discussing options available from the largest providers in the state.

Appendix B: Broadband Delivery Technologies

1. Digital Subscriber Line (DSL)

DSL is a wireline transmission technology that transmits data over traditional copper telephone lines already installed to homes and businesses.⁹⁵ The maximum speed the DSL technology provides can be hundreds of megabits per second (Mbps).

There are two types of DSL transmission technologies: Asymmetrical Digital Subscriber Line (ADSL) and Symmetrical Digital Subscriber Line (SDSL). ADSL provides faster speed in the downstream direction than in the upstream direction. It is used primarily by residential customers who receive a lot of data but do not send much.⁹⁶ SDSL provides symmetrical download and upload speeds and is typically used by businesses for services such as video conferencing, which require significant bandwidth both upstream and downstream in order to operate effectively.

2. Coaxial Cable (cable)

Coaxial cable is a type of copper cable built with a metal shield and other components engineered to block signal interference. Coaxial cable is primarily used by cable TV companies to connect their satellite antenna facilities to customers' homes and businesses. Coaxial cable is also sometimes used by telephone companies to connect central offices to telephone poles near customers.⁹⁷ Coaxial cable technology can provide thousands of megabits per second.

3. Fiber to the Home (fiber, FTTH)

Fiber refers to the use of fiber optic cables to deliver broadband internet connections from a central location directly to the home. In a fiber to the home network, optical fiber is used over the "last mile," displacing DSLs or coaxial wires with lower bandwidth capacities.⁹⁸ Fiber transmits data at speeds far exceeding current DSL or cable modem speeds.⁹⁹

4. Fixed Wireless

Fixed wireless is a type of internet service delivered using transmitters to send and receive internet signals from one point to another or from one point to multiple points. These transmitters are affixed to stationary objects —like poles, buildings, or towers — at strategic locations, combining to create a radio link. The radio link is typically established between rooftop or tower transmitters designed to provide the radio link with a direct line of sight between the two transmitters with minimal interference.¹⁰⁰ Cellular base stations are

increasingly being used by mobile network operators to also offer in-home broadband service using 5G technology, which differs from traditional fixed wireless, in part, in the bands of spectrum used to transmit data. Such 5G in-home broadband service is also categorized as “fixed wireless access” service in this report and by the FCC.¹⁰¹

Appendix C: Weighted and Unweighted Average Monthly Broadband Prices in 2022, FCC Urban Rate Survey Data

Figure C-1: Change in Weighted Average Monthly Rates for Broadband Service in Urban Areas in California by Technology, 2021-2022 URS Responses

	≤25 Mbps			≥26-50 Mbps			≥51-100 Mbps			≥101-1000 Mbps			≥1001 Mbps			All Speeds	
	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022
Cable	\$29.72	\$29.36	-1.2%	\$28.21	\$24.45	-13.4%	\$59.48	\$53.23	-10.5%	\$93.56	\$94.02	0.5%	\$100.00	\$110.00	10.0%	\$75.38	\$75.23
DSL	\$49.47	\$63.24	27.8%	\$65.51	\$66.02	0.8%	\$62.04	\$68.87	11.0%	\$56.01	\$54.99	-1.8%	--	\$39.99	--	\$53.47	\$64.89
Fixed Wireless	\$124.51	\$57.50	-53.8%	\$298.41	\$56.81	-81.0%	\$373.56	\$84.83	-77.3%	\$68.44	\$61.07	-10.8%	--	--	--	\$197.18	\$59.88
FTTH	\$44.20	\$64.38	45.7%	\$51.54	\$75.29	46.1%	\$62.74	\$104.66	66.8%	\$76.20	\$78.33	2.8%	\$261.25	\$176.65	-32.4%	\$73.03	\$112.30
All Techs	\$49.83	\$62.57	25.6%	\$40.08	\$34.29	-14.5%	\$65.27	\$57.05	-12.6%	\$85.64	\$89.26	4.2%	\$102.69	\$155.09	51.0%	\$72.18	\$82.62

Figure C-2: Change in Weighted Average Monthly Rate for Broadband Service in Urban Areas across the U.S. by Technology, 2021-2022 URS Responses

	≤25 Mbps			≥26-50 Mbps			≥51-100 Mbps			≥101-1000 Mbps			≥1001 Mbps			All Speeds	
	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022
Cable	\$38.62	\$37.76	-2.2%	\$31.93	\$27.84	-12.8%	\$70.86	\$55.38	-21.8%	\$99.22	\$99.40	0.2%	\$109.43	\$116.88	6.8%	\$81.94	\$80.54
DSL	\$55.58	\$66.26	19.2%	\$78.02	\$83.18	6.6%	\$64.60	\$69.43	7.5%	\$56.50	\$63.65	12.7%	--	\$39.99	--	\$59.81	\$69.34
Fixed Wireless	\$73.47	\$55.79	-24.1%	\$125.94	\$56.19	-55.4%	\$175.47	\$71.45	-59.3%	\$78.01	\$77.71	-0.4%	\$99.00	--	--	\$90.87	\$60.81
FTTH	\$38.75	\$46.73	20.6%	\$44.53	\$57.62	29.4%	\$66.41	\$71.80	8.1%	\$78.60	\$85.09	8.3%	\$198.11	\$183.40	-7.4%	\$76.42	\$105.01
All Techs	\$51.93	\$59.28	14.2%	\$39.23	\$35.91	-8.5%	\$70.08	\$58.33	-16.8%	\$90.63	\$94.74	4.5%	\$115.09	\$147.55	28.2%	\$77.91	\$84.83

Figure C-3: Change in Unweighted Average Monthly Rates for Broadband Service in Urban Areas in California by Technology, 2021-2022 URS Responses

	≤25 Mbps			≥26-50 Mbps			≥51-100 Mbps			≥101-1000 Mbps			≥1001 Mbps			AllSpeeds	
	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022
Cable	\$39.09	\$24.27	-37.9%	\$31.40	\$27.43	-12.6%	\$60.15	\$41.63	-30.8%	\$85.42	\$96.05	12.4%	\$100.00	\$110.00	10.0%	\$67.66	\$68.12
DSL	\$51.08	\$56.51	10.6%	\$71.57	\$62.65	-12.5%	\$68.71	\$62.39	-9.2%	\$65.82	\$54.99	-16.5%	--	\$39.99	--	\$55.46	\$58.49
Fixed Wireless	\$125.10	\$60.13	-51.9%	\$290.89	\$94.64	-67.5%	\$471.75	\$164.26	-65.2%	\$67.53	\$57.23	-15.3%	--	--	--	\$210.26	\$77.97
FTTH	\$45.83	\$57.48	25.4%	\$66.96	\$67.95	1.5%	\$62.65	\$100.14	59.8%	\$70.16	\$74.05	5.5%	\$261.25	\$185.29	-29.1%	\$71.21	\$86.32
All Techs	\$72.37	\$56.73	-21.6%	\$157.02	\$64.46	-58.9%	\$179.60	\$64.11	-64.3%	\$74.72	\$80.27	7.4%	\$153.75	\$167.90	9.2%	\$80.20	\$64.46

Figure C-4: Change in Unweighted Average Monthly Rate for Broadband Service in Urban Areas across the U.S. by Technology, 2021-2022 URS Responses

	≤25 Mbps			≥26-50 Mbps			≥51-100 Mbps			≥101-1000 Mbps			≥1001 Mbps			AllSpeeds	
	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022	%	2021	2022
Cable	\$39.07	\$32.38	-17.1%	\$49.47	\$33.07	-33.2%	\$67.10	\$49.77	-25.8%	\$105.38	\$101.45	-3.7%	\$109.97	\$134.40	22.2%	\$82.26	\$80.96
DSL	\$60.62	\$65.75	8.5%	\$89.57	\$81.70	-8.8%	\$76.73	\$63.41	-17.4%	\$60.12	\$59.91	-0.3%	--	\$39.99	--	\$67.12	\$68.24
Fixed Wireless	\$78.83	\$75.91	-3.7%	\$139.68	\$107.12	-23.3%	\$214.62	\$166.54	-22.4%	\$92.49	\$92.42	-0.1%	\$99.00	--	--	\$104.46	\$94.18
FTTH	\$51.90	\$51.66	-0.5%	\$59.61	\$59.75	0.2%	\$61.85	\$70.49	14.0%	\$86.51	\$89.93	4.0%	\$188.61	\$208.23	10.4%	\$82.62	\$97.74
All Techs	\$62.45	\$64.08	2.6%	\$83.35	\$69.43	-16.7%	\$80.61	\$64.42	-20.1%	\$94.96	\$94.70	-0.3%	\$159.25	\$173.75	9.1%	\$80.52	\$80.41

Endnotes:

¹ See California Public Utilities Commission (CPUC) Decision (D.) 20-07-032, Decision Adopting Metrics and Methodologies for Assessing the Relative Affordability of Utility Service at 27-32, (July 2020). See also D.21-10-020, Resolving Phase I of Broadband for All Proceeding, at 2 (Oct. 2021). See also Executive Department, State of California, Executive Order (E.O.) N-73-201 at 1 (Aug. 2020), available at <https://www.gov.ca.gov/wp-content/uploads/2020/08/8.14.20-EO-N-73-20.pdf>.

² Federal Communications Commission (FCC) 2022 Communications Marketplace Report, FCC 22-103 at ¶3 (Dec. 30, 2022) available at <https://docs.fcc.gov/public/attachments/FCC-22-103A1.pdf>.

³ Other barriers to broadband adoption include privacy and security concerns; lack of devices, such as laptops, to connect to broadband service; and discomfort using internet-connected devices. See Galperin, H and Le, T, *CETF-USC Statewide Broadband Adoption Survey 5* (Mar. 2021), available at <https://www.cetfund.org/wp-content/uploads/2021/03/Statewide-Survey-on-Broadband-Adoption-CETF-Report.pdf>.

⁴ The FCC defines fixed broadband service as “one that serves end users primarily at fixed endpoints using stationary equipment, such as the modem that connects an end user’s home router, computer or other Internet access device to the network. This term includes fixed wireless broadband services (including those offered over unlicensed spectrum).” FCC, Report and Order and Further Notice of Proposed Rulemaking, FCC-11-161 at ¶98 (Nov. 18, 2011), available at https://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0206/FCC-11-161A1.pdf.

⁵ In 2019, the Public Advocates Office began issuing annual broadband pricing data requests (Annual Broadband Pricing Data Requests) to telecommunications companies that provide broadband services in California. The Annual Broadband Pricing Data Requests seek pricing and customer subscribership information on the recipients’ broadband services offered in California. In early 2023, the Public Advocates Office received responses to its Annual Broadband Pricing Data Requests that contained information relating to the broadband plans subscribed to by an estimated 77% of households with fixed broadband connections in California. This estimate of the scope of total California broadband subscribers represented by responses to the Public Advocates Office’s (Cal Advocates) 2023 Broadband Pricing Data Requests is a rough estimate, as the timing of data used for this estimate does not perfectly overlap. Respondents to Cal Advocates’ 2023 Annual Data Requests reported that the plans for which responses are provided are subscribed to by 8,803,418 California subscribers as of January 31, 2023. This figure is compared with the 2022 American Community Survey (ACS) 5-Year Estimates of California subscribers to “broadband such as cable, fiber, or DSL,” and “Satellite internet service,” totaling 11,395,419 subscribers. See United States Census Bureau, 2022 American Community Survey 5-Year Estimates, S2801, Types of Computers and Internet Subscriptions (filtered to reflect California data), available at <https://data.census.gov/table/ACSST5Y2022.S2801?q=S2801&g=040XX00US06&y=2022>. See also note 12 for a discussion of the ACS 5-Year Estimates Methodology.

⁶ FCC, The FCC is Taking Steps to Wind Down the Affordable Connectivity Program, <https://www.fcc.gov/fcc-taking-steps-wind-down-affordable-connectivity-program> (last accessed Mar. 25, 2024). See also, FCC, Order In the Matter of Affordable Connectivity Program, DA-24-23A1 at ¶¶1 & 4 (Jan. 11, 2024).

⁷ State of California, Affordable Connectivity Program Enrollment Tracker, <https://broadbandforall.cdt.ca.gov/affordable-connectivity-program/acp-enrollment/> (last accessed Mar. 25, 2024).

⁸ FCC, Measuring the Impact of ACP: Survey Results at 12, <https://www.fcc.gov/sites/default/files/ACP-Survey-Results.pdf>.

⁹ FCC, Household Broadband Guide, available at <https://www.fcc.gov/consumers/guides/household-broadband-guide>.

¹⁰ See the Infrastructure Investment and Jobs Act, P.L. 117-58 §60101(1) (2021): “Access to affordable, reliable, high-speed broadband is essential to full participation in modern life in the United States.” See also D.20-07-032, Adopting Metrics and Methodologies for Assessing the Relative Affordability of Utility Service, Attachment A - Affordability Metrics Framework Staff Proposal at 22-23 (Jan. 24, 2020).

¹¹ Kavish Harjai & Seung Min Kim, High-speed internet is a necessity, President Biden says, pledging all US will have access by 2030, Associated Press, Jun. 6, 2023, <https://apnews.com/article/biden-internet-broadband-bead-0b95fabd7f6833ce420c80d474a145a5>.

¹² Compare United States Census Bureau, 2021 American Community Survey 5-Year Estimates, S2801, Types of Computers and Internet Subscriptions, available at <https://data.census.gov/table?q=S2801&tid=ACSST5Y2021.S2801>, with 2020 American Community Survey 5-Year Estimates, S2801, Types of Computers and Internet Subscriptions, available at <https://data.census.gov/table?q=S2801&tid=ACSST5Y2020.S2801>, (last accessed Jan. 2024). These figures refer to the subset of households that lack access to “[b]roadband such as cable, fiber or DSL” or “[s]atellite internet service.” *Id.* Each year the U.S. Census Bureau conducts a nationwide survey to collect and produce information on social, economic, housing, and demographic characteristics. Data collected in one year is produced the following year and is available on the Census Bureau website. One-year estimates and 5-year estimates collect data representing different timespans; 1-year estimates represent data for areas with populations of 65,000+, while 5-year estimates include data from all areas. U.S. Census Bureau American Community Survey Information Guide at 12, available at https://www.census.gov/content/dam/Census/programs-surveys/acs/about/ACS_Information_Guide.pdf.

¹³ United States Census Bureau, 2022 American Community Survey 5-Year Estimates, S2801, Types of Computers and Internet Subscriptions, available at <https://data.census.gov/table?q=S2801&y=2022>, (last accessed Jan. 2024).

¹⁴ See the Infrastructure Investment and Jobs Act, P.L. 117-58 §60101(1) (2021): “Access to affordable, reliable, high-speed broadband is essential to full participation in modern life in the United States.” See also D.20-07-032, Adopting Metrics and Methodologies for Assessing the Relative Affordability of Utility Service, Attachment A - Affordability Metrics Framework Staff Proposal at 22-23, (Jan. 24, 2020).

¹⁵ FCC, Affordable Connectivity Program, <https://www.fcc.gov/acp>, (last accessed March 20, 2024).

¹⁶ Compare CPUC 2022 CASF Annual Report at 17 with CPUC 2021 CASF Annual Report at 18. CPUC CASF Annual Reports are available on the CPUC website, CASF Performance and Financial Audit Reports, <https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/casf-performance-and-financial-audit-reports>.

¹⁷ Compare CPUC 2022 CASF Annual Report at 17 with CPUC 2021 CASF Annual Report at 18. CPUC CASF Annual Reports are available on the CPUC website, CASF Performance and Financial Audit Reports, <https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/casf-performance-and-financial-audit-reports>.

¹⁸ Compare CPUC 2022 CASF Annual Report at 17 with CPUC 2021 CASF Annual Report at 18. CPUC CASF Annual Reports are available on the CPUC website, CASF Performance and Financial Audit Reports, <https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/casf-performance-and-financial-audit-reports>.

¹⁹ Regarding the change in data collection measures between the 2021 and 2022 California Advanced Services Fund (CASF) Annual Report, CPUC staff explains: *The method for aggregating the 2021 broadband adoption levels was different from prior years. [Assembly Bill] AB 2752 was adopted in 2022, which authorized and directed the [California Public Utilities] Commission to collect information from broadband service providers at the address level. This aggregation of granular data collected at the actual location served has been attributed to the ~15% variance from the 2020 broadband adoption level [depicted in the 2021 CASF Annual Report]. The accuracy*

provided at the address level has provided more details and insight for broadband adoption levels for each county. Personal communication between CPUC Communications Division staff and Cal Advocates staff, Sept. 12, 2023.

²⁰ Public Advocates Office, *Broadband Pricing Trends in California: Implications of broadband pricing in achieving universal access to fixed broadband 5* (May 2023), hereinafter Cal Advocates’ 2023 Broadband Pricing White Paper, available at <https://www.publicadvocates.cpuc.ca.gov/-/media/cal-advocates-website/files/press-room/reports-and-analyses/230510-cal-advocates-broadband-pricing-trends-in-ca.pdf>.

²¹ Other barriers to broadband adoption include privacy and security concerns; lack of devices, such as laptops, to connect to broadband service; and discomfort using internet-connected devices. See Galperin, H and Le, T, *CETF-USC Statewide Broadband Adoption Survey 5* (Mar. 2021), available at <https://www.cetfund.org/wp-content/uploads/2021/03/Statewide-Survey-on-Broadband-Adoption-CETF-Report.pdf>.

²² Senate Bill (SB) 156 (Committee on Budget and Fiscal Review, 2020-2021 Reg. Sess.). Communications: broadband.

²³ Office of Governor Gavin Newsom Press Release, *State Begins Construction on 10,000-mile Broadband Network to Bring High-Speed Internet Service to All Californians*, Oct. 13, 2022, available at <https://www.gov.ca.gov/2022/10/13/state-begins-construction-on-10000-mile-broadband-network-to-bring-high-speed-internet-service-to-all-californians/>.

²⁴ See CPUC Website, “Last Mile Federal Funding Account,” featuring slides for a July 6, 2023 webinar noting that the Last Mile Federal Funding Account began accepting applications on June 30, 2023 and continued to accept applications through September 29, 2023. Slides available at <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/broadband-implementation-for-california/ffa-webpages/webinar-slides-20230706.pdf>.

²⁵ See generally CPUC Order Instituting Rulemaking (R.) 23-02-016, Proceeding to Consider Rules to Implement the Broadband Equity, Access and Deployment Program. See also CPUC Website, *California Broadband Equity, Access, and Deployment (BEAD) Program*, <https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-implementation-for-california/bead-program>, (last accessed Oct. 23, 2023).

²⁶ Infrastructure Investment and Jobs Act, P.L. 117-58, §60101 et seq.

²⁷ National Telecommunications and Information Agency (NTIA), *Broadband Equity, Access, and Deployment Program (BEAD) Notice of Funding Opportunity (NOFO) at 66* (hereinafter BEAD NOFO). The BEAD NOFO is available at <https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf>.

²⁸ BEAD NOFO at 66, emphasis in original.

²⁹ For example, the Digital Equity Act (DEA) identifies the following populations as those who tend to be associated with lower levels of digital inclusion:

- Individuals who live in households with incomes below 150% of the Federal Poverty Level.
- Aging individuals (60 and above).
- Incarcerated individuals, other than individuals who are incarcerated in a Federal correctional facility.
- Veterans.
- Individuals with disabilities.
- Individuals with a language barrier, including individuals who are English learners; and have low levels of literacy.
- Individuals who are members of a racial or ethnic minority group.
- Individuals who primarily reside in a rural area.

47 USC §§1721(7) and (8). The Digital Equity program is a companion program to the BEAD program. See the National Telecommunications and Information Administration’s (NTIA) “BEAD/DE Alignment Guide” for

guidance on how the programs should be coordinated, *available at* https://broadbandusa.ntia.gov/sites/default/files/2022-09/BEAD-Digital_Equity_Alignment_Guide.pdf.

³⁰ FCC, 2024 Section 706 Report, FCC 24-27 at ¶29 (Mar. 18, 2024), *available at* <https://docs.fcc.gov/public/attachments/FCC-24-27A1.pdf>. “As of December 2022, the mean download speed for all residential fixed broadband subscriptions was 439 Mbps while the median residential download speed was 300 Mbps, and nearly 79% of all residential subscriptions had a download speed of at least 100 Mbps.” This is the most recent year for which the FCC has published subscription data.

³¹ The FCC’s URS collects information on rates in urban areas, where weighted average rates in the ≤25 Mbps speed tier increased by over 25% in California from 2021 to 2022. *See* Appendix C for tables illustrating the variation between weighted and unweighted analyses of 2021 and 2022 FCC URS data results.

³² FCC, Urban Rate Survey Data & Resources, <https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources> (last accessed Mar. 25, 2024).

³³ CPUC Tableau Public Dashboard, EOY2020 CA Residential Fixed BB Deployment, *available at* <https://public.tableau.com/app/profile/cpuc/viz/EOY2020CAResidentialFixedBBDeployment/Dashboard>.

³⁴ Satellite service plans are similarly disproportionately represented in the top 25th percentile in cost: comprising only 21% of plans surveyed, they represent 37% of the plans making up the top 25 percentile in cost.

³⁵ The California High-Cost Fund-A (CHCF-A) is a subsidy program that promotes customer access to advanced services and deployment of broadband-capable facilities in rural areas. <https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-high-cost-fund-a>.

³⁶ Cal Advocates’ 2023 Broadband Pricing White Paper featured a chart similar to that presented in Figure 7, though it presented information relating to unweighted average prices for plans offering >25-50 Mbps download speeds. Here, prices are displayed for plans offering speeds in the ≥51-100 Mbps download tier. This change was made (1) to clarify the grouping of plans for analysis; (2) to reflect growing emphasis on the need for higher speed plans. *See* FCC, 2024 Section 706 Report, FCC 24-27 at ¶¶2, 22 (Mar. 18, 2024), increasing the national broadband speed standard to 100/20 Mbps, *available at* <https://docs.fcc.gov/public/attachments/FCC-24-27A1.pdf>. *See* Appendix C for tables illustrating the full variation between weighted and unweighted analyses of 2021 and 2022 FCC URS data results.

³⁷ FCC, 2023 Urban Rate Survey Broadband Methodology Report at 6-7, *available at* <https://us-fcc.app.box.com/v/2023URSBroadbandMethodology>.

³⁸ FCC, 2024 Section 706 Report, FCC 24-27 at ¶29 (Mar. 18, 2024), *available at* <https://docs.fcc.gov/public/attachments/FCC-24-27A1.pdf>. “As of December 2022, the mean download speed for all residential fixed broadband subscriptions was 439 Mbps while the median residential download speed was 300 Mbps, and nearly 79% of all residential subscriptions had a download speed of at least 100 Mbps.”

³⁹ *See* Appendix C for tables illustrating the variation between weighted and unweighted analyses of 2021 and 2022 FCC URS data results.

⁴⁰ Regarding the change in data collection measures between the 2021 and 2022 CASF Annual Report, CPUC staff explains: *The method for aggregating the 2021 broadband adoption levels was different from prior years. [Assembly Bill] AB 2752 was adopted in 2022, which authorized and directed the [California Public Utilities] Commission to collect information from broadband service providers at the address level. This aggregation of granular data collected at the actual location served has been attributed to the ~15% variance from the 2020 broadband adoption level. The accuracy provided at the address level has provided more details and insight for broadband adoption levels for each county.* Personal communication between CPUC Communications Division staff and Cal Advocates staff, Sept. 12, 2023.

⁴¹ Compare CPUC 2022 California Advanced Services Fund (CASF) Annual Report at 17 with CPUC 2021 CASF Annual Report at 18. CPUC CASF Annual Reports are available on the CPUC website, CASF Performance and Financial Audit Reports, <https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/casf-performance-and-financial-audit-reports>.

⁴² This update was assisted by Assembly Bill (AB) 2752 (Wood, 2021-2022 Reg. Sess.), which clarified the CPUC's authority and directed the CPUC to collect more granular broadband service subscription data from internet service providers, including cable companies.

⁴³ See Andrew Perrin, Mobile Technology and Home Broadband 8 (Pew Research Center, Jun. 3, 2021), available at https://www.pewresearch.org/internet/wp-content/uploads/sites/9/2021/06/PI_2021.06.03_Mobile-Broadband_FINAL.pdf. See also Julia King, Americans are cutting other expenses to pay for internet, survey shows, Fierce Telecom (Sept. 21, 2023), available at <https://www.fiercetelecom.com/broadband/americans-are-cutting-other-expenses-pay-internet-survey-shows>, citing U.S. News & World Report. See also CPUC Broadband Equity Access and Deployment Program Five-Year Action Plan at 87 (Aug. 2023), available at <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/broadband-implementation-for-california/bead/california-bead-five-year-action-plan---final-draft---20230828.pdf>.

⁴⁴ Universal Service Administrative Co., ACP Enrollment Tracker, comparing data from "ACP Households by County January-December 2022" with data from "ACP Households by County January-July 2023," <https://www.usac.org/about/affordable-connectivity-program/acp-enrollment-and-claims-tracker/#enrollment-and-claims-by-zipcode-and-county>.

⁴⁵ State of California, Affordable Connectivity Program Enrollment Tracker, <https://broadbandforall.cdt.ca.gov/affordable-connectivity-program/acp-enrollment/> (last accessed Mar. 25, 2024).

⁴⁶ Cal Advocates' 2023 Broadband Pricing White Paper at 18-20

⁴⁷ Cal Advocates' 2023 Broadband Pricing White Paper at 19, comparing the "low-income" thresholds for LifeLine, the California Advanced Services Fund, and the Commission's Environmental and Social Justice Action Plan.

⁴⁸ See Cal Advocates' Opening Comments on the CPUC's Draft Five Year Action Plan in Rulemaking (R.)23-02-016, Proceeding to Consider Rules to Implement the Broadband Equity, Access and Deployment Rulemaking at 5-6 (Aug. 7, 2023), citing Broadband For All, Digital Equity, and BEAD Regional Planning Workshops Summary of Recommended Strategies, available at <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M513/K879/513879010.PDF>.

⁴⁹ Universal Service Administrative Co., What is a Household? - ACP, <https://www.affordableconnectivity.gov/do-i-qualify/what-is-a-household/>, (last accessed Oct. 25, 2023).

⁵⁰ See Cal Advocates' Opening Comments on the CPUC's Draft Five Year Action Plan in Rulemaking (R.)23-02-016, Proceeding to Consider Rules to Implement the Broadband Equity, Access and Deployment Rulemaking at n.19 (Aug. 7, 2023).

⁵¹ See Cal Advocates' 2023 Broadband Pricing White Paper at 3.

⁵² See Cal Advocates' 2023 Broadband Pricing White Paper at 18.

⁵³ Charter's Spectrum Internet Assist was offered at \$17.99 for 30/4 Mbps service as of July 21, 2022. See Cal Advocates' 2023 Broadband Pricing White Paper at 18.

⁵⁴ White House Briefing Room Website, FACT SHEET: President Biden and Vice President Harris Reduce High-Speed Internet Costs for Millions of Americans, , May 9, 2022. <https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/09/fact-sheet-president-biden-and-vice-president-harris-reduce-high-speed-internet-costs-for-millions-of-americans/>.

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- ⁵⁵ Comcast Corporation, Internet Essentials from Comcast, <https://www.internetessentials.com/>, (last accessed Aug. 15, 2023).
- ⁵⁶ AT&T Communications Inc., Access from AT&T. <https://www.att.com/internet/access/>, (last accessed Aug. 15, 2023).
- ⁵⁷ Cox California Telecom LLC, Connect2Compete Affordable Internet Program, <https://www.cox.com/residential/internet/connect2compete.html>, (last accessed Aug. 15, 2023).
- ⁵⁸ Charter Communications, Spectrum Internet Assist from Charter Communications, <https://www.spectrum.com/browse/content/spectrum-internet-assist.html>, (last accessed Aug. 15, 2023).
- ⁵⁹ Frontier Communications, Frontier Fundamental Internet, <https://frontier.com/fundamental-internet>, (last accessed Aug. 15, 2023).
- ⁶⁰ Leichtman Research Group, Inc., Press Release - About 3,500,000 Added Broadband From Top Providers in 2023, (Mar. 7, 2024), available at <https://leichtmanresearch.com/about-3500000-added-broadband-from-top-providers-in-2023/>.
- ⁶¹ Data from providers marked with an asterisk (*) comes from the FCC’s 2023 URS (prices as of July 1, 2022); all other data provided in response to Cal Advocates’ data requests (prices as of January 31, 2023). Plans shown are those with advertised speeds of at least 25 Mbps download and 3 Mbps upload.
- ⁶² Not all plans noted are available across providers’ stated service territories and customers should not rely on the information for specific plan availability in a given area. Please contact the service provider to verify plan and price availability.
- ⁶³ FCC, 2022 Communications Marketplace Report, FCC 22-103 at 15, Figure II.4.A, (Dec. 30, 2022), available at <https://docs.fcc.gov/public/attachments/FCC-22-103A1.pdf>.
- ⁶⁴ Leichtman Research Group, Research Notes: Q12023 at 4-5, available at <https://leichtmanresearch.com/wp-content/uploads/2023/03/LRG-Research-Notes-1Q-2023.pdf>. This research studied the broadband subscriber additions and losses for companies representing about 95% of the market.
- ⁶⁵ FCC, 2022 Communications Marketplace Report, FCC 22-103 at 20, Figure II.A.10, (Dec. 30, 2022), available at <https://docs.fcc.gov/public/attachments/FCC-22-103A1.pdf>.
- ⁶⁶ Wireless Industry Service Providers Association (WISPA) & The Carmel Group, Liftoff! Internet Service Providers Take Flight with Fixed-Wireless and Hybrid Networks at 8, (2021), available at https://www.wispa.org/media/v1/543/2024/01/2021_WISPA_Report_FINAL-compressed.pdf.
- ⁶⁷ FCC, Report, FCC 18-181 at ¶177, (Dec. 26, 2018) available at <https://docs.fcc.gov/public/attachments/FCC-18-181A1.pdf>.
- ⁶⁸ Andrew Afflerbach, Fixed Wireless Technologies and Their Suitability for Broadband Delivery at 7, (Benton Institute for Broadband & Society, June 2022), available at <https://www.benton.org/sites/default/files/FixedWireless.pdf>.
- ⁶⁹ Andrew Afflerbach, Fixed Wireless Technologies and Their Suitability for Broadband Delivery at 15, (Benton Institute for Broadband & Society, June 2022), available at <https://www.benton.org/sites/default/files/FixedWireless.pdf>; noting that mmWave “technology can deliver high-speed service because of the large amount of spectrum available and the fact that the signal tends to be transmitted in a small beam instead of a large sector (which allows the spectrum to be reused many times in a physical area).”
- ⁷⁰ Andrew Afflerbach, Fixed Wireless Technologies and Their Suitability for Broadband Delivery at 20, (Benton Institute for Broadband & Society, June 2022), available at <https://www.benton.org/sites/default/files/FixedWireless.pdf>; see also Jon Brodtkin, Millimeter-wave 5G will never scale beyond dense urban areas, T-Mobile

says, (Ars Technica, Apr. 22, 2019), <https://arstechnica.com/information-technology/2019/04/millimeter-wave-5g-will-never-scale-beyond-dense-urban-areas-t-mobile-says/>.

⁷¹ Starry, Inc., Technology, <https://starry.com/technology>, (last accessed Mar. 26, 2024).

⁷² Tom Brownlow and Blake Drager, How radio takes our fiber optic network to new heights, (Google Fiber blog post, Dec. 19, 2022), <https://gfiber.com/blog/post/5595227742039141462/>.

⁷³ Linda Hardesty, Is FWA from big carriers different than FWA from WISPS?, Fierce Telecom (Sept. 21, 2023), available at <https://www.fiercetelecom.com/broadband/americans-are-cutting-other-expenses-pay-internet-survey-shows>,

⁷⁴ BEAD NOFO at 7 and 13, n.6.

⁷⁵ See, e.g., R.23-02-016, Comments of WISPA on the CPUC’s BEAD Draft Initial Proposal, Volumes 1 and 2 at 7.

⁷⁶ See, e.g., R.23-02-026, Comments of the Communications Workers of America, District 9, et al., on the CPUC’s BEAD Draft Initial Proposal, Volumes 1 and 2 at 7, 11 (Nov. 27, 2023).

⁷⁷ See, e.g., Andrew Afflerbach, Fixed Wireless Technologies and Their Suitability for Broadband Delivery at 7 (Benton Institute for Broadband & Society, June 2022), available at <https://www.benton.org/sites/default/files/FixedWireless.pdf>.

⁷⁸ US Ignite & Altman and Solon, Broadband Models for Unserved and Underserved Communities at 2, available at [USIgnite Altman-Solon Whitepaper-on-Broadband-Models FINAL 7-9-2020.pdf \(us-ignite.org\)](https://usignite.org/altman-solon-whitepaper-on-broadband-models-final-7-9-2020.pdf).

⁷⁹ Utility cooperatives, electrical and telephone, were crucial in bringing services to rural America in the 1930s-50s, and due to their access to utility infrastructure and local roots, among other reasons, may be particularly well positioned to deploy nonprofit broadband networks. Christopher Ali, Farm Fresh Broadband: The Politics of Rural Connectivity 34 (The MIT Press, 2021).

⁸⁰ Colby Leigh Rachfal, Congressional Research Service, Expanding Broadband: Potential Role of Municipal Networks to Address the Digital Divide at 2, (Aug. 21, 2022), available at <https://crsreports.congress.gov/product/pdf/R/R47225/1>.

⁸¹ US Ignite & Altman and Solon, Broadband Models for Unserved and Underserved Communities at 2, available at [USIgnite Altman-Solon Whitepaper-on-Broadband-Models FINAL 7-9-2020.pdf \(us-ignite.org\)](https://usignite.org/altman-solon-whitepaper-on-broadband-models-final-7-9-2020.pdf).

⁸² US Ignite & Altman and Solon, Broadband Models for Unserved and Underserved Communities at 8, available at [USIgnite Altman-Solon Whitepaper-on-Broadband-Models FINAL 7-9-2020.pdf \(us-ignite.org\)](https://usignite.org/altman-solon-whitepaper-on-broadband-models-final-7-9-2020.pdf).

⁸³ Institute for Local Self-Reliance, Community Networks Project, “Community Network Map,” <https://communitynets.org/content/community-network-map>, (last accessed Mar. 25, 2024).

⁸⁴ See, e.g., Institute for Local Self-Reliance, Community Networks Project, “Big Money, Lies: Incumbents Try to Confuse Fort Collins Voters,” (Oct. 2017), <https://communitynets.org/content/big-money-lies-incumbents-try-confuse-fort-collins-voters>. See also, Machles, “A Tale of Two Cities in Maine: Municipal Broadband and Misinformation,” Institute for Local Self-Reliance (Dec. 2017), <https://ilsr.org/a-tale-of-two-cities-in-maine-municipal-broadband-and-misinformation/>.

⁸⁵ ConnectCalifornia is a consultancy that provides services to “overbuilders, WISPS [wireless internet service providers], and Municipalities.” Connect California, <https://www.connectcalifornia.com/>, (last accessed Mar. 25, 2024).

⁸⁶ Connect California, “Municipal Broadband Providers in California 2024,” <https://www.connectcalifornia.com/internet-service/municipal-broadband-providers>, (last accessed Mar. 25, 2024). While referred to as “municipal” providers, not all of the providers listed by Connect California are technically “municipal,” or run by municipalities. As noted above, some providers listed are cooperatives, owned by their

customers, rather than by a city or local agency. The common thread of all providers listed, however, is that they are nonprofit providers and are locally owned.

⁸⁷The residential providers listed by ConnectCalifornia are Connect Anza, Loma Linda Connected Community, Plumas Sierra Telecom, San Bruno Municipal Cable TV, Santa Monica City Net, Truckee-Donner; Cal Advocates was able to confirm that the first four providers listed currently serve residential customers. Connect California, Municipal Broadband Providers in California 2024, <https://www.connectcalifornia.com/internet-service/municipal-broadband-providers>, (last accessed Mar. 25, 2024).

⁸⁸ Connect California, Municipal Broadband Providers in California 2024, <https://www.connectcalifornia.com/internet-service/municipal-broadband-providers>, (last accessed Mar. 25, 2024). US Ignite’s whitepaper, Broadband Models for Unserved and Underserved Communities, *supra* note 78 at 13, notes that “starting with commercial-only services is one way to generate a steady inflow of cash to help program costs.”

⁸⁹ Anza Electric Cooperative, Inc., What is ConnectAnza?, <https://www.anzaelectric.org/what-connectanza>, (last accessed Mar. 25, 2024).

⁹⁰ Ali, Farm Fresh Broadband at 34.

⁹¹ Res. T-17581 (2018), Res. T1-7503 (2015).

⁹² For some broadband providers, data was transformed as necessary to perform comparative analysis. See descriptions for “Advertised Download and Upload Speed,” “Monthly Recurring Price Without Promotions, Surcharges, Taxes, Equipment Fees,” and “Price of Standalone Broadband Within Bundle.”

⁹³ All analysis was performed using Tableau Desktop Software, version 2021.4, and Microsoft Excel.

⁹⁴ For example, this is how FCC collects data for Urban Rate Survey. See FCC, 2024 Urban Rate Survey – Fixed Broadband Service at 1, available at <https://us-fcc.box.com/s/nm4oqvqpeywxlgmtui3lhkbwiunjqmxb>.

⁹⁵ FCC, Getting Broadband Q&A, <https://www.fcc.gov/consumers/guides/getting-broadband-qa> (last accessed Mar. 25, 2024).

⁹⁶ FCC, Getting Broadband Q&A, <https://www.fcc.gov/consumers/guides/getting-broadband-qa> (last accessed Mar. 25, 2024).

⁹⁷ Eamon McCarthy Earls, Coaxial Cable, TechTarget Network, <https://searchnetworking.techtarget.com/definition/coaxial-cable-illustrated> (last accessed Mar. 25, 2024).

⁹⁸ IQGeo, Fiber to the Home (FTTH), <https://www.iqgeo.com/guides/fiber-to-the-home> (last accessed Mar. 25, 2024).

⁹⁹ FCC, Getting Broadband Q&A, <https://www.fcc.gov/consumers/guides/getting-broadband-qa> (last accessed Mar. 25, 2024).

¹⁰⁰ Andrew Afflerbach, Fixed Wireless Technologies and Their Suitability for Broadband Delivery at 41, 81 (Benton Institute for Broadband & Society, June 2022), available at <https://www.benton.org/sites/default/files/FixedWireless.pdf>.

¹⁰¹ See, e.g., FCC, 2022 Communications Marketplace Report, FCC 22-103 at ¶166, (Dec. 30, 2022), available at <https://docs.fcc.gov/public/attachments/FCC-22-103A1.pdf>.