

Broadband Pricing Trends in California

Implications of broadband pricing in achieving universal access to fixed broadband

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Executive Summary

Broadband is an essential service for accessing emergency services, healthcare, employment, education, and social services.¹ This was especially the case during the COVID-19 pandemic and several wildfires in the state. This paper presents the analyses by the Public Advocates Office at the California Public Utilities Commission (Cal Advocates) on broadband pricing trends in California and the implications of broadband pricing on achieving universal access to broadband. Every year since 2019, Cal Advocates issues annual broadband data requests to all telecommunication companies that provide broadband services in California, seeking pricing, penetration and other information on broadband services they provide in California. Cal Advocates' pricing analysis utilizes responses to its 2022 annual data requests (DR) from fixed broadband² providers offering services in California, along with data from the annual Federal Communications Commission (FCC) Urban Rate Surveys.³

Among the most pressing findings of this analysis are the following:

Pricing

- California has some of the highest monthly recurring prices in the nation for fixed broadband service plans, averaging \$157 per month for advertised broadband download speeds⁴ of >25-50 Mbps in 2021.⁵
- Since the start of the COVID-19 pandemic, the prices of some broadband plans have markedly increased. An unweighted average of monthly recurring plan prices shows that providers offered plans with sharply higher prices in the same speed tiers in 2021 when compared with 2020.
- Broadband prices vary widely across broadband service providers and technologies.⁶ The price variations cannot be explained solely by the technology used to deliver the broadband service or the advertised speed of the service, but depend largely on whether the service is offered as standalone service or bundled with other services.
- Broadband plan prices do not reflect the true cost to serve customers, but instead appear to be designed to maximize profit for the broadband service provider. Broadband plan prices need not increase as the speed of broadband plans increase.

Conclusions

- Existing government subsidies aimed at making broadband affordable for low-income customers are not substantial enough to increase broadband subscribership among low-income customers due to the high prices that broadband service providers charge customers.

- Subsidies such as the Affordable Connectivity Program (ACP) will not help reduce broadband prices for customers if the design of the subsidies allows broadband providers to monetize the subsidies by concurrently raising the price of broadband plans.
- The effectiveness of broadband service providers' plans for low-income customers is hobbled by varying eligibility requirements and low awareness of those programs among potential customers.

Introduction

Broadband Internet Access Service (broadband)⁷ is an essential service⁸ for communities to meaningfully participate in the modern economy. This white paper comes on the heels of a global pandemic that has dispelled the myth of broadband as a luxury. As billions of people sheltered in place around the world, broadband became vital in enabling people to work, study, access healthcare, and connect with loved ones remotely.⁹

Despite the critical importance of broadband for daily life, millions continue to lack access to this service in the United States (U.S.). Based on the 2020 American Community Survey (ACS) five-year estimate, 30% of households across the nation do not have a broadband subscription.¹⁰ In California alone, more than two million households do not subscribe to broadband, even though they have access to fixed broadband service at an advertised speed¹¹ of 25 Megabits per second (Mbps) download and 3 Mbps upload (25/3 Mbps) or greater.¹² Fixed broadband service refers to broadband that serves consumers primarily at fixed endpoints using stationary equipment, such as the modem that connects an end-user's router, computer, or other device to access the internet.¹³

Key Terms	
Broadband	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. This is currently defined as 25/3 Mbps. See https://www.fcc.gov/consumers/guides/getting-broadband-qa .
Broadband subscription rate	The percentage of total population with access to broadband service that subscribes to a broadband service.
Broadband adoption	The service and infrastructure area available for the household to subscribe to broadband service. This is measured by dividing the number of broadband subscribers in an area by the number of households with access to broadband service.

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. Broadband adoption is measured by dividing the number of broadband subscribers in an area by the number of households with access to broadband service, meaning the service and infrastructure area available for the household to

subscribe to broadband service. The price of broadband service is one of the barriers to broadband adoption.¹⁴

Current studies on broadband prices nationally and internationally underscore a troubling fact: Americans pay some of the highest broadband prices in the world.¹⁵ From 2017-2020, the average U.S. household's expenditures for broadband increased by 19%, a rate that far exceeds the rate of inflation.^{16, 17} While these studies provide important information on broadband prices at the national level, trends in broadband prices within California remain understudied.

California-specific broadband price analysis is needed now more than ever. There is growing urgency to promote universal access to affordable broadband in California.¹⁸ At the same time, record-high levels of federal and state funding is being made available to address the interrelated issues of broadband access and broadband adoption in the state.¹⁹ Information on broadband pricing in California is critical to assess whether the billions of dollars spent on broadband infrastructure investment will benefit the populations it is meant to serve.²⁰

This white paper is intended to inform the dialogue about the price of broadband and its role in advancing or inhibiting universal access to affordable broadband in California. The key question guiding the analysis in this white paper is: **Are there 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 and service providers' marketing practices 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.

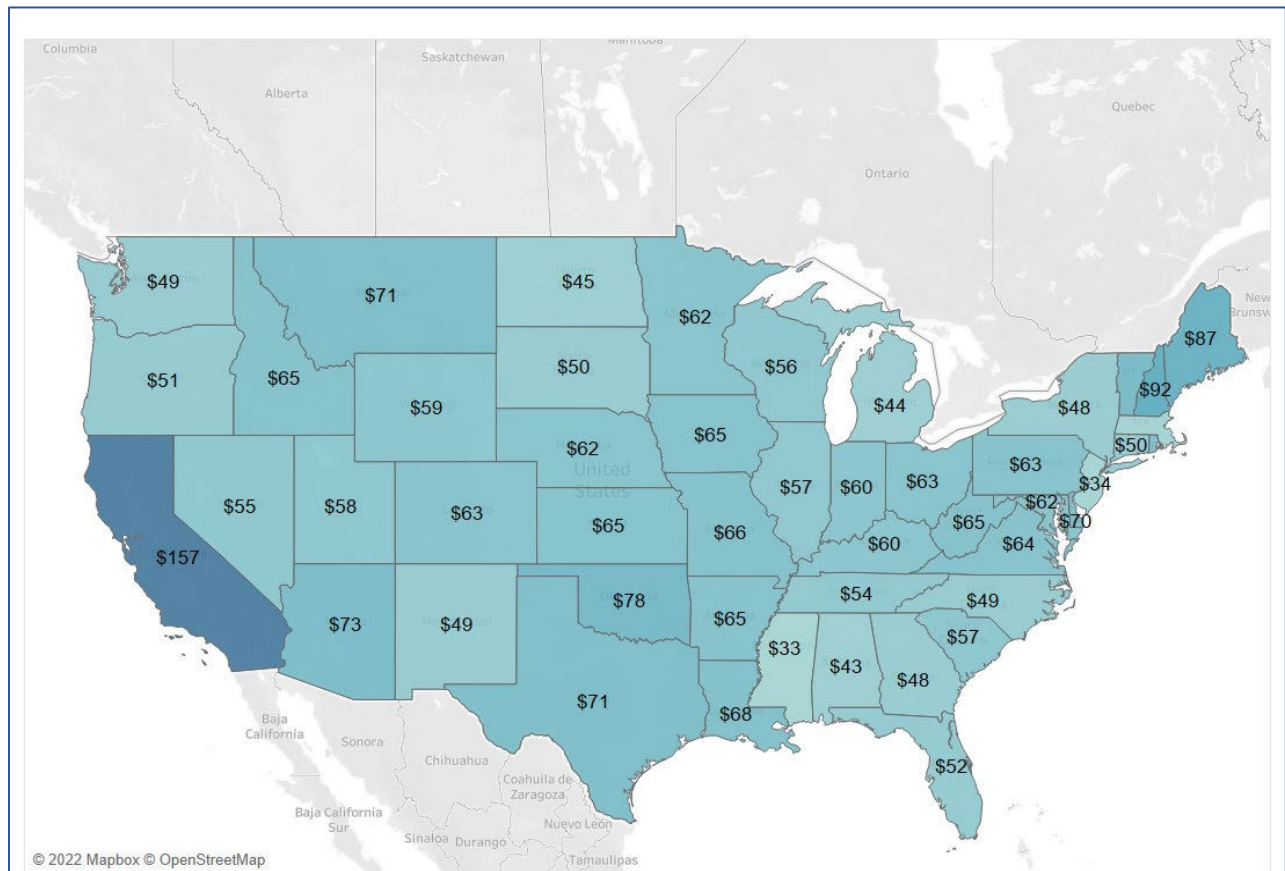
This white paper is accompanied by two focused studies – one on broadband affordability, health, and wellbeing in California and the other on broadband pricing trends for small local exchange carriers (LECs). [Appendix A](#) provides a detailed explanation of this white paper's methodology. [Appendix B](#) explains the broadband delivery technologies discussed in this paper.

Broadband Pricing Trends in California

California's broadband plan prices are some of the highest prices in the country.

Each year, the FCC collects price data for fixed standalone broadband plans offered to customers in urban census tracts.²¹ Examining national trends in prices for all plans offered to customers (i.e., unweighted prices) reveals that California has some of the highest monthly recurring prices in the nation for broadband plans. As shown in Figure 1, California had the highest prices of broadband in the country with an average of \$157 per month in the >25-50 Mbps speed tier in 2021. While the unweighted plan prices are a simple average that do not account for the number of subscribers to each plan, the prices provide a snapshot of plans available to all customers.

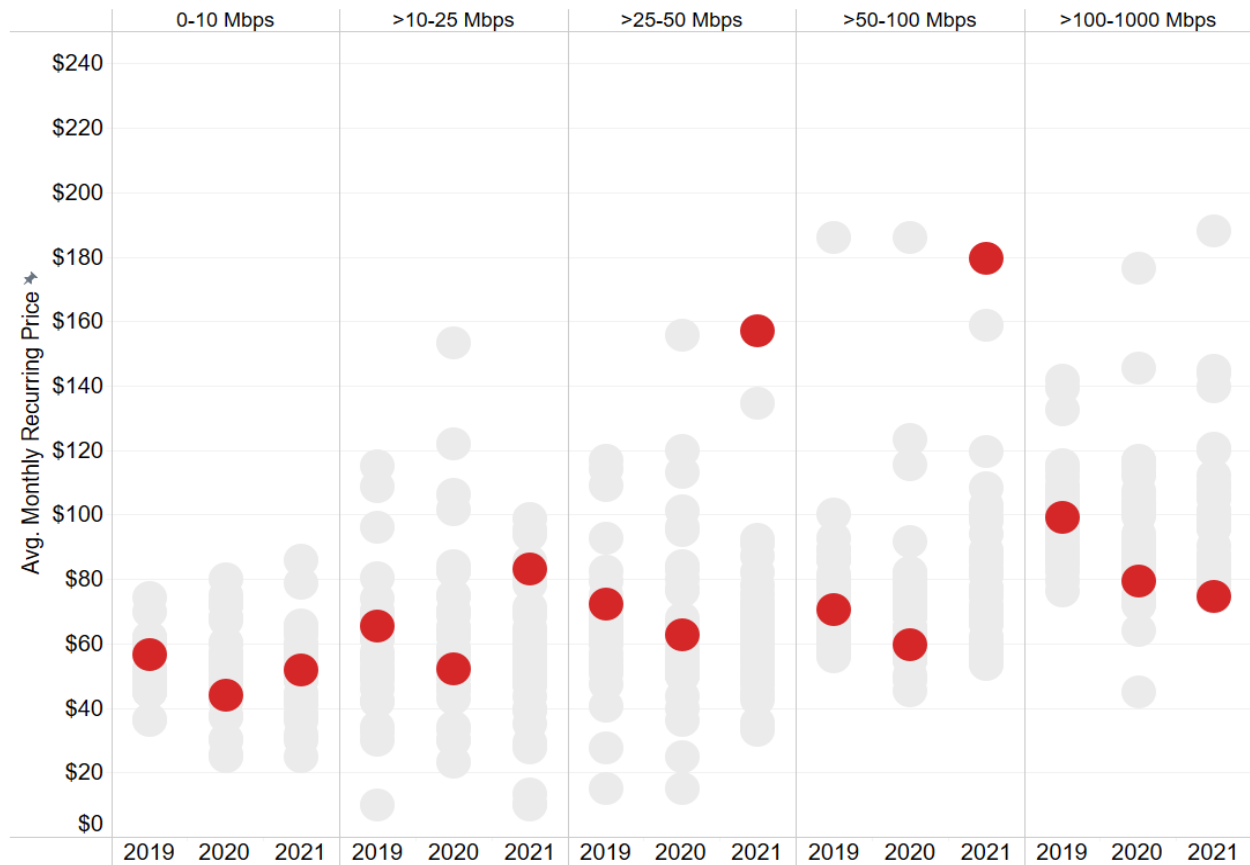
Figure 1: Unweighted Monthly Recurring Price for Fixed Broadband Across States for the >25-50 Mbps speed tier, 2021



As shown in Figure 2 below, for the >25-50 Mbps speed tier and the >50-100 Mbps speed tier, California's unweighted average monthly recurring prices in 2021 were 1.5 times and two times the national average, respectively. Only in speed tiers greater than 100 Mbps were California's

unweighted average monthly recurring prices in 2021 lower than the national average. From 2019-2021, California's unweighted average and median monthly recurring prices decreased from 2019 to 2020 before increasing from 2020 to 2021, especially for the 0-10 Mbps, >10-25 Mbps, >25-50 Mbps, and >50-100 Mbps speed tiers. The unweighted average provides a snapshot of prices across the dataset in California; higher unweighted average prices from one year to the next indicate that there were a greater number of higher priced plans across service provider census-tract pairs in the year showing the increase compared to prior years. Simply stated, during the COVID-19 pandemic providers offered plans with higher prices in the same speed tiers than those offered prior to the pandemic. Most markedly, unweighted monthly prices in the >25-50 Mbps, and >50-100 Mbps speed tiers rose substantially in 2021 when compared with the unweighted average prices in 2020.

Figure 2: Unweighted Monthly Recurring Price for Fixed Broadband Across U.S. States, 2019-2021

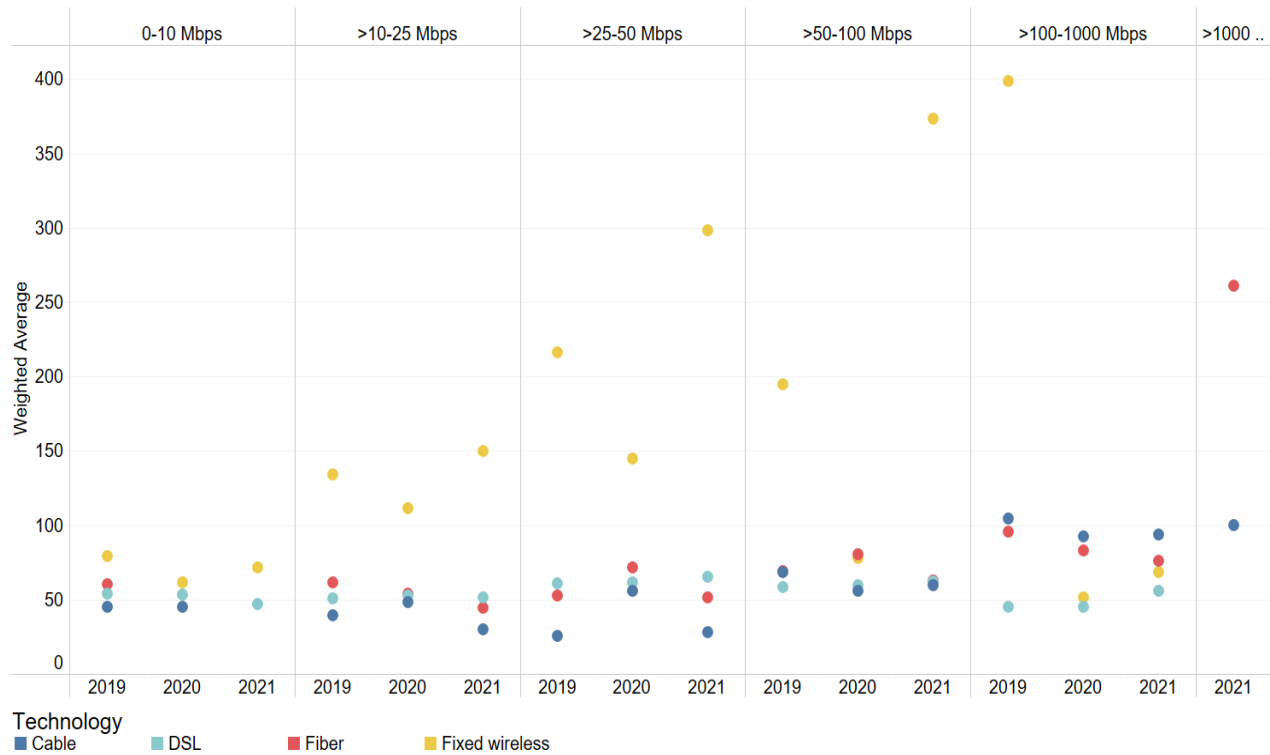


Highlight .. Highlighting "CALIFORNIA"

Broadband providers’ plan prices vary widely even within the same technology and speed tiers.

Using the FCC’s weights,²² which are comprised of a variety of factors including nonresponsive providers and potential subscribers, the analysis examines trends in the weighted average plan prices by technology. In California, the FCC’s data also shows that from 2019-2021, that year-on-year prices have fluctuated widely.

Figure 3: Weighted Average Monthly Recurring Price for Fixed Broadband Plans in California by Technology Type, 2019-2021



As Figure 3 shows, for cable and fiber, weighted average prices increased for cable and fiber in 2020 compared to 2019 in the speed tiers of >10-25 Mbps and >25-50 Mbps for cable, and >25-50 Mbps and >50-100 Mbps for fiber. But for DSL and fixed wireless, prices either remained the same or decreased from 2019 to 2020 before increasing in 2021 — rather dramatically for fixed wireless — in the >25-50 Mbps and >50-100 Mbps speed tiers. Weighted average prices likely represent the prices that may be offered to the average customer in urban areas in California.

Prior to the COVID-19 pandemic, plans in lower speed tiers offering download speeds of 25 Mbps were considered entry level options,²³ which are especially critical to enable new adopters and lower-income households to connect to broadband. The fact that weighted average prices for cable and fiber in the entry level speed tiers increased from 2019 to 2020 (compared to price decreases from 2019 to 2020 in the speed tier of >100-1000 Mbps) highlights the differential price impacts for new adopters and lower-income households, who likely faced price *increases* at the onset of the COVID-19 pandemic.

This finding comes in the wake of other studies that have found that prices of entry level options have increased since 2015. One study's analysis of the FCC Urban Rate Survey data from 2015-2020 found that both median and average prices have increased considerably from 2015 to 2020 at the speed of 25 Mbps download; excluding fiber-only plans, the study found that the median non-promotional broadband prices increased by 22% between 2016 and 2020, approximately three times the rate of inflation during that four-year period.²⁴ Other data sources also point to price increases in this entry level tier that are greater than the rate of inflation.²⁵

In addition to the FCC Urban Rate Survey data, Cal Advocates analyzed the trends in average minimum recurring prices for plans from 2019-2022 based on its Annual Broadband data request and found indications of price *increases* for entry level standalone fixed broadband plans. In the 0-10 Mbps speed tier, average minimum recurring prices increased from \$61 to \$90 from 2019-2021 before decreasing to \$55.5/month in 2022. In the >10-25 Mbps speed tier, average minimum recurring prices increased from \$76/month in 2019 to \$84/month in 2020 before decreasing starting in 2021. Average minimum prices reflect the lower bounds of the prices available to customers with access to broadband plans in a given speed tier. Higher prices during the COVID-19 pandemic for plans in the entry level speed tier meant that at a time when the service was needed most, customers faced higher prices for a service essential to work, study, and obtain critical social services. These higher prices were likely especially problematic for new adopters and low-income customers.

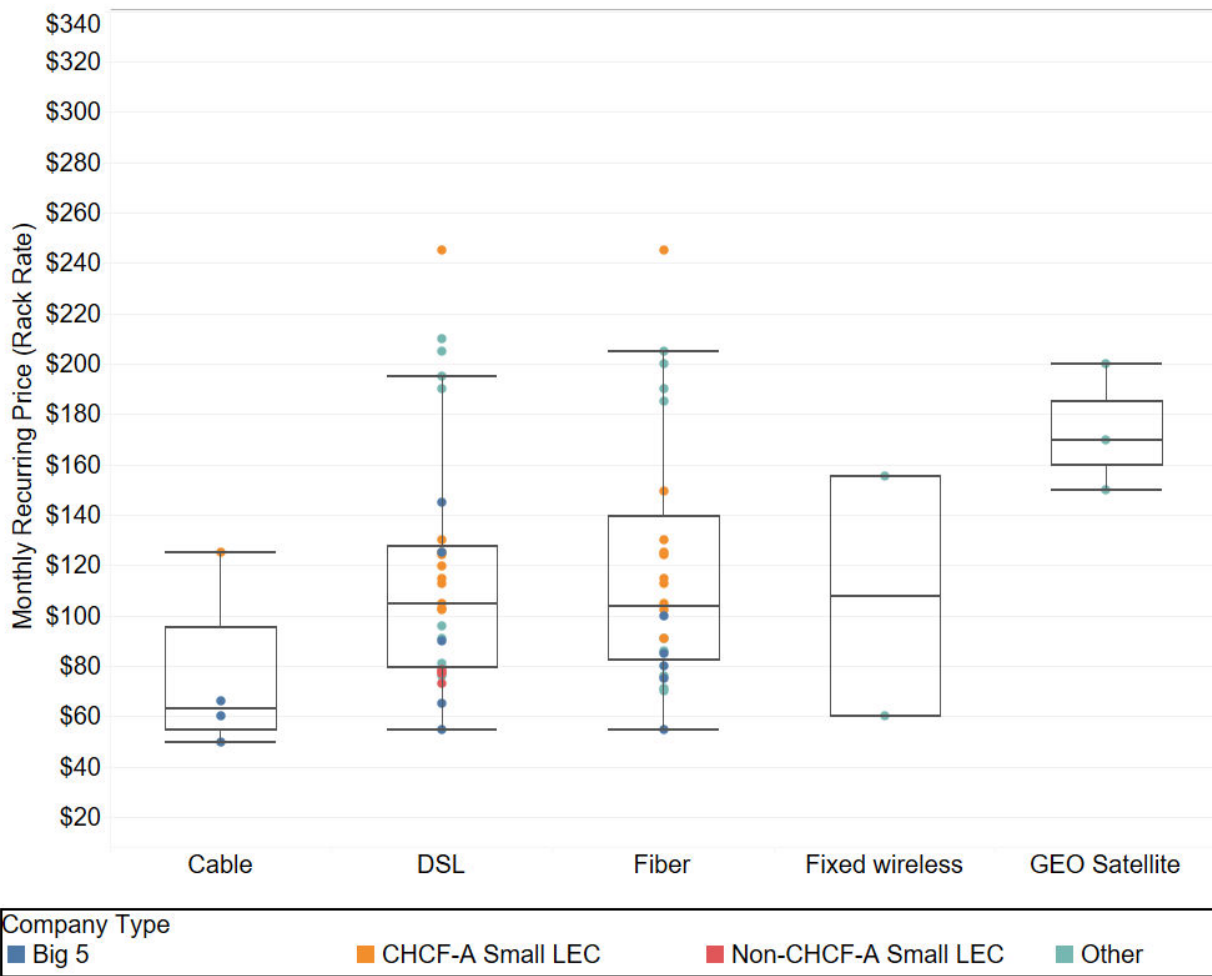
For each technology-speed tier, prices for broadband plans vary widely across and within individual service providers' offerings.

Not only have prices for broadband plans fluctuated year-on-year, but analysis of broadband providers' prices in California collected through Cal Advocates' Annual Broadband Data

Request shows that the average monthly recurring prices for broadband plans vary widely across broadband providers by each technology-speed tier. Average monthly recurring prices were the highest for GeoLinks and Personal Network for Computing (PNC), followed by the small local exchange carriers (LECs) and Consolidated Communications. Of the five largest broadband providers²⁶ — AT&T, Comcast, Charter, Cox, and Frontier (Big 5) — the average monthly recurring price across all plans offered by AT&T, Comcast, and Cox was lower than that of the others for plans within the same technology-speed tier. Lastly, and notably, Anza Electric Cooperative, a member-owned not-for-profit organization, had the lowest average monthly recurring price in the state; this finding is in keeping with current research that shows that non-for-profit municipal networks offer lower priced and higher-speed alternatives than privately held providers.²⁷

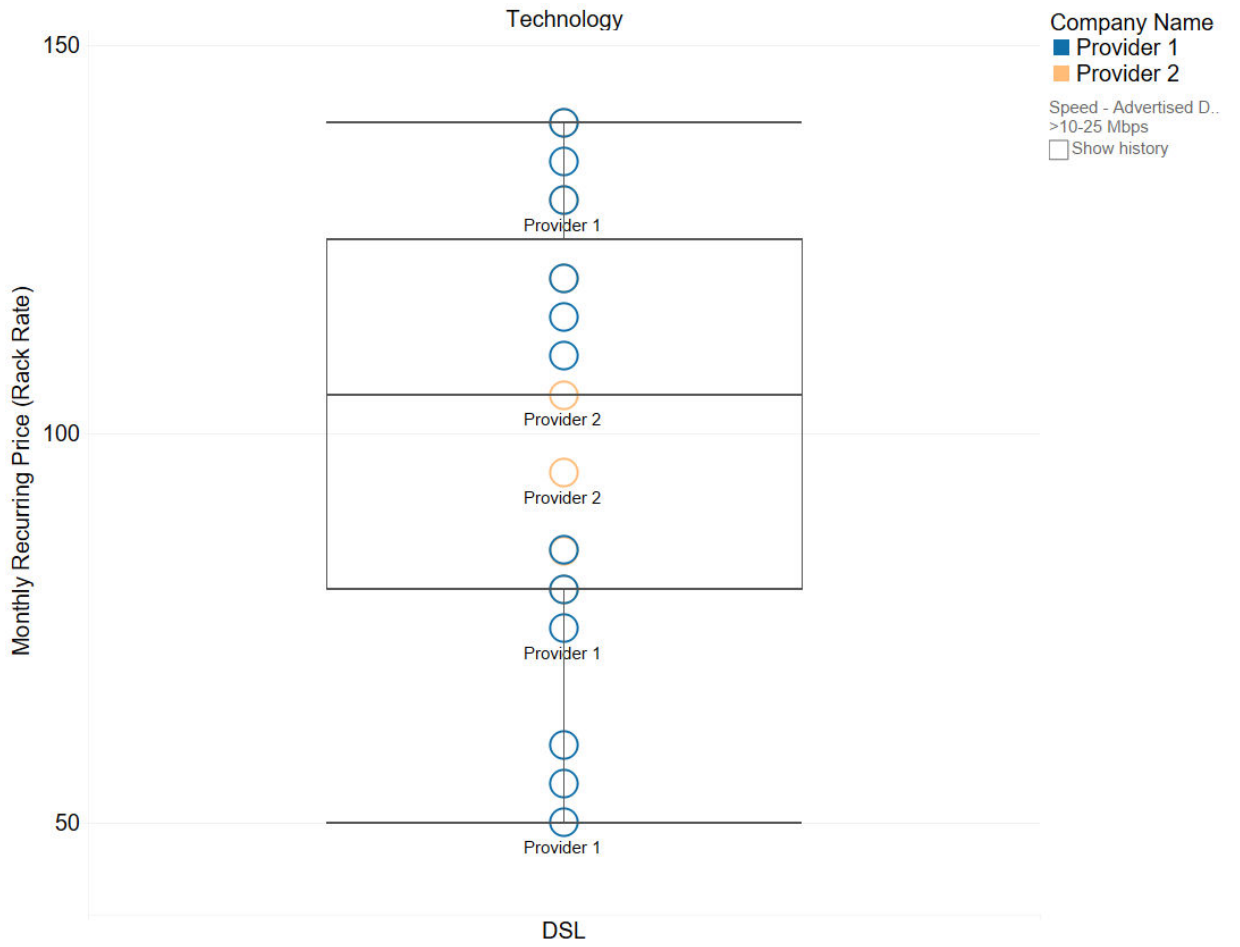
Analysis of data from California broadband providers also reveals that those providers have a wide variation in prices for broadband plans within the same technology-speed tier. In other words, for plans with similar advertised speeds that use the same technology to deliver service, broadband providers charge customers widely different prices. Cal Advocates analyzed the spread in monthly recurring prices by examining the prices of all plans of each provider in specific technology-speed tiers to provide a comprehensive picture of each provider's prices. For broadband plans in the >25-50 Mbps advertised download speed tier offered over DSL networks, for instance, the analysis shows that broadband providers' monthly recurring prices ranged from \$55-\$245 (see Figure 4). This wide variation in monthly recurring prices is not limited to DSL broadband service with an advertised download speed >25-50 Mbps. Instead, there is a substantial variation in the monthly recurring prices of broadband plans in all speed tiers, whether delivered over cable, fiber, or fixed wireless.

Figure 4: Monthly recurring price by company, advertised download speed and technology for the speed tier of >25-50 Mbps, 2021



This wide variation in monthly recurring prices within the same technology-download speed tiers persists even when controlling for advertised upload speeds in addition to advertised download speeds. For example, for fixed advertised speeds of 0-10 Mbps upload and 0-10 Mbps download for plans delivered over DSL, one provider’s monthly recurring price ranged from \$95-\$105. and another provider’s ranged from \$50-\$140 (Figure 5).

Figure 5: Monthly recurring price by company, advertised download speed, advertised upload speed and technology, 2021



IS BROADBAND SERVICE AFFORDABLE FOR CALIFORNIA'S LOW-INCOME CUSTOMERS?

For fixed standalone broadband service plans at or near the advertised speed of 25/3 Mbps — speeds necessary for a service to qualify as broadband under the FCC definition — Race Communications charged the lowest monthly recurring price in the state, between \$25-35. The Big 5 charged monthly prices in the range of \$45-55. If customers lived outside the footprint of the large 5 Broadband providers but within the service area of one of the Small LECs, they could be expected to pay anywhere between \$72.50/month (for TDS Companies) to \$150/month (for Ponderosa). And if customers were left with the choice of a provider other than the Big 5 or Small LECs, this range in price increased further from \$70 to \$229/month. These plans do not include taxes, surcharges, and fees, which further add to the price of the fixed standalone broadband plans.

Current research indicates that low-income customers cannot afford to pay more than \$10-\$20 for broadband.* The prices for broadband plans above illustrate that even plans offering 25/3 Mbps speeds may not be affordable to households at the lower end of the wealth spectrum — especially those that may make slightly more than what would qualify for discounted/income-qualified low-income broadband plans.

In recent years, the FCC has noted that it will assess the affordability of voice and broadband service by “measuring the extent to which voice and broadband service expenditures exceed two percent of low-income consumers’ disposable household income as compared to the next highest income group.”** The current annual income threshold for California LifeLine is \$40,300 for a family of four; if a family makes slightly over this amount, say, \$42,000, then a \$70 broadband plan is about 2% of gross income per month. Therefore, a \$70 broadband plan is not affordable since it does not include voice service, and since gross income does not equate to disposable income.

* See Sallet, J., *Broadband for America's future: A vision for the 2020s*, The Benton Institute for Broadband & Society, 2019, https://www.benton.org/sites/default/files/BBA_full_F5_10.30.pdf, pp. 65-66.

** See Federal Communications Commission, *Third Report and Order, Further Report and Order, and Order on Reconsideration*, March 31, 2016, p. 151. Emphasis added.

Broadband providers’ marketing practices influence the price of broadband. The price of broadband varies depending on whether it is bundled with other services or sold on standalone basis.

To explore the variations in broadband providers’ plan prices, Cal Advocates examined trends in plan pricing based on the providers’ service descriptions. The service descriptions categorize whether broadband is sold independently (i.e., on a standalone basis) or in conjunction with a voice and/or TV connection (i.e., bundled). If the price of broadband on a standalone basis and the price of broadband within a bundle is the same for plans offering the same speeds over

similar technologies, then pricing is *not* a function of whether the plan is bundled or stand-alone. The analysis reveals that several broadband providers charge varying prices for broadband in the same speed tier and using the same technology, depending only on whether broadband is offered as a standalone service or bundled with other services. Simply stated, *prices varied based on whether the plans were marketed on a standalone basis or bundled with additional services.*

For Comcast and Charter, the price of broadband *decreased* if bought in a bundle rather than a standalone basis as seen in Table 1.

Table 1: Monthly recurring prices for select plans: Comcast and Charter

Company	Plan Speed Download/ Upload	Service Description	Monthly Recurring Price (Price of Broadband in Bundle)
Comcast	400/10	Broadband (standalone)	\$80 (N/A)
		Broadband + Voice + TV	\$120 (\$43-\$52)
		Broadband + TV	\$110 (\$47-\$56)
Charter	400/20	Broadband (standalone)	\$94.99 (N/A)
		Broadband + Voice	\$107.98 (\$95)
		Broadband + Voice + TV	\$178.97 (\$89)
		Broadband + Mobile Voice	\$108.99 (\$95)
		Broadband + TV	\$165.98 (\$89)

The wide variation in pricing based on plan marketing has an important implication for broadband policy: it suggests that *plan prices are not a good gauge of the true cost to serve customers.* By the same token, the variations in plan prices based on whether the plan is bundled or standalone indicate the need for caution while using plan prices to compare the cost of one specific technology of service delivery to another. For instance, from a technological perspective, fiber offers higher, symmetrical speeds compared to cable, fixed wireless, and DSL (see Appendix B). While fiber plans (as well as fixed wireless plans) are more expensive on an average basis compared to cable and DSL, the stark difference in monthly recurring plan prices based on whether the plan is standalone and bundled makes it difficult to discern the true cost to customers of fiber plans attributable to technology alone.

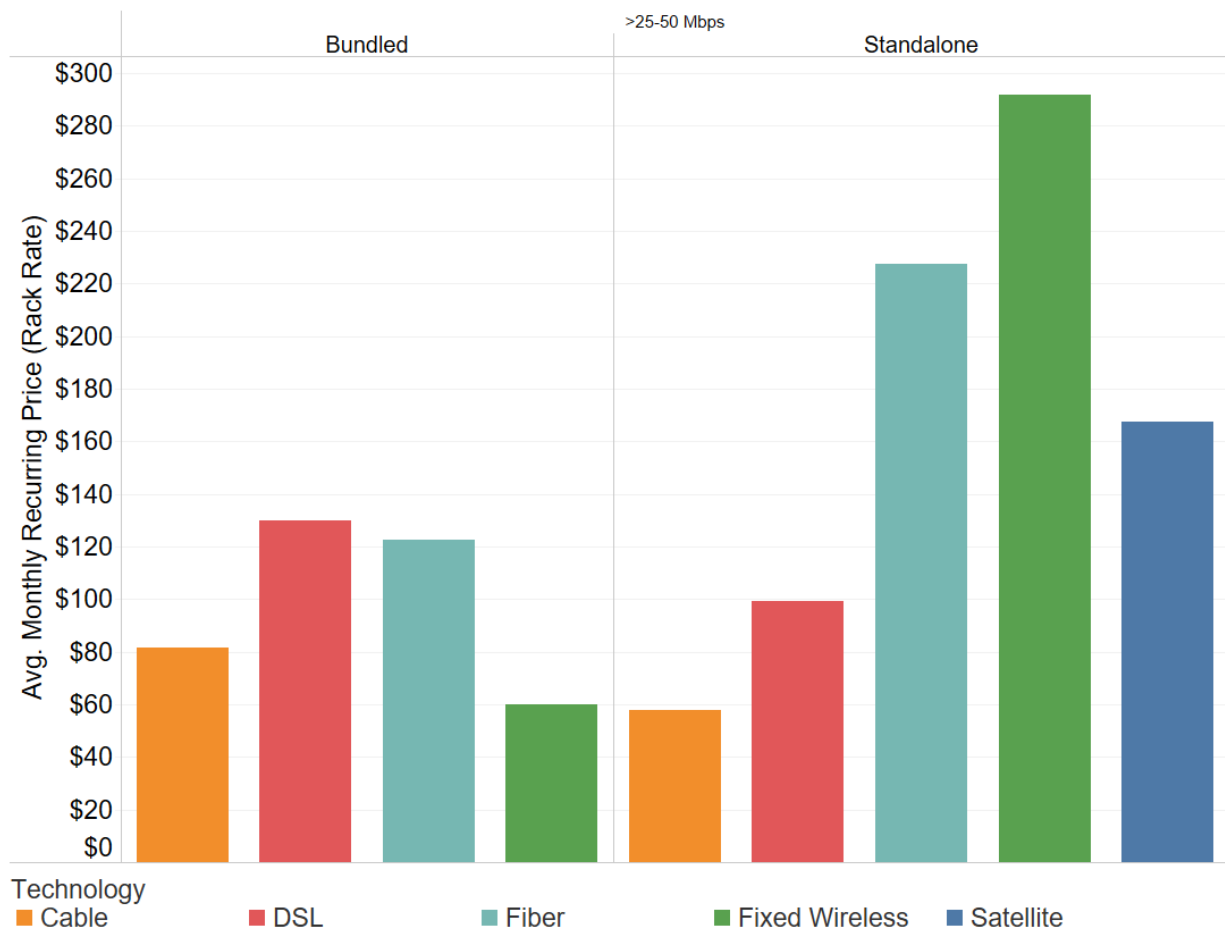
Prices do not have to increase as speeds increase.

In addition to examining trends in plan pricing based on their service description, the analysis examines whether there is a correlation between monthly recurring plan pricing and advertised download speed for plans within each technology type. When examining plan prices for each

provider, prices appear to increase as speeds increase; however, Cal Advocates reviewed the data to learn whether the same trend was observed across all plans within a given technology. Reviewing all plans within the same technology helps discern whether price variations for plans for a single provider based on advertised download speed align with trends in the broader broadband market.

All plans²⁸ within cable, DSL, fiber, and fixed wireless technologies demonstrate statistically significant correlations between advertised download speed and monthly recurring price for cable, DSL, and fixed wireless. However, advertised download speed explains only some of the variation in pricing for cable and fixed wireless and very little of the pricing variation for DSL²⁹ (see Figure 6).³⁰

Figure 6: Average monthly recurring prices for broadband bundled and standalone plans by technology at advertised download speed of >25-50 Mbps, 2021



Fiber plans exhibited no correlation between broadband providers' advertised download speeds and the plans' monthly recurring prices (Table 2).³¹

Table 2: Relationship between advertised download speed and monthly recurring price by technology for all standalone and bundled broadband plans offered in 2021.

Technology	P value ³²	R ² Value ³³	No. of modeled observations (n)
Cable	<0.0001	0.4066	54
DSL	<0.0001	0.2406	263
Fiber	0.9339	3.764e-05	185
Fixed Wireless	< 0.0001	0.4051	115

Review of the prices of standalone broadband plans reveal a statistically significant correlation between advertised download speed and monthly recurring price for cable and fixed wireless (Table 3). Furthermore, advertised download speed helped explain ~73% of the variation in cable monthly recurring prices; however, this result should be interpreted with caution due to the small sample size of standalone cable plans. For fixed wireless, advertised download speed helped explain roughly half the variation. There was no correlation between advertised download speed and monthly recurring price for DSL and standalone fiber broadband plans.

Table 3: Relationship between advertised download speed and monthly recurring price by technology for all standalone broadband plans offered in 2021.

Technology	P value	R ² Value	No. of modeled observations (n)
Cable	<0.0001	0.7296	16
DSL	0.0912	0.0324	89
Fiber	0.5044	0.0053	86
Fixed Wireless	< 0.0001	0.5200	107

The effectiveness of broadband service providers' plans for low-income customers is hobbled by varying eligibility requirements and low awareness of those programs among potential customers.

Several major broadband providers offer low-cost broadband plans to qualifying low-income households in California (see Table 4). However, there are two critical features of many broadband programs designed for qualifying low-income households that may limit the ability of low-income households to subscribe to these plans.

Table 4: Low-Income Broadband Plans as of October 20, 2021³⁴

Plan and Company Name	Plan details as of October 20, 2021		Plan details as of July 21, 2022	
	Monthly Rate Without Tax	Speed (download/upload in Mbps)	Monthly Rate Without Tax	Speed (download/upload in Mbps)
Internet Essentials from Comcast³⁵	\$9.95	Up to 50/5	\$9.95	Up to 50/10
Access from AT&T³⁶	\$10	Up to 25 download**	\$30	Up to 100 download
Connect2Compete from Cox³⁷	\$9.95	Up to 50/3	\$9.95	Up to 100/3
Spectrum Internet Assist from Charter³⁸	\$19.99*	30 download	\$17.99	Up to 30/4
Frontier Fundamental Internet³⁹	\$19.99*	1.6-50/1-50***	\$19.99*	3-50/1-50***

*Includes \$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 are eligible for a speed upgrade up to 25Mbps.

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

First, broadband providers' low-income broadband plans have varying eligibility requirements. For example, enrollment in various government assistance programs such as the Supplemental Nutrition Assistance Program (SNAP) or Medicaid is sufficient to establish eligibility for Comcast Internet Essentials plan.⁴⁰ AT&T's Access plan has similar eligibility requirements where enrollment in SNAP or Supplemental Security Income (SSI) is sufficient. Additionally, households with incomes below 200% of the federal poverty guidelines are also eligible for AT&T's Access plan. On the other hand, Cox's Connect2Compete plan, requires not only participation in a government subsidy program such as SNAP, but also requires that qualifying households include at least one child that attends a K-12 school.⁴¹ As previously discussed, broadband providers may not offer service throughout the state, which means that customers can only subscribe to low-income plans available where they live. Varying eligibility requirements may limit the ability of low-income households to qualify for low-income broadband plans available where they live.

The Existing Definition of Low-Income Households in Public Purpose Programs Excludes Those in Need

There are varying thresholds to qualify as low-income for the Public Purpose Programs overseen by the Commission. For example, the California LifeLine threshold for a family of four is \$40,300 per year. The California Advanced Services Fund (CASF) uses the low-income threshold of \$55,000 annually for a family of four. The difference in just these two standards exemplifies the risk of leaving those in need behind: According to the Census Bureau, 10% of California’s households — more than one million households — have incomes between \$35,000 and \$50,000 in 2020,** the majority of which would be negatively impacted depending on a program’s use of the California LifeLine or CARE income threshold.

Through the Environmental and Social Justice (ESJ) Action Plan,**** the Commission defines low-income households as households with incomes below 80% of the area median income (AMI). Using the statewide median income as defined by the California Department of Housing and Community Development (HCD), households with an annual income of \$81,280 or lower would be considered low-income.**** Applying the HCD income limits to the ESJ Action Plan definition of low-income is more inclusive and accounts for cost-of-living in California.

*CASF uses the same low-income threshold as the California Alternative Rates for Energy (CARE) program.

** Census Bureau. “Income in the Past 12 Months (In 2020 Inflation-Adjusted Dollars).” 2020: ACS 5-Year Estimates Subject Tables. U.S. Department of Commerce. Available at <https://data.census.gov/cedsci/table?q=household%20income&g=0400000US06&tid=ACSST5Y2020.S1901>.

*** See <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/news-and-outreach/documents/news-office/key-issues/esj/esj-action-plan-v2jw.pdf>

**** See <https://www.hcd.ca.gov/docs/grants-and-funding/inc2k22.pdf>

Second, a significant fraction of eligible households is unaware of either low-income broadband plans offered by broadband providers or federal broadband subsidies for low-income customers. A 2021 California statewide survey on broadband adoption found that affordability was the main reason for lack of broadband adoption, yet, nearly two in three unconnected or smartphone-only households were unaware of broadband providers’ low-income internet plans.⁴² Moreover, of the limited number of households that were aware of broadband providers’ low-income offerings, the vast majority of those (76%) did not apply for the offerings.⁴³ Likewise, low-income customers are not aware of federal subsidies that may help lower out-of-pocket costs for broadband plans. For instance, commenters at the FCC note that only 25% of households eligible for the Emergency Broadband Benefit (EBB) Program were aware of the benefit.⁴⁴ *Lack of awareness about federal subsidies and broadband providers’ low-income plans prevents*

qualified customers from subscribing to broadband because of affordability concerns that might be resolved if the customers were informed of their options.

The cost of computing devices, including hardware and software, is another barrier for broadband adoption among low-income families.⁴⁵ For example, the Office of Governor Gavin Newsom published a press release on April 20, 2020, stating that, “[a]pproximately one in five students in California lack high-speed Internet or an appropriate computing device at home. In a parent survey, two weeks ago, 50% of low-income families and 42% of families of color reported that they lacked the laptop, Chromebook, or tablet needed to access distance learning.” The EBB and Affordable Connectivity Program (ACP) attempt to address the high cost of devices by providing a one-time subsidy of \$100 towards the cost of a device; yet, as discussed above, low awareness of these programs means that not all customers that qualify for such subsidies will actually benefit from them.⁴⁶

Case Study: AT&T

In response to the critical need for broadband connectivity during the COVID-19 pandemic, Congress created the Emergency Broadband Benefit (EBB) Program⁴⁷ followed by its successor in 2021 — the Affordable Connectivity Program (ACP) —which provided subsidies to reduce the out-of-pocket costs of broadband plans for customers and can be applied to any broadband plan.⁴⁸ To determine the existence of potential trends in broadband prices before and after implementation of these subsidies, Cal Advocates analyzed the monthly recurring price of all of AT&T’s broadband plans. AT&T was selected as a case study because the company collected price data just before the EBB went into effect (i.e., mid-2021) and after the ACP was implemented (i.e., early 2022). Additionally, AT&T offers only standalone broadband plans, which allows for comparability analysis of prices across years. Likewise, AT&T offers service over multiple technologies, which also enables comparison of prices of plans by technology. Lastly, since AT&T’s prices affect many Californians, the company serves as an important test case to evaluate if and how subsidies ultimately affect the end consumers.

AT&T offers broadband plans in California using two technologies: DSL and fiber. In 2021, AT&T offered several plans within the advertised download speed range of 10-100 Mbps. All plans had a monthly recurring price of \$55, regardless of the advertised download or upload speed. In other words, plans prices were unrelated to the advertised speeds of the plans. All the

plans within the advertised download speed range of 10-100 Mbps, except the 100 Mbps plan, were offered over legacy DSL networks. The 100 Mbps advertised download speed plan, along with a few other high-speed plans, were delivered over fiber. In 2021, the monthly recurring price of the fiber plans with speeds that exceeded 100 Mbps ranged from \$65 to \$80. In 2022, AT&T *increased* the monthly recurring price of all DSL plans from \$55 to \$70, a ~27% increase (for comparison inflation increased by 7% from Dec. 2020 to the end of 2021). In contrast, AT&T *decreased* the monthly recurring price of two fiber plans; specifically, for plans with symmetrical speeds of 300 and 500 Mbps, AT&T decreased the monthly recurring price by \$5 and \$10, respectively (a ~7% and 12.5% decrease in monthly recurring price, respectively, compared to 2021).

The increase in all DSL plan prices has negative consequences for customers since it effectively blunts the benefit of the EBB/ACP subsidies. If AT&T had maintained the 2021 monthly recurring price for plans after EBB/ACP went into effect, customers would have seen dramatic decreases in out-of-pocket costs, as all plans would have cost \$5 with EBB and \$15 with ACP. Instead, AT&T's monthly recurring price increases negate the effect of subsidies, and even with ACP, plans cost \$40/month.⁴⁹ It is also worth noting that AT&T increased the prices of broadband plans targeted toward low-income customers after the launch of federal subsidies, particularly the ACP, from \$10 to \$30 per month. While companies may argue that monthly recurring price does not reflect the cost savings of any discounts, these discounts come with conditions and requirements and may not be accessible to all customers.⁵⁰ In this case, monthly recurring prices reflect long-term costs that customers may pay in the absence of discounts or once any discounts have expired.

As such, AT&T's across the board increase in all DSL plan prices exemplifies the pitfall of solely relying on federal subsidies, notably ACP, to address affordability concerns. The ACP subsidy can be applied to any plan and without concurrent requirements to limit price increases for plans, **there is no guarantee that the subsidies will lower out-of-pocket costs for customers.** In other words, if broadband providers raise prices to match subsidies, i.e., monetize subsidies, the ultimate result is that the broadband providers will benefit from the subsidies, whereas customers will not.

The asymmetrical changes in monthly recurring prices for DSL versus fiber plans also raises concerns of unfair impacts on customers that only have access to DSL service.⁵¹ This is especially so, since DSL is a legacy technology and has likely been fully depreciated.⁵² While AT&T increased upload speeds for all DSL plans except the plan offering 100 Mbps symmetrical speeds, these speed increases do not justify the corresponding increases in monthly recurring price. As noted earlier, in 2021 and 2022, AT&T charged the same monthly recurring price regardless of advertised download and upload speed for DSL plans.

It is likely that the increase in monthly recurring prices was a business decision rather than one driven by any inherent technological reason alone. This is supported by AT&T's statements in its annual 10-K filed to the United States Securities and Exchange Commission (SEC), which asserted that broadband revenue increases in 2021 were driven by an increase in fiber customers and pricing,⁵³ although the increase in fiber customers does not reflect a significant overall increase in customers. Additionally, the company's operating expenses during the same time did not significantly increase.

Summary of broadband pricing analysis.

There are two critical implications of the findings related to the pattern of correlation between advertised download speed and monthly recurring price for broadband policy:

First, advertised download speeds alone do not inform the prices of fixed broadband plans.

When looking across all plans, especially for DSL and fiber plans that reflect a large sample size, **it is unclear whether increases in speed must result in price increases, as well.** Rather, broadband providers can and do make a *choice* in setting the prices and advertised download speeds at which they market the fixed broadband service plans. This finding is also corroborated with findings from the FCC Urban Rate Survey dataset: for the same monthly recurring price, the unweighted average download and upload speeds offered for standalone broadband plans varied widely from 2019-2021 (see Figure 7).

Figure 7: Average download and upload speed at monthly recurring prices for fixed standalone broadband service plans in California according to the FCC Urban Rate Survey, 2019-2021

	Monthly Recurring Price / Year								
	40		50			60			
	2020	2021	2019	2020	2021	2019	2020	2021	
Avg. Download Bandwidth Mbps	7.0	11.7	32.5	36.1	70.0	15.6	506.0	82.8	
Avg. Upload Bandwidth Mbps	1.0	9.0	20.3	17.1	34.0	13.1	500.8	62.2	

Second, while Big 5 companies appear to charge nearly identical prices for plans at the same advertised download speed (see Figure 4) *they do not necessarily compete for the same customers* due to their distinct service territories.⁵⁴ Providers may argue that customers do not purchase a service based on the underlying network. Looking solely across the standalone broadband plans of the Big 5 providers that serve most residential customers in California, it may appear that there is price competition. Yet this finding is weakened by the fact that not all providers and plans are available to all customers across California.

Furthermore, as the AT&T Case Study demonstrates, **subsidies may not serve the intended benefit of lowering broadband plan prices for customers. This is especially the case if broadband providers increase prices in response to subsidies.**

Conclusions

California has some of the highest monthly recurring prices in the nation for fixed broadband service plans when examining the unweighted average monthly recurring prices based on the FCC Urban Rate Survey data. For some speed tiers, prices have markedly increased during the COVID-19 pandemic. At a time of critical need for broadband service, these price increases are detrimental to increased adoption.

Broadband prices vary widely within and across broadband providers' offerings. These variations in broadband providers' plan prices are not solely predicated on the technology over which the broadband plan is delivered or even the broadband plan speeds. The way that broadband providers' offer a broadband plan — either on a standalone or bundled basis — influences the price of the plan. Price variations based on whether the service is standalone or bundled underscore that plan prices do not reflect the true cost to serve customers. Companies make a choice in setting the monthly recurring prices and advertised download speeds of broadband plan prices: prices do not have to increase as speeds increase. For broadband plans offered over cable technology, broadband providers' plan pricing choices raise concerns of lack of adequate competition.

Existing policies and programs aimed at addressing high prices for low-income customers suffer from serious pitfalls and design flaws. Subsidies, such as ACP, will not reduce broadband prices for customers if broadband providers monetize the subsidies by raising plan prices in response to subsidies. In addition, broadband providers' plans for low-income customers are limited in their ability to increase subscribership by varying eligibility requirements and low awareness among the customers that could benefit from the plans.

Households increasingly rely on broadband to meet everyday needs, including accessing healthcare and education. Communities with lower broadband subscribership also often experience other negative health determinants and health outcomes. Yet price is a barrier to broadband adoption, and adoption is critical because broadband is an essential service.

Notes:

¹ See Decision (D.) 20-07-032 (2020, July 16), Decision Adopting Metrics and Methodologies for Assessing the Relative Affordability of Utility Service, pp. 27-32.

See also D.21-10-020, Rulemaking 20-09-001 (2021, October 21), Decision Resolving Phase I of Broadband for All Proceeding, p.2.

See also Executive Department, State of California (2020, August 14), Executive Order (E.O.) N-73-201.

² 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).” See FCC-11-161 (2011), pp. 36-37.

³ FCC, Urban Rate Survey Data & Resources, <https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources>.

⁴ It is important to note that this analysis used advertised download and upload speeds and not actual speeds. Thus, actual speeds that customers receive may be different than advertised.

⁵ This finding is based on the analysis of unweighted average monthly recurring prices based on the FCC Urban Rate Survey dataset.

⁶ “An Internet service provider (ISP) is an entity that provides broadband service to subscribers. Broadband refers to all services that supply high-speed Internet to subscribers.” Cornell Law School, Legal Information Institute, [https://www.law.cornell.edu/wex/internet_service_provider_\(isp\)](https://www.law.cornell.edu/wex/internet_service_provider_(isp)), accessed July 2022.

⁷ Broadband refers to high-speed internet access that delivers speeds of at least 25/3 over digital subscriber line (DSL), cable, fiber, wireless, or satellite. See Federal Communications Commission, *FCC 2015 Broadband Progress Report*, February 4, 2015.

⁸ *Decision Adopting Metrics and Methodologies for Assessing the Relative Affordability of Utility Service*, (D.20-07-032), Attachment A - Affordability Metrics Framework Staff Proposal, R.18-07-006, January 24, 2020, p. 23.

⁹ See, for example, Vogel, E.A., Perrin, A., Rainie, L., & Anderson, M. (2020, April 30). 53% of Americans Say the Internet Has Been Essential During the COVID-19 Outbreak. Pew Research Center. <https://www.pewresearch.org/internet/2020/04/30/53-of-americans-say-the-internet-has-been-essential-during-the-covid-19-outbreak/>. See also Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California (R. 20-09-001), September 10, 2020, p. 7.

¹⁰ United States Census Bureau, American Community Survey, S2801, Types of Computers and Internet Subscriptions. <https://data.census.gov/cedsci/table?q=internet&tid=ACSST5Y2020.S2801>, accessed May 2022.

¹¹ It is important to note that this analysis used advertised download and upload speeds and not actual speeds. Thus, actual speeds that customers receive may be different than advertised.

¹² California Public Utilities Commission (CPUC), EOY2020 CA Fixed Broadband Adoption, <https://public.tableau.com/app/profile/cpuc/viz/EOY2020BBAoptionbyHH/Dashboard> <https://public.tableau.com/app/profile/cpuc/viz/EOY2019BroadbandAdoptionbyPopulation/County>, accessed June 2022.

¹³ See FCC-11-161 (2011), pp. 36-37.

¹⁴ 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 (March 2021). *CETF-USC Statewide Broadband Adoption Survey*, p. 5. <https://www.cetfund.org/wp->

<content/uploads/2021/03/Statewide-Survey-on-Broadband-Adoption-CETF-Report.pdf>, accessed September 2, 2022.

¹⁵ Chao, B., Park, C., & Stager, J. (2020, July 15). *The Cost of Connectivity 2020*. Open Technology Institute. <https://www.newamerica.org/oti/reports/cost-connectivity-2020/>; “OECD Fixed Broadband Basket, High User,” (2017, June). <http://www.oecd.org/sti/broadband/broadband-statistics/>. The “high user” designation matched the minimum criteria for the 25 Mbps standard.

¹⁶ Turner, S. (2021, May 20). *Price Too High and Rising: The Facts About America's Broadband Affordability Gap*. Free Press. https://www.freepress.net/sites/default/files/2021-05/prices_too_high_and_rising_free_press_report.pdf, p. 2.

¹⁷ Brodtkin, J. (2021, May 14). ISPs claim broadband prices aren't too high – Biden admin isn't buying it. Ars Technica. <https://arstechnica.com/tech-policy/2021/05/white-house-doesnt-believe-isps-claims-that-prices-are-low-enough-report-says/>

¹⁸ See E.O. N-73-201.

¹⁹ See, for example, R. 20-09-001; California Advances Services Fund (CASF), <https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/casf-background-and-history>.

²⁰ 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.

See 47 USC §1721(7) and (8).

²¹ FCC, Urban Rate Survey Data & Resources, <https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources>.

²² FCC's Urban Rate Survey data includes weights corresponding with each fixed broadband plan offering for a given service provider-census tract pair. FCC notes that the weights are used to ensure that the contributions of each response properly represent the offers that consumers possibly receive nationwide. The weights are a product of factors such as nonresponse weight, service level weight for respondents who provide multiple rates for the same service level offered via different technologies, number of potential subscribers, among others. FCC does not disclose the inputs used to derive weights for each service provider-census tract pair. Therefore, some weights may over/under value certain plans.

²³ Broadband providers' low-income offering before the COVID-19 pandemic were at speeds of 25/3; however, during the pandemic, almost all Broadband providers increased the plan speeds; See, Turner, S. (2021, May 20). *Price Too High and Rising: The Facts About America's Broadband Affordability Gap*. Free Press. https://www.freepress.net/sites/default/files/2021-05/prices_too_high_and_rising_free_press_report.pdf.

²⁴ Turner, S. (2021, May 20). Price Too High and Rising: The Facts About America's Broadband Affordability Gap. Free Press. https://www.freepress.net/sites/default/files/2021-05/prices_too_high_and_rising_free_press_report.pdf, p. 15.

²⁵ Turner, S. (2021, May 20). Price Too High and Rising: The Facts About America's Broadband Affordability Gap. Free Press. https://www.freepress.net/sites/default/files/2021-05/prices_too_high_and_rising_free_press_report.pdf, citing Kagan.

²⁶ Largest measured by population served as identified in the EOY 2020 Residential Fixed Broadband Deployment by ISP database, available at: <https://public.tableau.com/app/profile/cpuc/viz/EOY2020CAResidentialFixedBBDeployment/Dashboard>

²⁷ See, for example, Brookings; OTI; Sallet.

²⁸ We examined the correlation across all plans, as this provided a larger sample size compared to standalone and bundled plans, respectively. That said, results for standalone broadband plans are discussed in the white paper for reference.

²⁹ It is important to note that the statistically significant correlation only exists if Consolidated Communications' plans are included in the analysis. Consolidated Communications has 63 plans offered over DSL, i.e., it contributes to a sizeable number of plans in the sample.

³⁰ It is also worth noting that the model performance was similar when natural logs of download speed were used in computing the linear trend model. In addition, we found similar trends when analyzing the correlation monthly recurring price and upload speeds. For cable, specifically, upload speeds explained ~45% of the variation in monthly recurring price.

³¹ We found similar trends when analyzing the correlation between monthly recurring price and upload speeds.

³² The p-value is used to determine the probability of data occurring by random chance. A p-value of less than 0.05 is typically considered statistically significant.

³³ The R² value is used to represent the proportion of variance for a dependent variable that is explained by one or more independent variables in the regression model.

³⁴ 2022 Broadband Pricing Data Request "Confidential_Attachment 1_Fixed Broadband Pricing_2022_Charter."

³⁵ Comcast Corporation. Internet Essentials from Comcast. <https://www.internetessentials.com/>, accessed October 2021.

³⁶ AT&T Communications Inc. Access from AT&T. <https://www.att.com/internet/access/>, accessed October 2021.

³⁷ Cox California Telecom LLC. Connect2Compete Affordable Internet Program. <https://www.cox.com/residential/internet/connect2compete.html>, accessed October 2021.

³⁸ Charter Communications. Spectrum Internet Assist from Charter Communications <https://www.spectrum.com/browse/content/spectrum-internet-assist.html>, accessed October 2021.

³⁹ Frontier Communications. Frontier Fundamental Internet. <https://frontier.com/fundamental-internet>, accessed October 2021.

⁴⁰ Comcast Corporation. Internet Essentials from Comcast. <https://www.internetessentials.com/>, accessed October 2021.

⁴¹ Cox California Telecom LLC. Connect2Compete Affordable Internet Program. <https://www.cox.com/residential/internet/connect2compete.html>, accessed October 2021.

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- ⁴² California Emerging Technology Fund (CETF). (2021, March). Statewide Survey on Broadband Adoption 2021. https://www.cetfund.org/wp-content/uploads/2021/03/Annual_Survey_2021_CETF_USC_Final_Summary_Report_CETF_A.pdf, slide 20.
- ⁴³ California Emerging Technology Fund (CETF). (2021, March). Statewide Survey on Broadband Adoption 2021. https://www.cetfund.org/wp-content/uploads/2021/03/Annual_Survey_2021_CETF_USC_Final_Summary_Report_CETF_A.pdf, slide 21.
- ⁴⁴ Federal Communications Commission (FCC). (2022, January 21). FCC Releases Rules to Implement Affordable Connectivity Program. <https://www.fcc.gov/document/fcc-releases-rules-implement-affordable-connectivity-program>, p. 88.
- ⁴⁵ Sallet, J. (2019, October). Broadband for America’s future: A vision for the 2020s. The Benton Institute for Broadband & Society. https://www.benton.org/sites/default/files/BBA_full_F5_10.30.pdf, p. 65.
- ⁴⁶ Federal Communications Commission (FCC). Affordable Connectivity Program . <https://www.fcc.gov/acp>, accessed June 2022.
- ⁴⁷ EBB was available to eligible households that qualified based on their income and/or participation in specific pandemic relief or other means-tested programs (e.g., Medicaid or SNAP). EBB provided eligible households with discounts of up to \$50 a month for broadband service, and up to \$75 a month if the household was on Tribal lands. EBB also provided a one-time discount of up to \$100 on a computer or tablet for eligible households. See, FCC, *FCC Adopts Report and Order to Implement Emergency Broadband Benefit Program*, <https://docs.fcc.gov/public/attachments/DOC-370324A1.pdf>.
- ⁴⁸ FCC, Emergency Broadband Benefit (EBB), <https://www.fcc.gov/broadbandbenefit>, accessed June 2022.
- ⁴⁹ Existing research indicates that low-income customers cannot afford to pay more than \$10-15 per month for broadband service; see Sallet 2020.
- ⁵⁰ See, for example, AT&T’s Autopay discount, which requires customers to simultaneously enroll in paperless statements.
- ⁵¹ See, areas that do not have access to Fiber using AT&T’s “check for service” tool, <https://www.att.com/buy/broadband/not-available.html>, accessed June 2022.
- ⁵² See, for example, Turner, S. (2021, May 20). Price Too High and Rising: The Facts About America's Broadband Affordability Gap. Free Press. https://www.freepress.net/sites/default/files/2021-05/prices_too_high_and_rising_free_press_report.pdf.
- ⁵³ AT&T, Form 10-K, <https://otp.tools.investis.com/clients/us/atnt2/sec/sec-show.aspx?Type=html&FilingId=14746187&CIK=0000732717&Index=10000>, February 25, 2021, p.36.
- ⁵⁴ For example, Cox exclusively serves five counties in Southern California, including Santa Barbara, Ventura, Los Angeles, Orange, and San Diego counties. By contrast, Comcast serves a majority of counties in California but does not provide service to San Diego county, which is serviced by Cox and Charter. Additionally, Charter provides service to several counties that Comcast and Cox do not serve, including Del Norte, Shasta, and Kern counties. See service territory/broadband deployment of the providers at: <https://public.tableau.com/app/profile/epuc/viz/EOY2020CAResidentialFixedBBDeployment/Dashboard>.

Appendix A: Methodology

Broadband Pricing Data

We used two main data sources for the analysis of broadband pricing trends. Cal Advocates have issued Data Requests (DRs) to broadband providers regarding fixed broadband service offerings since 2019. For this analysis, Cal Advocates compiled data from Cal Advocates' 2021 DR. The DR was sent to a total of 38 broadband providers, and 34 of those broadband providers responded to the DR. These 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 34 respondents (2021 Broadband Pricing Datasheet). The 2021 Broadband Pricing Datasheet collates the data that was collected on the following plan elements:⁵⁵

- Plan Service Description.
- Advertised Download and Upload Speed: Several providers did not include their advertised speeds, particularly upload speeds. Cal Advocates addressed the missing data issues based on advertised speed information available on the company's website. In one case where upload speed information was also not available on a company's website, Cal Advocates listed the speed in the database as "not provided."
- Monthly Data Caps.
- Technology.
- 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, Cal Advocates 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.
- Price of Standalone Broadband Within Bundle.
- Cost of Device.
- Installation Fees.
- Overage Fees, where available.

It is important to note that this analysis used *advertised* download and upload speeds and not actual speeds. Thus, actual speeds that customers receive may be different. In addition to the plan elements above, Cal Advocates created a coded field in the 2021 Broadband Pricing

Datasheet based on the plan service description to identify whether a plan was offered on a standalone basis or bundled with voice and/or TV. All speed elements were converted to Megabits per second and data caps to megabits. For conversion purposes, Cal Advocates used 1000 MB = 1 GB. The approach used in collecting and collating data for the 2021 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, taxes, or other hidden fees⁵⁶ are not captured in the price database.

Additionally, the study created multi-year databases to analyze prices for select companies for years 2019-2022 and for 2021-2022. For 2019-2022, the study compiled *minimum* monthly recurring pricing for 38 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. Cal Advocates 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 and 2022.

For 2021-2022, Cal Advocates compiled all plans offered by AT&T for the two years, including information on the following plan elements:

- Plan Service Description.
- Advertised Download and Upload Speed.
- Technology.
- Monthly recurring price without promotions, surcharges, taxes, equipment fees.

Data Analysis

All analysis was performed using Tableau Desktop Software, version 2021.4. 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 is structured as follows:

We primarily analyzed broadband service plan monthly recurring prices, which do not include promotions, surcharges, taxes, 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. Cal Advocates excluded installation fees or device

fees, as these vary widely across providers and plans. To the extent a price other than Rack Rate is used in the analysis, that fact is identified explicitly in the findings.

We compared broadband plan prices within the same technology of service delivery and, in most instances, within the same speed tiers. The analysis focuses on Cable, DSL, Fiber, Fixed Wireless. Although only a small portion of plans use Satellite, those prices are noted. Different technologies of service delivery have variable service quality elements, e.g., speed.⁵⁷ Additionally, different technologies may have varying infrastructure costs and be in distinct stages of investment recouperation (e.g., DSL compared to Fiber). Therefore, comparing within similar technologies enables examination of like-to-like. It also helps reveal any trends between prices and network investments. Analysis within technology is also important because Small LECs offer similar plans over different technologies (DSL and Fiber) and listed the same plan twice to reflect the different technologies. As a result, comparing within technology minimizes the potential to skew averages and medians.

We examined plans in six speed tiers of advertised download speed: 0-10 Mbps, >10-25 Mbps, >25-50 Mbps, >50-100 Mbps, >100-1000 Mbps, and >1000 Mbps. These tiers aim to make plans more comparable and reflect download speeds used in policy making. For example, historically, areas with no service provider offering speeds of at least 10 Mbps download and 1 Mbps upload were considered “unserved” for the CASF.⁵⁸ Similarly in the Commission’s Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California. (R. 20-09-001),⁵⁹ areas with no service provider offering speeds of at least 25 Mbps download and 3 Mbps upload are considered “unserved.”⁶⁰ The analysis focused primarily on advertised download speed, since advertised upload speeds were not available for all providers and plans. Moreover, many of the studies and reports on broadband prices that are cited in this report use advertised download speeds as well. 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, which only provides data without any additional features such as voice and/or television service.⁶¹ Yet, examining standalone plans alone does

not provide a complete picture of the residential broadband market where bundles are ubiquitous. Comparing prices within each category and across helps reveal trends in pricing based on plan marketing. To the extent Cal Advocates assessed trends across all plans offered by a single/multiple provider(s), Cal Advocates made a note if the findings are based on analyzing all plans rather than each category of plan. Small LECs note that they don't offer "bundles" of plans, wherein the voice or broadband service is discounted when purchased together. However, several Small LEC plans "require" a voice line to sign up for service. Since a voice line was "required" to access broadband service, i.e., broadband could not be purchased without voice, Cal Advocates coded and analyzed these plans as bundled.

Our analysis excluded fixed broadband service plans available 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 that may not qualify for the means-tested offerings. Therefore, the analysis focuses on fixed broadband service plans available to the general population only. That said, Cal Advocates touch upon the fixed broadband service plans available to low-income customers while discussing findings on the interrelation of broadband prices and subsidies.

Health Impact Analysis

Cal Advocates used the Health Impact Assessment (HIA) model to better understand the ways in which Californians' ability to access and subscribe to broadband relate to their public health and wellbeing.⁶² A HIA is an approach used to determine the potential health effects of a condition, policy, program or project on a population. HIAs are often used on issues that touch on public health but are not squarely within the public health field. They can be used to engage stakeholders, members of the public and decision makers in considering public health impacts related to a situation or proposal.

First, Cal Advocates reviewed and hypothesized whether having access to high speed, reliable broadband would impact a set of 35 health determinants in the following categories: built environment, social and community context, economic stability, education, healthcare and social services, and other.⁶³ Based on this review, Cal Advocates hypothesized that not having a broadband subscription could negatively impact 19 of the 35 health determinants. Cal Advocates

then reviewed literature based on the hypothesized health impacts related to broadband access, and based on this review, Cal Advocates limited the analysis to focus on six health determinants:

1. Access to healthcare,
2. Access to education,
3. Access to government-provided social services,
4. Access to emergency services,
5. Access to employment, and
6. Access to social connections and community support.

Developing the Assessment

We then reviewed available data based on the above topics, and limited the analysis to understanding broadband penetration, which is the percentage of the total population that subscribes to a broadband service, compared to access to general health determinants, access healthcare and education. Based on the cursory research explained above, Cal Advocates developed the following research questions:

1. Are populations with lower rates of broadband penetration also less likely to have access to positive health determinants?
 - a. Are populations with lower rates of broadband penetration also likely to have less access to healthcare?
 - b. Are populations with lower rates of broadband penetration also likely to experience poor educational determinants?
2. Are populations with lower rates of broadband penetration also likely to have less favorable health outcomes?
3. How have customers’ experiences with broadband service impacted their access to health resources?

To answer these questions, Cal Advocates compiled the following datasets:

Dataset	Time period	Geographic area	Summary of Dataset
Agency for Healthcare Research and Quality (AHRQ) Social Determinants of Health dataset⁶⁴	2018	county and zip code	Includes publicly available data from 17 sources ⁶⁵ on population distribution, age, race/ethnicity, social vulnerability, segregation, living conditions, workforce/employment, poverty, income, education, physical infrastructure, environment, crime, housing, food access, transportation, healthcare access, healthcare quality, health insurance status, health behaviors, health status, healthcare

			utilization, healthcare system characteristics and mortality.
County Health Ranking dataset⁶⁶	2015-2019	county	Includes publicly available data from 15 sources ⁶⁷ on length of life, quality of life, diet and exercise, alcohol and drug use, other health behaviors, access to healthcare, education, income, family and social support, community safety, housing and transit, demographics.
Health Resources and Service Administration Health Professional Shortage Area data	2022	Primary Care Health Professional Shortage Areas	Primary Care Health Professional Shortage Areas are determined by the Health Resources and Service Administration as areas where there are fewer than 1 primary care physician per 3,500 people, or 3,000 people if the population is indicated as having high health needs.
California Public Utilities Commission’s Consumer Affairs Branch customer issue reports	March 2020-April 2022	Individual address, California	Telecommunications customers’ reports to the Commission’s Consumer Affairs Branch (CAB) regarding issues they are experiencing with telecommunications service.
FCC customer issue reports	March 1, 2020-April 1, 2022	State and city	Telecommunications customers’ reports to the FCC regarding issues they are experiencing with telecommunications service.
California Health Care Foundation’s California Telehealth patient and care provider survey	March – September, 2020	State	Surveys were conducted with patients and healthcare providers to determine the impact of the COVID-19 pandemic on healthcare access. Surveys were conducted between March-September 2020.
Pew Research Center American Trends Panel Survey	April 2021	National	The American Trends Panel is a nationally representative sample of randomly selected U.S. adults. Participants take the survey via self-administered web surveys. Participants who do not have internet access at home are provided with a tablet and wireless internet connection. Interviews are conducted in both English and Spanish. The April 2021 sample size was 4,623.
Pew Research Center Teen Survey	April/ May 2022	National	Pew Research Center surveyed 1,316 pairs of U.S. teens and their parents – one parent and one teen from each household. The survey is weighted to be representative by age, gender,

			race, ethnicity, household income and other demographic factors.
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Based on the data available, Cal Advocates increased the specificity of Cal Advocates’ research questions and followed the methodologies described below.

Research question 1: Are zip codes with lower rates of broadband penetration also less likely to have access to positive health determinants?

Using the AHRQ Social Determinants of Health dataset, Cal Advocates compared percentages of households that had a broadband penetration from ACS 2015-2019 five-year estimates to the following factors by each California zip code:

- median household income,
- the percentage of the population that is unemployed,
- the percentage of the population who received Medicaid,
- the percentage of the population who received food stamps,
- the percentage of the population with a bachelor’s degree, and
- the percentage of the population that is disabled.

We ran linear regressions between the listed factors above to determine whether these factors were correlated and the strength of the correlation.

Research question 1a: Are census tracts with lower rates of broadband penetration also likely to be in health professional shortage areas?

We used California shapefiles for “Health Professional Shortage Area” (HPSA), a designation from the Health Resources and Service Administration that indicates whether a given area has a shortage of primary care physicians. Cal Advocates used ArcGIS to determine which census tracts fall within HPSAs. Then, Cal Advocates used RStudio to join HPSA census tracts to broadband data by census tracts and ran a hypothesis test comparing the mean percentage of households with a broadband penetration in HPSA census tracts to the mean percentage in non-HPSA census tracts.

Research question 1b: Are counties with lower rates of broadband penetration also likely to experience poor educational determinants?

We merged the AHRQ Social Determinants of Health dataset and County Health Ranking dataset by county, then compared percentages of households with broadband penetration to average math and reading scores for grade three students in each county, and the

percentage of youth aged 16-19 who are not in school and not working. Cal Advocates ran linear regressions between the listed factors above to determine whether these factors were correlated and the strength of the correlation.

Research question 2: Are counties with poor health outcomes less likely to subscribe to broadband?

We merged the AHRQ Social Determinants of Health dataset and County Health Ranking dataset by county, then compared the percentage of county populations subscribing to broadband and the percentage of the population reporting being in mental distress,⁶⁸ physical distress,⁶⁹ fair/poor physical health,⁷⁰ the average number of days that county populations reported being in poor mental and physical health per month, child mortality rate,⁷¹ and infant mortality rate.⁷² Cal Advocates ran linear regressions between the listed factors above to determine whether these factors were correlated and the strength of the correlation.

Research question 3: how have customers' experiences with broadband service impacted their access to health determinants?

We requested customer issue reports made to the Consumer Affairs Branch (CAB data) under the following parameters:

- Name of utility/entity – all telecommunications providers,
- Subject matter – broadband,
- Industry – telecommunications,
- Time period – March 1, 2020-April 1, 2022,
- Case type – all contacts, including misdirected contacts,
- Geodata.

Based on these parameters, Cal Advocates received data on 3634 issue reports. Cal Advocates filtered these reports by “Non-Jurisdictional Internet” as a way of filtering for reports regarding customers’ broadband service (501 in total). This dataset should be seen as a sample and non-inclusive of all customers reports regarding broadband from this time period.⁷³ Of the 501 reports, Cal Advocates reviewed specific customer language from 156 reports and coded this language based on the content of the reports using inductive coding. From this process, Cal Advocates developed the following codes: additional charge, affordability, billing issue (transparency, reimbursement, discount), COVID-19, education, incorrect charge, pricing policy,

quality, cancellations, collections, education, health, and safety. Cal Advocates then uploaded analyzed data based on when reports were made, types of reports, and content of reports.

We accessed customer issue reports reported to the FCC⁷⁴ then filtered data by date (March 1, 2020 – April 1, 2022) location (California) and service type (“Broadband Story” and “Internet”). The FCC data includes codes of customer reports but does not specific language about the issue being report. Cal Advocates analyzed FCC data based on when the reports were made, and the types of reports made.

We reviewed findings from the following surveys: California Health Care Foundation’s California Telehealth patient and care provider survey, Pew Research Center American Trends Panel Survey and Pew Research Center Teen Survey for findings regarding broadband access or adoption and respondents’ access to healthcare, education, government-provided social services, emergency services, employment, and social connections and community support.

⁵⁵ 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.”

⁵⁶ Chao, B., Park, C., & Stager, J. (2020). *The Cost of Connectivity 2020*. <https://www.newamerica.org/oti/reports/cost-connectivity-2020/>.

⁵⁷ Fixed Broadband Pricing Trends in California, Appendix B: Broadband Delivery Technologies.

⁵⁸ CASF’s definition of “unserved” was 10 Mbps download and 1 Mbps upload (10/1) prior to revision to 25 Mbps download and 3 Mbps upload (25/3) in 2021 pursuant to Senate Bill 156. Regardless of this new definition, areas with 10/1 and no internet connectivity are typically prioritized for funding. See CASF Fact Sheet, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-infrastructure-and-market-analysis/casf_fact_sheet_0222.pdf.

⁵⁹ R. 20-09-001 is known as the “Broadband for All” proceeding at the CPUC.

⁶⁰ R. 20-09-001, p.7.

⁶¹ This is how FCC collects data for Urban Rate Survey.

⁶² A Health Impact Assessment is an approach used to understand the potential health effects of a policy, program or project on a population, particularly on vulnerable or disadvantaged groups. It is an established method used in public health research and practice, particularly for plans, projects, and policies that fall outside traditional public health arenas. See; Center for Disease Control, “Healthy Places - Health impact assessment (HIA)” <https://www.cdc.gov/healthyplaces/hia.htm>, accessed on June 16, 2022; and World Health Organization, “Health Impact Assessments” <https://www.who.int/tools/health-impact-assessments#:~:text=Health%20Impact%20Assessment%20%28HIA%29%20is%20a%20practical%20approach,a%20population%2C%20particularly%20on%20vulnerable%20or%20disadvantaged%20groups.,> accessed on June 16, 2022.

⁶³ The list of health determinants was developed using a combination of two HIA screening tools: Grinnell, Sophie “Liverpool Health Impact Assessment Screening Tool and Support Notes”, November 2013 <https://www.semanticscholar.org/paper/Liverpool-HIA-Screening-Tool-and-Support-Notes-Grinnell/0084239307a7376299b3f0ed6178cccf3fff6fb4>, and “Complete Screening Grid” accessed in

Online Course: Health Impact Assessment, Step by Step, Module 2, <https://ccnpps-ncchpp.ca/online-course-health-impact-assessment-step-by-step/>.

⁶⁴ “Social Determinants of Health (SDOH) Beta Data Files Data Source Documentation”, https://www.ahrq.gov/sites/default/files/wysiwyg/sdohchallenge/data/sdoh_data_file_documentation.pdf.

⁶⁵ Including American Community Survey (ACS), Area Health Resources Files (AHRF), amfAR Opioid & Health Indicators Database (amfAR), U.S. Census Bureau County Adjacency File (CAF), U.S. Census County Business Patterns (CCBP), U.S. Census Bureau, TIGERweb and COVID-19 Demographic and Economic Resources (Census), Centers for Disease Control and Prevention (CDC) Interactive Atlas of Heart Disease and Stroke (CDC Atlas), CDC Wide-ranging Online Data for Epidemiologic Research (CDC Wonder), County Health Rankings (CHR), Civil Rights Data Collection (CRDC), Medicare Advantage Penetration Files (MAP), Economic Research Service (ERS), National Environmental Public Health Tracking Network (NEPHTN), National Center for Health Statistics (NCHS) Urban-Rural Classification Scheme, Nursing Home Compare (NHC), Social Vulnerability Index (SVI), U.S. Cancer Statistics (USCS) [Social Determinants of Health \(SDOH\) Beta Data Files Data Source Documentation \(ahrq.gov\)](https://www.ahrq.gov/sites/default/files/wysiwyg/sdohchallenge/data/sdoh_data_file_documentation.pdf).

⁶⁶ “2022 Measures” County Health Rankings & Roadmaps,” <https://www.countyhealthrankings.org/2022-measures>.

⁶⁷ National Center for Health Statistics - Mortality Files, CDC Behavioral Risk Factor Surveillance System, United States Diabetes Surveillance System, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Feeding America Map the Meal Gap data, USDA Food Environment Atlas, US Census Bureau's Small Area Health Insurance Estimates, Center for Medicare & Medicaid Services National Provider Identification, US Department of Education EDFacts, American Community Survey 5-year estimates, Stanford Education Data Archive, US Census Bureau's Small Area Income and Poverty Estimates, National Center for Education Statistics, EPA EJSCREEN: Environmental Justice Screening and Mapping Tool, and Census Population Estimates.

⁶⁸ The percentage of adults reporting 14 or more days of poor mental health per month (age-adjusted).

⁶⁹ Percentage of adults reporting 14 or more days of poor physical health per month (age-adjusted).

⁷⁰ The percentage of adults reporting being in fair or poor health (age-adjusted).

⁷¹ The number of deaths among children under age 18 per 100,000 population.

⁷² The number of all infant deaths (within 1 year), per 1,000 live births.

⁷³ The dataset does not include other reports that were categorized as “jurisdictional - billing” (which could include internet bundled packages), “non-jurisdictional rebates and promotions,” “non-jurisdictional equipment,” “non-jurisdictional inability to serve,” and others that may apply.

⁷⁴ FCC “Customer Complaints Data” <https://opendata.fcc.gov/Consumer/CGB-Consumer-Complaints-Data/3xyp-aqkj>.

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.⁷⁵ 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 the upstream direction. It is used primarily by residential customers who receive a lot of data but do not send much.⁷⁶ 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 customer homes and businesses. Coaxial cable is also sometimes used by telephone companies to connect central offices to telephone poles near customers.⁷⁷ Coaxial cable technology can provide thousands of megabits per second.

3. Fiber to the Home (fiber)

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.⁷⁸ Fiber transmits data at speeds far exceeding current DSL or cable modem speeds.⁷⁹

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. 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 transmitters designed to provide the radio link with direct line of sight between the two transmitters with minimal interference. Unlike cellular

towers, fixed wireless transmitters are hardwired into an Internet Service Provider (ISP) network.⁸⁰

⁷⁵ FCC, Types of Broadband Connections – FCC Consumer Facts, <https://www.fcc.gov/general/types-broadband-connections>.

⁷⁶ FCC, Types of Broadband Connections – FCC Consumer Facts, <https://www.fcc.gov/general/types-broadband-connections>.

⁷⁷ Coaxial Cable, *TechTarget Network*, <https://searchnetworking.techtarget.com/definition/coaxial-cable-illustrated>

⁷⁸ Fiber to the Home – the Ultimate Guide, *OSPInsight*, <https://get.ospinsight.com/the-ultimate-guide/fiber-to-the-home>

⁷⁹ FCC, Types of Broadband Connections – FCC Consumer Facts, <https://www.fcc.gov/general/types-broadband-connections>.

⁸⁰ FCC, Types of Broadband Connections – FCC Consumer Facts, <https://www.fcc.gov/general/types-broadband-connections>.