2023 Statewide Digital Equity Survey

Final Report

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PREFACE

The 2023 Statewide Digital Equity Survey is a joint effort between the California Department of Technology (CDT) and the California Emerging Technology Fund (CETF) in partnership with the University of Southern California (USC) Annenberg School for Communication and Journalism. It is one source of information for preparation of the State of California Broadband For All Digital Equity and Broadband Equity Access Deployment (BEAD) Plans submitted to the U.S. Department of Commerce National Telecommunications and Information Administration (NTIA) pursuant to the Infrastructure Investment and Jobs Act (IIJA) to receive federal funding.

The Statewide Digital Equity Survey has been sponsored by CETF since 2008 in collaboration with 4 different independent research organizations, all of which have reinforced the integrity of the methodology and validated the reliability of historical trends in access to the internet and use of technology by Californians. CETF and USC launched their current partnership in 2021.

The Statewide Survey is conducted via telephone interviews using a random digit-dialing (RDD) methodology to obtain the most representative sample possible of all residents. Historically, the Survey sample is approximately 1,650 households to achieve no more than a 3% margin of error (confidence interval) for statewide variables and reliable regional and demographic data with about 90% by cell phone and conducted in 4 languages. However, given the expansive geography of California, especially large rural areas where access to high-speed internet infrastructure is more limited, for purposes of the Digital Equity and BEAD Plans, CDT decided to double the 2023 Survey sample to 3,200 households to "oversample" specific Covered Populations identified in IIJA, especially rural residents, low-income households, and people with disabilities.

CDT established specific performance standards for the 2023 Statewide Survey using RDD methodology, including:

- >1,650 Households in the Main Sample with no more than a 3% margin of error.
- >1,550 Households in Targeted Oversampling (to be approved by CDT).

The Oversampling Plan was developed by CDT and CETF in consultation with key State Agencies and stakeholders, including the California State Association of Counties (CSAC) and Rural County Representatives of California (RCRC) to include the following:

- >825 Households in 4 Groupings of Regions of Rural Counties (RDD).
- >250 Low-Income Households (RDD using Pre-Paid Phones as Proxy).
- >250 People with Disabilities (Department of Rehabilitation Randomized Client List).

In order to overcome the increasing challenges of reaching households by telephone due to companies instituting government regulations to reduce spam calls, the Main Sample was divided between 1,000 telephone interviews (which required about 100,000 calls to complete the surveys and achieved the 3% margin of error for statewide data) and the balance online (using the CDT Digital Equity Online Survey) to the randomized telephone numbers that previously had not been answered or were directed to answering machines. In addition, consistent with the Online Survey, qualified respondents who completed the baseline questions about connectivity were added to the sample to include more data (referred to as "basic").

Table 1 summarizes the final Statewide Survey participation by type of sample which exceeded the performance standards:

Sample Type	Description	Amount	Total
Main Sample	Telephone Surveys Complete	1,000	1,899
	Telephone Surveys Basic	249	
	Online Text-to-Web	650	
Oversample	4 Rural County Regions Groupings	1,059	1,661
	Low-Income HHs (Pre-Paid Phones)	283	
	Department of Rehabilitation List	319	
TOTAL			**3,560**

Table 1: Summary of Sample Responses

The combination of telephone interviews and online responses coupled with the oversampling provided very robust sets of samples from multiple methodologies, which is recommended by Pew Charitable Trusts and other respected sources as state-of-the-art research practice to obtain representative participation by diverse populations. The 2023 Statewide Survey on Broadband Adoption and Digital Equity is the largest-ever endeavor in California to obtain a scientific sampling of input on these topics.

Sunne Wright McPeak
President and CEO
California Emerging Technology Fund

1. INTRODUCTION

This report presents the main findings from the 2023 Statewide Survey on Broadband Adoption Survey led by a team of researchers at the University of Southern California on behalf of the California Emerging Technology Fund (CETF) and the California Department of Technology (CDT). The main goal of the survey is to assess California's progress towards closing the divide in broadband adoption, with particular focus on variations across different state regions and subpopulations of interest, in particular those defined as Covered Populations in the Infrastructure Investment and Jobs Act of 2021 (IIJA):

1. Individuals Living in Households with Annual Incomes at or Below 150% of the Federal Poverty Level
2. Aging Individuals (60+ Years)
3. Incarcerated Individuals
4. Veterans
5. Individuals with Disabilities
6. Individuals with a Language Barrier
7. Individuals Who are Members of a Racial or Ethnic Minority Group
8. Individuals Who Primarily Reside in a Rural Area

In addition to these populations, the National Telecommunications and Information Administration's (NTIA) Notice of Funding Opportunity (NOFO) expanded the definition of Covered Populations to include women and individuals who identify as LGBTQIA+.[1] The study was reviewed and approved by the University of Southern California's Institutional Review Board (study #UP-21-00037).

There are a number of limitations to how the study captured information about Covered Populations that warrant note. First, due to research ethic concerns the study was unable to capture information for incarcerated individuals. Further, it is important to note that the small number of respondents who identified as LGBTQIA+ in the Main Sample (n=91) limits the analysis for this population of interest. As such, estimates for this Covered Population must be interpreted as merely indicative.

In addition, while the legislation defines the Covered Populations at the individual level, some are captured in this study at the household level to maintain comparability with Statewide Surveys on Broadband Adoption conducted in previous years. This is particularly relevant for the interpretation of results for the following Covered Populations: individuals with disabilities, individuals with a language barrier, and veterans. Finally, it is also worth noting that the analysis of differences by gender and age must also be interpreted as indicative, for the survey did not ask respondents to report on the gender and ages of all other household members. These differences in unit of analysis and the interpretation of variables for Covered Populations are further discussed in the Methods appendix.

Throughout the report, the analysis probes for differences in connectivity and patterns of broadband access across Covered Populations, with the goal of informing federal,

[1] See https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf

state and local policies that seek to improve access and outcomes for historically disadvantaged groups. The report also examines historical trends in adoption by taking advantage of comparable results in Statewide Broadband Adoption surveys dating back to 2008. Particular attention is paid to households with children of school age, given its relevance for digital equity policies and the investments in connectivity made for this population during the COVID-19 pandemic. Another unique feature of this study is the ability to examine in more depth the broadband adoption and access patterns for residents of less populated counties and rural areas, which tend to be underrepresented in random sample surveys in California. This is critical given the multiple geographic areas with distinct demographic and economic characteristics that exist across the state.

Beyond the assessment of broadband adoption, the study covers a broad range of related topics, including whether residents connect using a computing device or a smartphone, the cost of broadband service, and the level of satisfaction with the contracted service. Further, the study probes into the impact of the Affordable Connectivity Program (ACP), a federal subsidy program established by the Digital Equity Act of 2021 (included in the IIJA) to lessen the affordability burden of broadband service for middle and low-income households. Finally, the study examines the patterns of adoption of telehealth services across Covered Populations.

The study is based on a multimodal methodology that combines RDD (random digit dialing) with text-to-web responses from individuals sampled at random from a single sampling frame of telephone numbers (mobile and fixed, including prepaid lines) in California.[2] This resulted in 1,899 valid responses in the Main Sample. In addition, an oversample of residents in rural and less populated counties was collected using the same fieldwork procedure, resulting in an additional 1,059 cases (henceforth called Rural Counties Oversample). Combining the Main Sample and the Rural Counties Oversample (n=2,958) makes possible two different types of analysis by region.

The first is a regional analysis of variations in broadband adoption and patterns of access across all 58 counties in California, based on the following grouping of counties:

1. Los Angeles County
2. Orange County
3. San Diego County
4. Inland Empire (2 Counties): Riverside and San Bernardino
5. San Joaquin Valley (8 Counties): San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern
6. Sacramento Valley (4 Counties): Sacramento, Yolo, Sutter, and Yuba
7. North Bay North Coast (6 Counties): Del Norte, Humboldt, Trinity, Mendocino, Sonoma, Napa
8. Bay Area (7 Counties): Solano, Alameda, Contra Costa, San Francisco, San Mateo, Santa Clara, and Marin

[2] For discussion of strengths in multimodal survey methodology see "How Public Polling Has Changed in the 21st Century" (Pew Research Center, 2023), available at https://www.pewresearch.org/methods/2023/04/19/how-public-polling-has-changed-in-the-21st-century.

9. Central and Pacific Coast (6 counties): Santa Cruz, Monterey, San Benito, San Luis Obispo, Santa Barbara, and Ventura
10. Other Rural (22 counties): Siskiyou, Shasta, Modoc, Lassen, Plumas, Butte, Tehama, and Glenn, Colusa, Lake, Nevada, Sierra, Placer, El Dorado, Alpine, Amador, Calaveras, Tuolumne, Mariposa, Mono, Inyo, and Imperial

The second analysis centers on the more rural and less populated counties grouped into four Neighbor Regions. These regions were created in consultation with the California State Association of Counties (CSAC) and Rural County Representatives of California (RCRC). Table 2 and the map below (Figure 1) present the four Neighbor Regions and the corresponding sample size:

Neighbor Regions	**Counties**	**Rural Counties Oversample**	**Main Sample + Rural Counties Oversample)**
Neighbor Regions 1 ***North West***	Redwood Coast: Del Norte, Humboldt, Trinity North Bay North Coast: Lake, Marin, Mendocino, Napa, Sonoma	287	343
Neighbor Regions 2 ***North East***	Northeastern: Butte, Modoc, Shasta, Siskiyou, Tehama, Lassen, Plumas Upstate: Colusa, Glenn Connected Capital Area: Sutter, Yolo, Yuba Gold Country: El Dorado, Nevada, Placer, Sierra	296	379
Neighbor Regions 3 ***Central East***	San Joaquin Valley: Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare Central Sierra: Tuolumne, Amador, Calaveras, Mariposa Eastern Sierra: Inyo, Alpine, Mono	274	472
Neighbor Regions 4 ***South West***	Central Coast: Monterey, San Benito, Santa Cruz Pacific Coast: Santa Barbara, San Luis Obispo	202	258
Total		**1,059**	**1,452**

Table 2: Neighbor Regions and Sample Sizes

Figure 1: Map of Counties in Each Neighbor Regions (2003)

In addition, the study oversampled two additional populations of interest to ensure that accurate estimations can be produced for low-income residents (n=283) and individuals with disabilities (n=319). Further details about how each of the samples was obtained, the research methodology and a comparative analysis of the samples can be found in Methods appendix.

2. HISTORICAL TRENDS

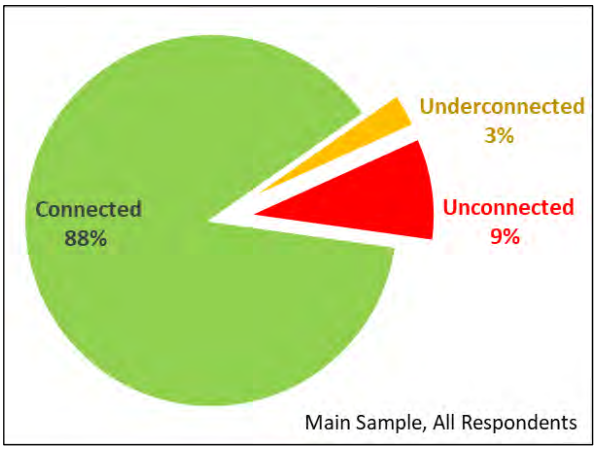


Figure 2: Broadband at Home (2023)

Overall broadband adoption in California remains high as 91% of respondents report being able to connect to the Internet at home, including 88% who have a home broadband connection and 3% who can only connect through a mobile device – henceforth called "underconnected" (Figure 2). This is similar to the overall level of connectivity reported in the 2021 Statewide Survey on Broadband Adoption (the most recent before 2023).

It reflects the challenges that persist in connecting those who remain unconnected despite multiple initiatives at the federal, state, and local levels (Figure 3). At the same time, the share of underconnected respondents was cut in half, from 6% in 2021 to 3% in 2023. This encouraging trend is likely explained by the aforementioned efforts in combination with the increased connectivity needs associated with new patterns of remote work, telehealth, remote learning and other online activities in the aftermath of the COVID-19 pandemic.

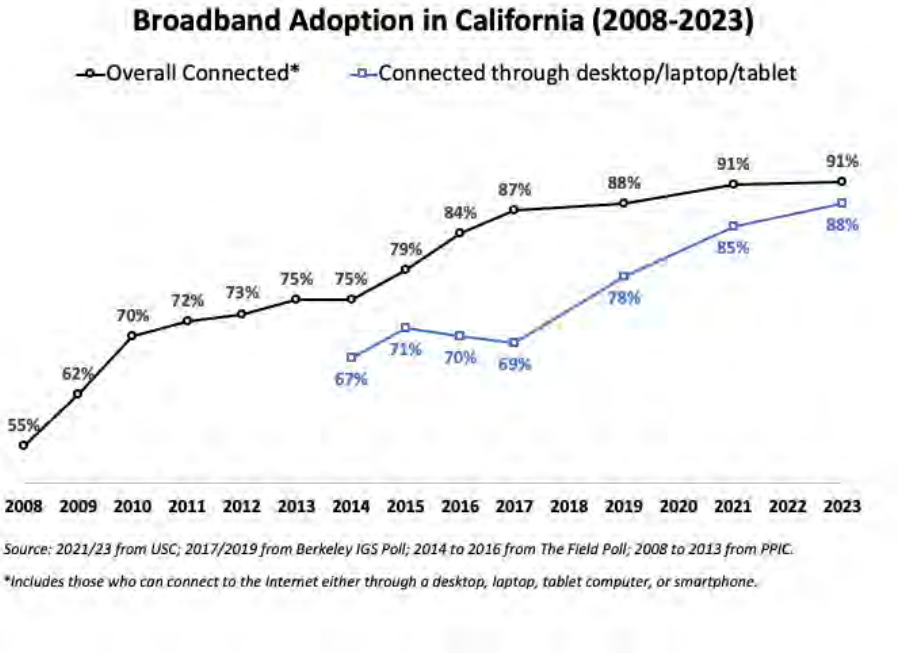


Figure 3: Broadband Adoption in California Households (2008-2023)

Examining connectivity trends by age group reveals a significant increase in broadband adoption among older adults (defined in this case as 65 years or older for consistency with previous Statewide Surveys), which jumped from 78% in 2021 to 91% in 2023 (Figure 4). This remarkable increase brings older adults significantly closer to the connectivity levels observed among younger age groups. While more research is needed to understand these trends, it is likely that the greater health risks faced by older adults during the COVID-10 pandemic and the increased availability of telehealth and other key services created strong incentives for this age group to adopt home broadband.

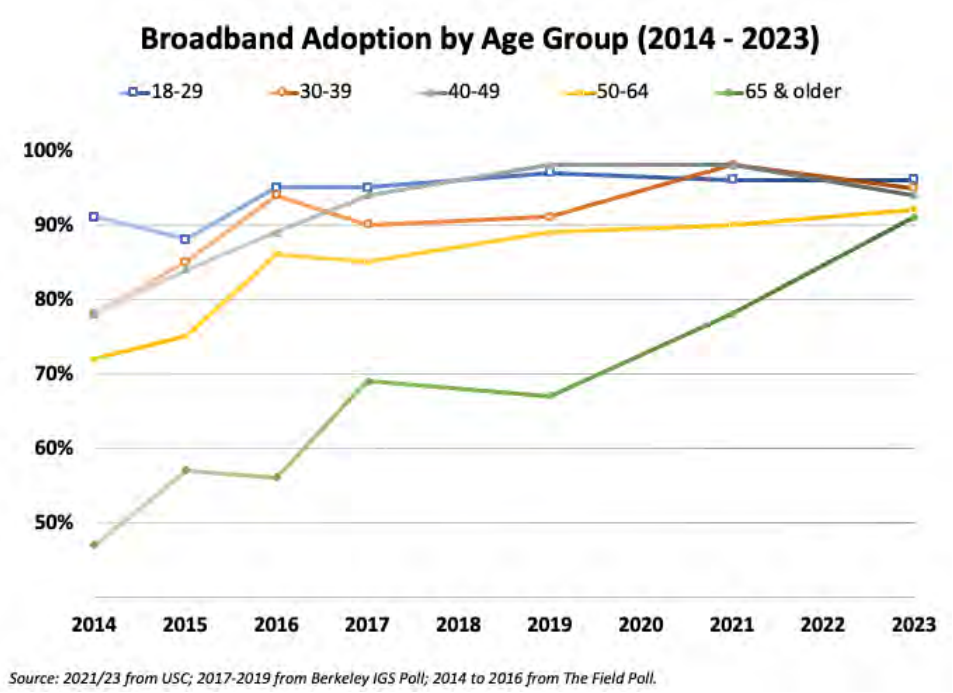


Figure 4: Broadband Adoption by Age Group in California Households (2014-2023)

A similar trend is observed in the examination of broadband adoption by race/ethnicity over the past decade (2014-23). Overall, adoption trends for racial minority groups continue to converge to the level observed for non-Hispanic Whites (Figure 5). Among Asian-Americans, broadband adoption levels are already at similar levels than for non-Hispanic Whites. Hispanic/Latino residents still trail non-Hispanic Whites by about 10 percentage points. However, after two consecutive survey years (2019 and 2021) showing declines, the most recent results indicate that the trend for Hispanic/Latino residents has reverted back towards convergence with other racial/ethnic groups. Further, it is worth noting that the share of underconnected (smartphone only) among this group has dropped by more than half, from nearly 8% in 2021 to about 3% in 2023.

African-American respondents are an exception as recent results show no changes in broadband adoption between 2021 and 2023 (the small decline of 1 percentage point observed in Figure 5 is within the survey margin of error). While overall adoption continues to be relatively high in this group at 92% in 2023, the flattening of the adoption trend among African-Americans, as well as the increase in the share of underconnected from 1% in 2021 to about 4% in 2023, is worth policy attention and monitoring in future studies.

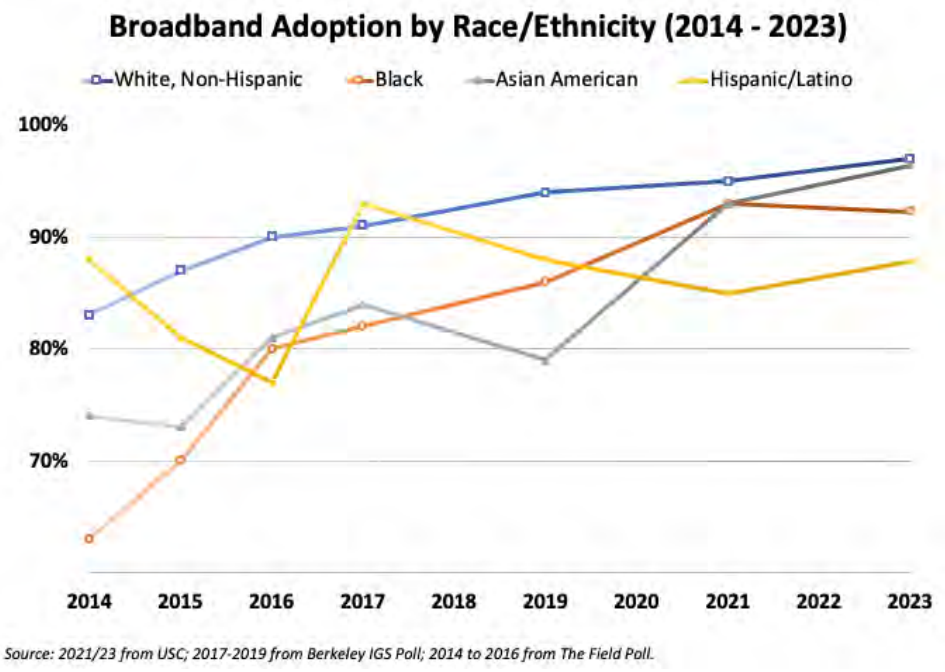


Figure 5: Broadband Adoption by Race/Ethnicity in California Households (2014-2023)

The breakdown of results by gender indicates that, after trailing male residents in most survey years in the past decade, women are now as likely as men to report living in a household with broadband access, with an increase in adoption from 88% in 2021 to 93% in 2023 (Figure 6). Achieving gender parity in adoption represents a notable achievement that equalizes opportunities for women as hybrid patterns of work, education and access to social services become the new normal in the aftermath of the COVID-19 pandemic.

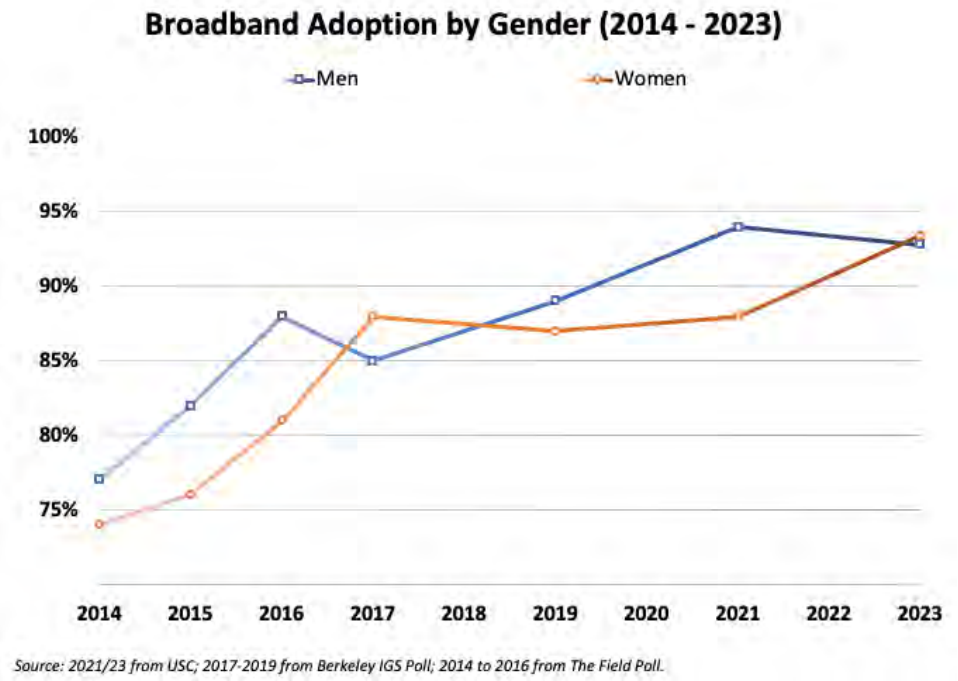


Figure 6: Broadband Adoption by Gender in California Households (2014-2023)

Previous surveys reveal significant regional differences in broadband adoption across California counties. While this remains the case, the most recent results show a pattern of convergence with growth in broadband adoption in less densely populated counties (Figure 7). This is particularly the case in the Central Valley, where home broadband grew from 86% in 2021 to 89% in 2023.[3] However, these areas are still lagging about five percentage points behind the most connected counties, which suggests the need for continued investments in infrastructure development and broadband adoption programs for rural and less populated areas. The state of connectivity in these areas is further examined below, taking advantage of the Rural Counties Oversample to produce estimates with greater precision than in previous Statewide Surveys.

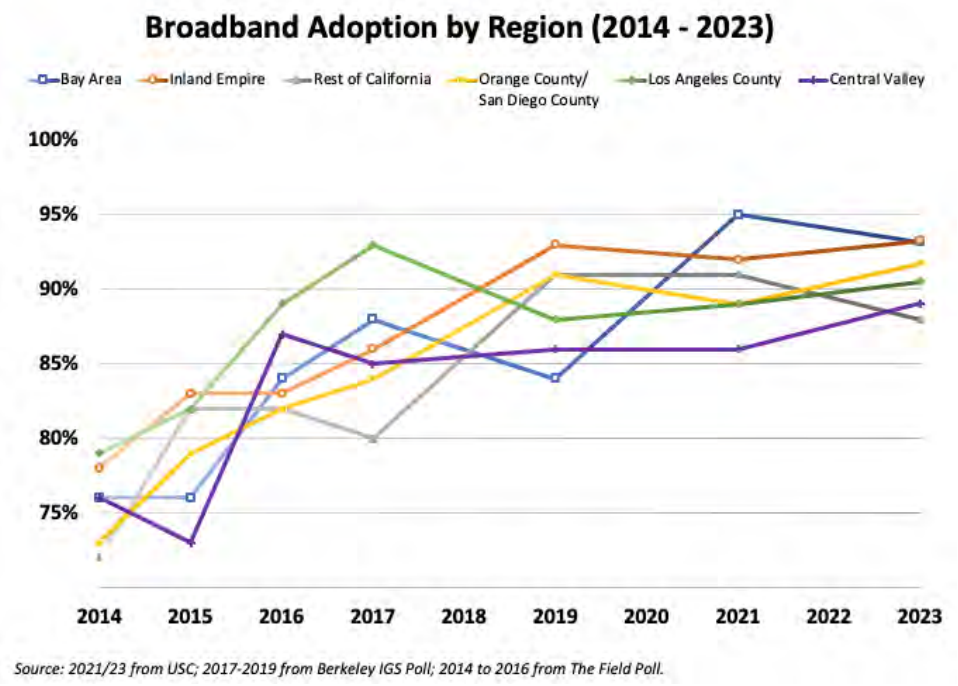


Figure 7: Broadband Adoption by Region in California Households (2014-2023)

[3] The Central Valley includes the following counties: Butte, Colusa, El Dorado, Glenn, Placer, Sacramento, Shasta, Sutter, Tehama, Yolo, Yuba, Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare.

Similar to the case of older adults, the most recent results show remarkable gains in broadband adoption for residents without a high school degree, from 64% in 2021 to 79% in 2023 (Figure 8). However, this group is still 12 percentage points below the level observed in the next group of educational attainment (high school graduates). This indicates the need for continued investments in human capital and digital literacy training for those with the least formal education, whose barriers to broadband adoption often include limited experience and abilities with computing devices and related digital technologies.

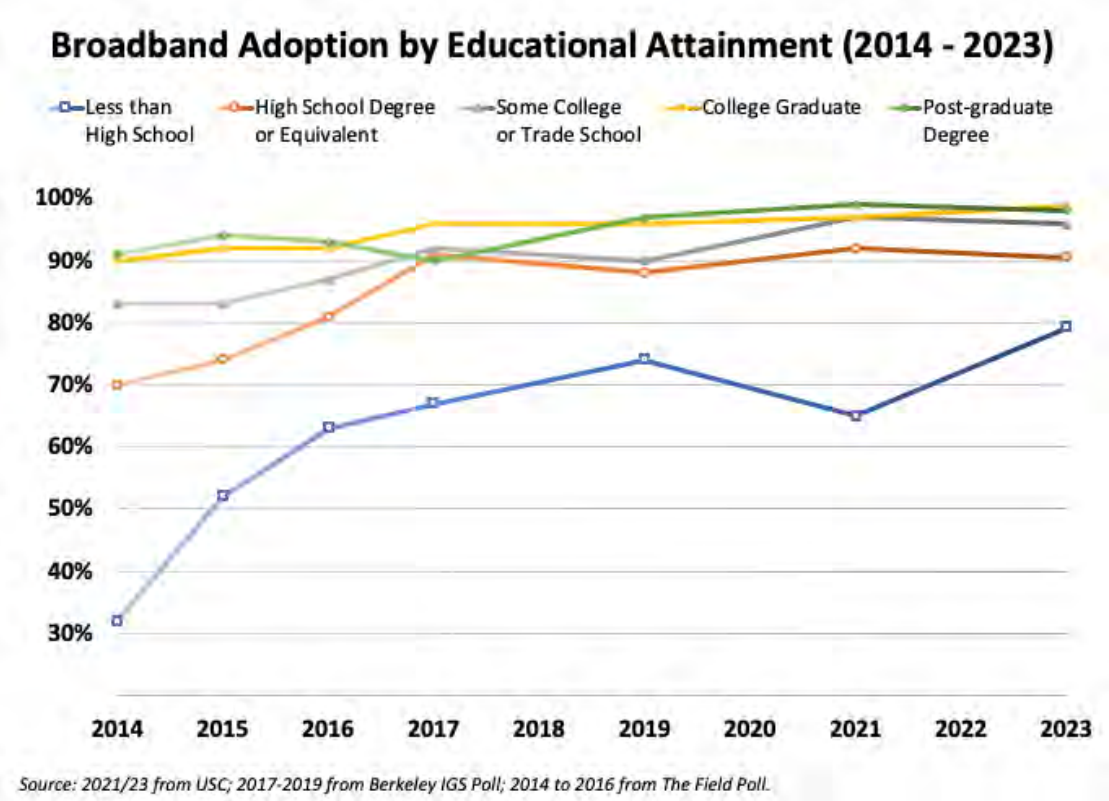


Figure 8: Broadband Adoption by Educational Attainment in California Households (2014-2023)

Figure 9 shows a puzzling pattern whereby home broadband adoption among households with school-age children peaked at 97% during the height of the COVID-19 pandemic in 2021 and has now dropped just below pre-pandemic levels at 93%. While further research is needed to explain this trend, the expiration of connectivity programs and the support provided by schools during the period of remote learning is a likely factor. It is also worth noting that the current level of adoption among K-12 families remains above those without school-age children by about four percentage points. At the same time, it remains important to monitor this trend to ensure that the connectivity gains among K-12 students associated with the COVID-19 pandemic are sustained over time. A further examination of results for K-12 families is presented in Section 7.

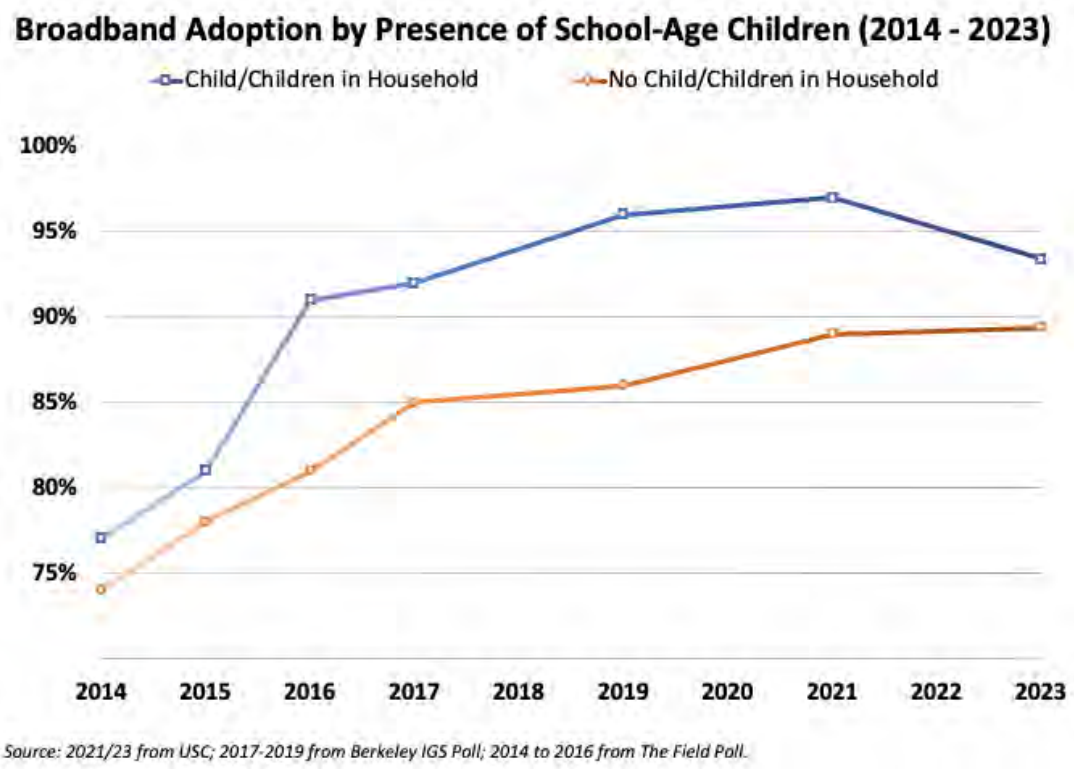


Figure 9: Broadband Adoption by Presence of School-age Children in California Households (2014-2023)

Another convergence trend can be observed for those who report living in a household including at least one member with disabilities (henceforth Households with Disabilities). While in 2021 the gap between Households with Disabilities and Households without Disabilities was about nine percentage points, the observed gap in 2023 is only three percentage points (Figure 10). This convergence is consistent with the trend observed among older adults, a population with significant overlap with those reporting disabilities. The large increase in broadband adoption among this Covered Population opens up numerous opportunities to improve the delivery of health and other services for this population.

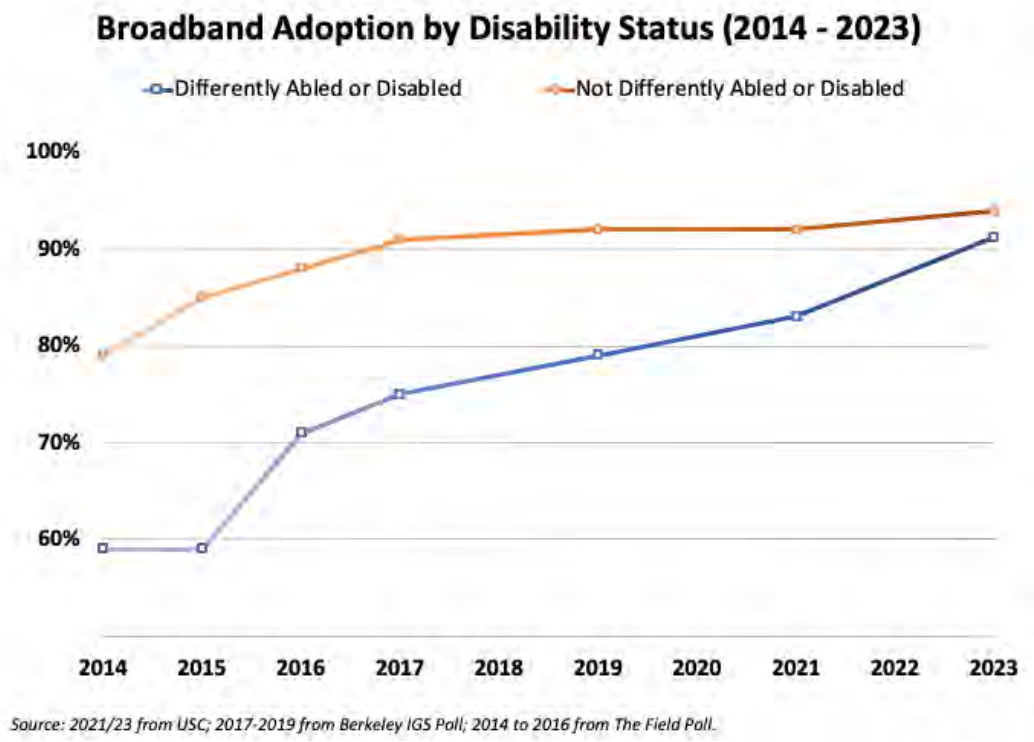


Figure 10: Broadband Adoption by Presence of People with Disability in California Households (2014-2023)

A consistent finding in digital equity research is the strong correlation between household income and broadband adoption. As such, closing the income gap in adoption has taken center stage in broadband policy, particularly since the launch of the Emergency Broadband Benefit (EBB) in 2021, later replaced by the ACP program in 2022. The positive impact of these programs can be observed in Figure 11, which tracks adoption across income groups over time. As shown, the most significant change in recent years is the increase in broadband adoption among the lowest income bracket (below $20,000 annual household income) from 70% in 2021 to 85% in 2023. While still trailing the next income bracket (annual household income between $20,000 and $39,999) by about five percentage points, the adoption gains among the poorest households indicate the presence of strong demand for broadband services that are affordable and accessible for this income group. Further, the results suggest that, given the right policy design and levels of program investments, closing the income gap in broadband adoption in California is within reach in the next 3-5 years.

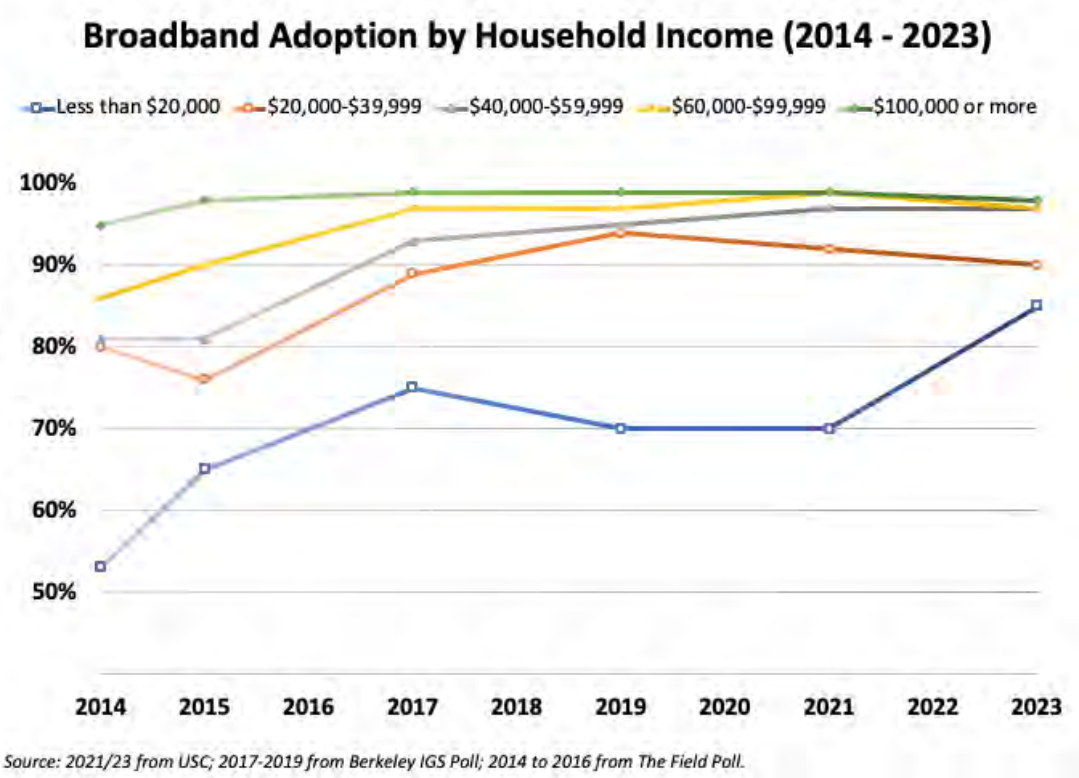
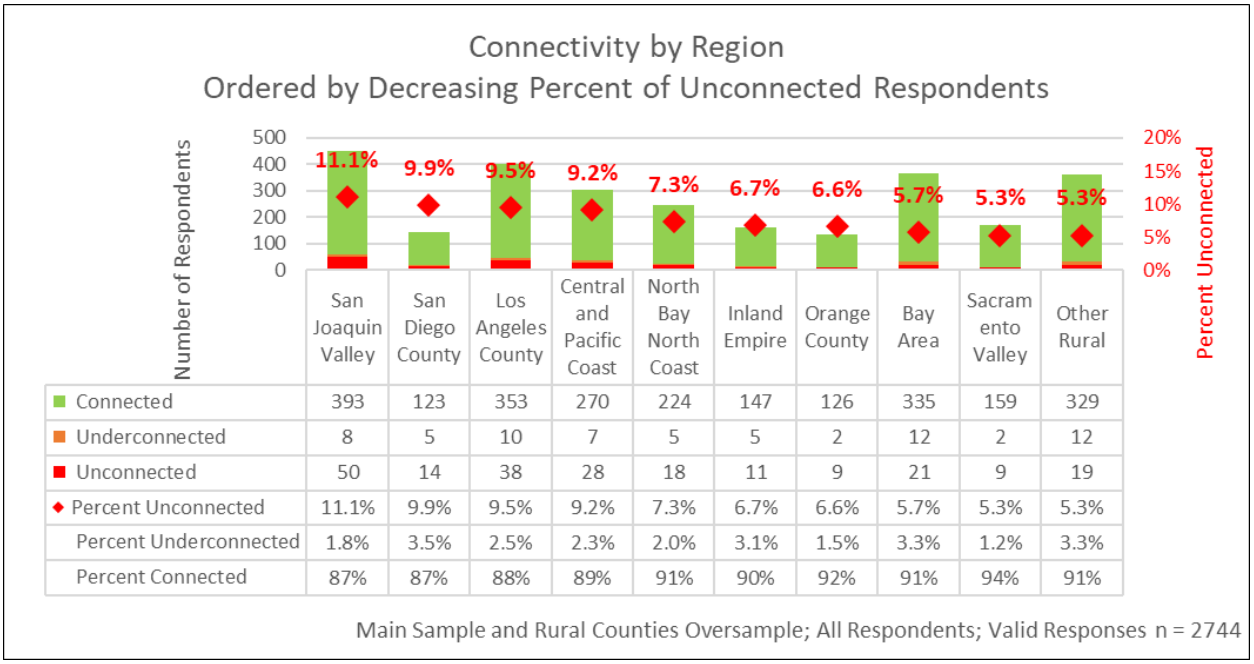


Figure 11: Broadband Adoption by Household Income in California (2014-2023)

3. CONNECTIVITY, QUALITY AND PRICES

A. Connectivity by Region

Broadband adoption varies significantly across the 10 regions in which counties are grouped for this analysis, thus validating the need to expand the sample to improve the accuracy of estimates in rural and less populated areas. As shown in Figure 12, the share of unconnected households is highest in the San Joaquin Valley region, where about 11% of respondents report lacking broadband at home. San Diego and Los Angeles County follow with about 10% of respondents without home broadband. At the other end of the spectrum are the Bay Area, the Sacramento Valley, and, perhaps surprisingly, Other Rural counties. These differences reflect a combination of demographic factors as well as variations in infrastructure deployment, which must be addressed jointly to close the regional gap in broadband adoption in the state.

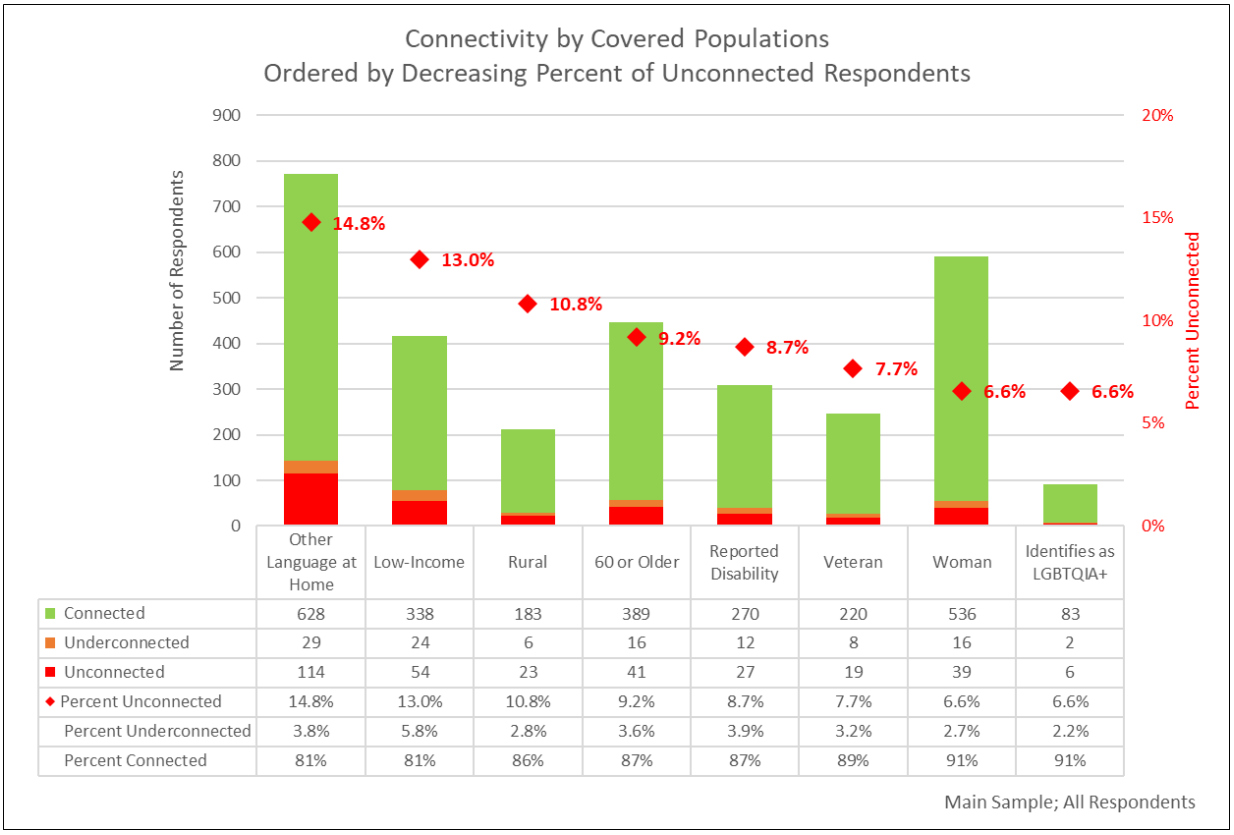


	San Joaquin Valley	San Diego County	Los Angeles County	Central and Pacific Coast	North Bay North Coast	Inland Empire	Orange County	Bay Area	Sacramento Valley	Other Rural
Connected	393	123	353	270	224	147	126	335	159	329
Underconnected	8	5	10	7	5	5	2	12	2	12
Unconnected	50	14	38	28	18	11	9	21	9	19
Percent Unconnected	11.1%	9.9%	9.5%	9.2%	7.3%	6.7%	6.6%	5.7%	5.3%	5.3%
Percent Underconnected	1.8%	3.5%	2.5%	2.3%	2.0%	3.1%	1.5%	3.3%	1.2%	3.3%
Percent Connected	87%	87%	88%	89%	91%	90%	92%	91%	94%	91%

Figure 12: Connectivity by Region (2023)

B. Connectivity Across Covered Populations

Overall, broadband adoption levels continue to increase across the state and as noted in the previous section, some of the largest gains are observed among historically disadvantaged groups. At the same time, there are persistent differences for Covered Populations that need to be addressed to realize digital equity goals. For example, Non-English-Only Households are nearly twice as likely to be unconnected (about 15%) than Women or Veteran Households (Figure 13). Low-Income Households are also more likely to be unconnected (13%), a result that likely reflects the overlap of this group with Non-English-Only Households. Interestingly, the share of unconnected among Aging Individuals (60 years and older) and Households with Disabilities is similar to the share in the overall population (9%), a result that speaks to the progress made in connecting these groups that have previously lagged in broadband access.



	Other Language at Home	Low-Income	Rural	60 or Older	Reported Disability	Veteran	Woman	Identifies as LGBTQIA+
Connected	628	338	183	389	270	220	536	83
Underconnected	29	24	6	16	12	8	16	2
Unconnected	114	54	23	41	27	19	39	6
Percent Unconnected	14.8%	13.0%	10.8%	9.2%	8.7%	7.7%	6.6%	6.6%
Percent Underconnected	3.8%	5.8%	2.8%	3.6%	3.9%	3.2%	2.7%	2.2%
Percent Connected	81%	81%	86%	87%	87%	89%	91%	91%

Figure 13: Connectivity by Covered Populations (2003)

The analysis below is based on the subset of respondents from the Main Sample whose demographic characteristics can be established. As such, sample sizes will vary across characteristics.

Starting with low-income households, defined here as at or below 150% of the federal poverty level for consistency with the definition in the IIJA of 2021, Figure 14 shows that nearly 13% of respondents living in low-income households do not have access to home Internet, relative to about 3% of non-low-income households. As discussed later, this 10-percentage point gap is largely explained by affordability barriers and highlights the need for the continuation of support programs to lower affordability barriers.

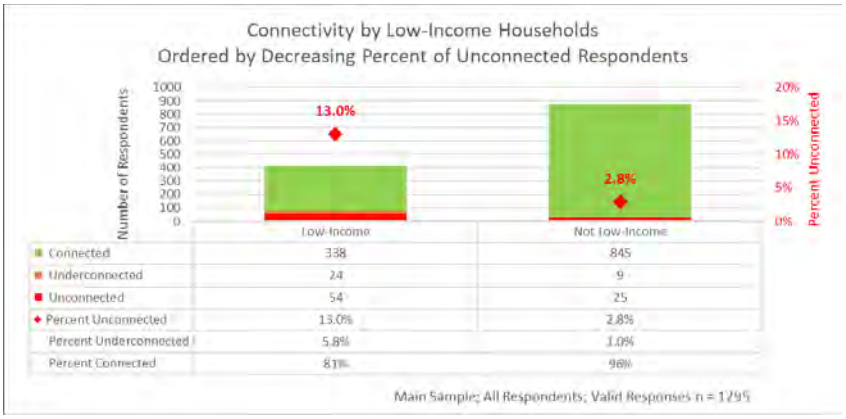


Figure 14: Connectivity by Low-Income Households (2023)

Adoption gaps by race and ethnicity are similarly large, particularly for Hispanic/Latino residents. Using the most connected group as reference (non-Hispanic Whites), Figure 15 shows that about 12% of residents who identify as Hispanic/Latino cannot connect to the Internet at home, a gap of nearly nine percentage points. A somewhat smaller gap is also observed for African-American residents, among whom almost 8% are unconnected. The gap for other racial/ethnic groups (including Asian Americans) is generally smaller, although it is worth noting that the sample size is insufficient to characterize gaps for other groups, such as Native American or Alaska Native and for Native Hawaiian and Pacific Islander.

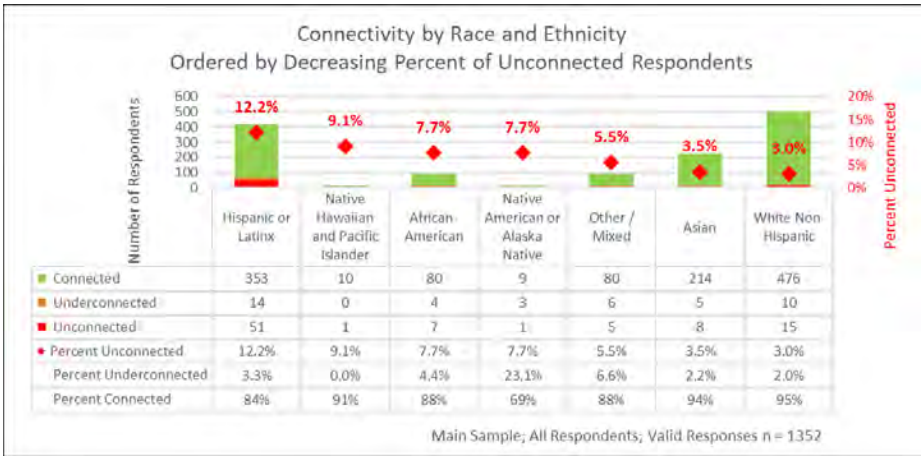


Figure 15: Connectivity by Race and Ethnicity (2023)

Despite the large increase in broadband adoption among older adults discussed in the previous section, residents 60 years and older continue to trail younger residents, as shown in Figure 16. Interestingly, the adoption levels for those below 60 years are essentially similar across age brackets. This differs from several other studies (including previous Statewide Surveys) in which connectivity among the youth (18-29 years) surpassed every other age group. While the observed adoption gap for older adults is smaller than in previous Statewide Surveys, it remains the case that roughly 1 in 10 aging individuals cannot connect at home. The factors driving the age gap in adoption, which combine affordability barriers with limited digital skills and concerns about negative outcomes from online services (for example, concerns about cybercrime), are further examined in later sections.

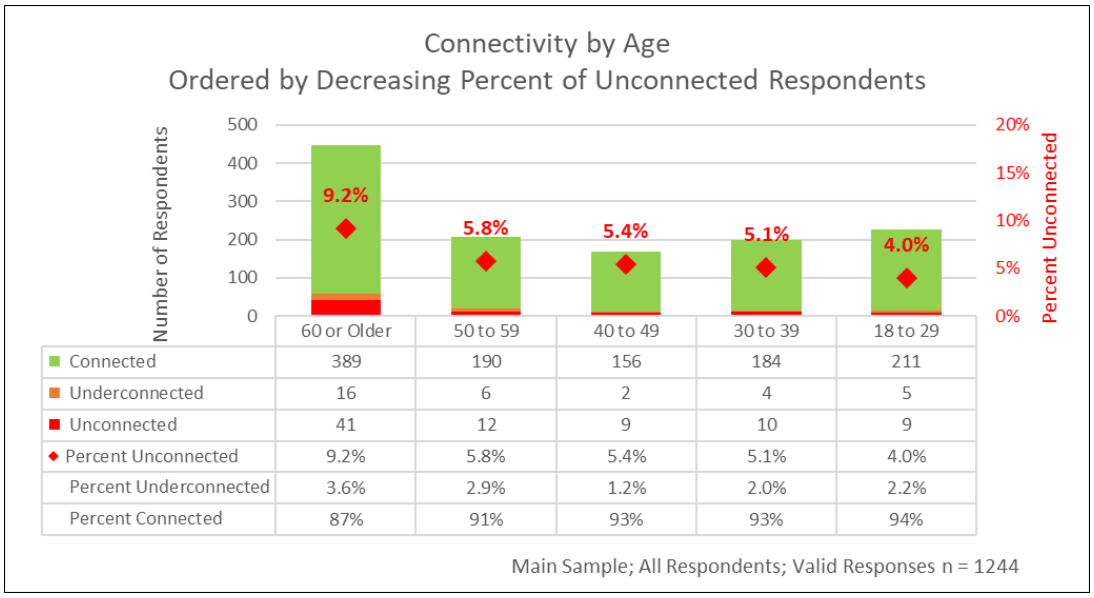
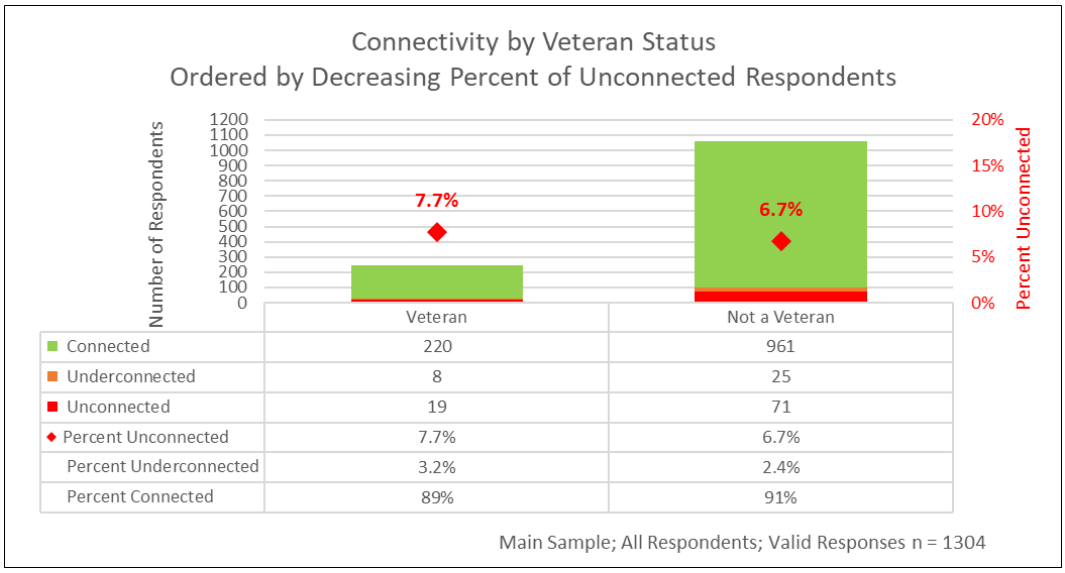


Figure 16: Connectivity by Age (2023)

Though Veteran Households are slightly less likely to be connected than non-Veterans Households (Figure 17), they are more likely to be connected than most other Covered Populations (Figure 13). This is a somewhat surprising result considering that veteran status intersects with several other factors associated with lower broadband adoption such as age, disability, income and even housing instability, among others. For example, this overlap is reflected in the fact that nearly 57% of Veteran Households are Aged 60 and Older (see Table A6 in the Methodology appendix). This relatively high adoption rate may be the result of targeted efforts through specialized federal and state agencies, including the U.S. Department of Veteran Affairs' Bridging the Digital Divide program that is designed to improve access to telehealth among Veterans [4].



	Veteran	Not a Veteran
Connected	220	961
Underconnected	8	25
Unconnected	19	71
Percent Unconnected	7.7%	6.7%
Percent Underconnected	3.2%	2.4%
Percent Connected	89%	91%

Figure 17: Connectivity by Veteran Status (2023)

[4] See https://telehealth.va.gov/digital-divide

Language ability is another known factor that creates barriers for broadband adoption among California residents. Using primary language spoken at home as an indicator of potential English-language barriers among household members, Figure 18 reveals a significant adoption gap of about 10 percentage points between individuals living in households where English is not the primary spoken language relative to respondents in English-only households. There are multiple potential explanations and confounding factors that deserve further study to account for this gap. Regardless, this result highlights the outreach challenges faced by broadband support programs in a de-facto multilingual state such as California, where according to the most recent Census Bureau data (ACS 2021) about 44% of residents speak a language other than English at home.

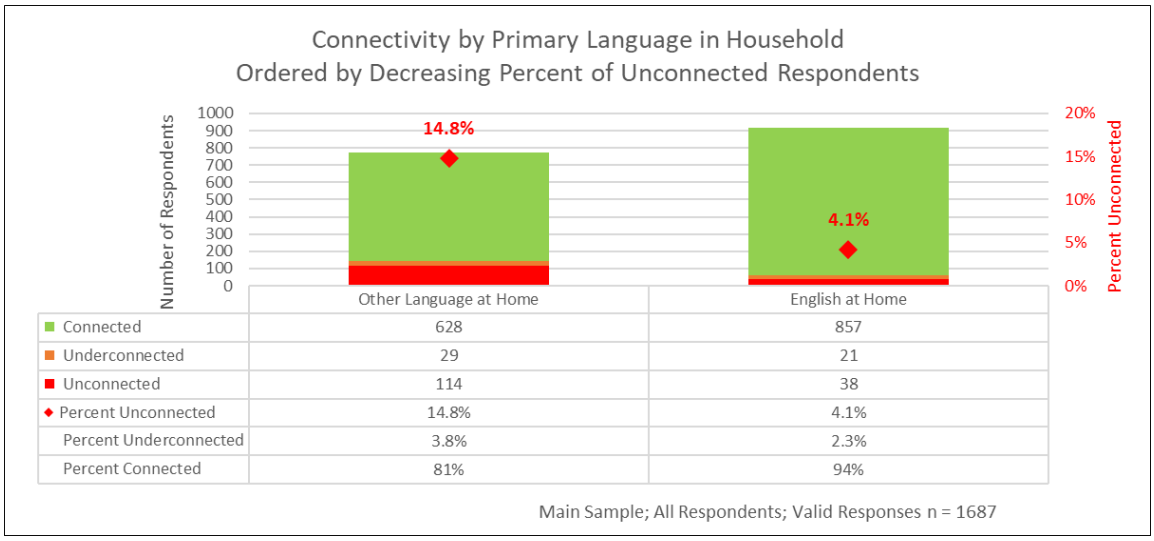


Figure 18: Connectivity by Primary Language in Household (2023)

Considering individuals who self-report living in a rural area, the results indicate a notable broadband adoption gap with respect to those that report living in urban or suburban areas (Figure 19). While nearly 11% of rural residents cannot access the Internet at home, the combined result for urban and suburban residents is 2.3 times lower (about 4.7%). In other words, living in a rural area more than doubles the odds of not having broadband at home. These results highlight the multiple connectivity challenges that persist in rural communities, which combine demand-side factors (such as lower average disposable incomes) and supply-side factors (such as lack of high-speed service availability and higher prices due to less competition and higher deployment costs in rural areas). Further analysis of these areas using the Rural Counties Oversample is presented in Section 9 (Rural Areas).

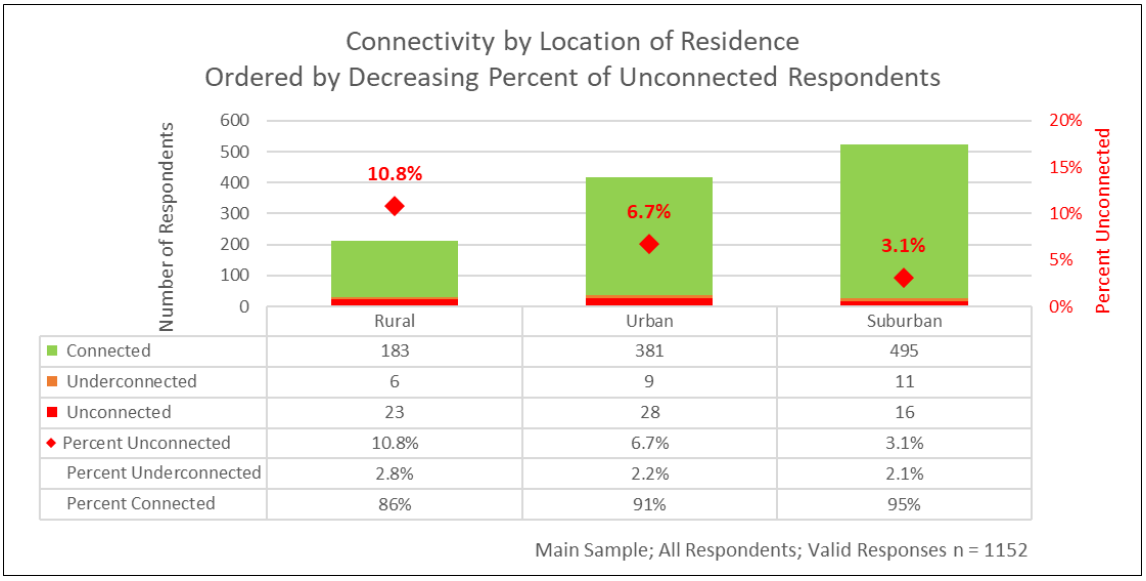


Figure 19: Connectivity by Location of Residence: Rural/Urban/Suburban (2023)

Finally, the results reveal that broadband adoption levels for two of the Covered Populations are comparable to those in the overall population, as the differences fall within the survey margin of error. They are:

- *Women*. The observed difference in broadband adoption by gender favors women by less than 1 percentage point (92.8% for men versus 93.4% for women). As noted previously, this is a significant reversal from prior survey years that highlights the expansion in connectivity among women.

- *Households with Disabilities*. As noted in the previous section, the connectivity gains observed among households in which at least one member reports a disability is a remarkable shift in historical trends that brings this disadvantaged group within close distance from the rest of the population (91.3% compared 93.9% for households that do not report a disability). However, it is worth recalling that measuring connectivity at the household level may conceal differences in broadband use within households for individuals with disabilities. This points to the need for continued attention to this Covered Population.

C. *Service Cost, Reliability and Adequacy Across Covered Populations*

Cost of Home Broadband

Cost is known to be the main factor that affects a household's decision to adopt broadband service. This study probes into the affordability question by asking respondent to self-report the monthly cost of home broadband (final cost including all taxes and fees). It is worth noting this question was only asked to those who report being able to connect to broadband at home through a computer, laptop or tablet, and thus by design the results exclude the underconnected and unconnected populations.

The results reported in Figure 20 reveal interesting patterns across Covered Populations. Overall, the average cost of service reported by respondents is $83.6/month, which is in line with expectations and consistent with other studies, including the average monthly cost reported in the 2023 FCC's Broadband Rate Survey for California ($82.4/month).[5] This generally supports the validity of results despite known concerns about self-reported costs in survey studies.

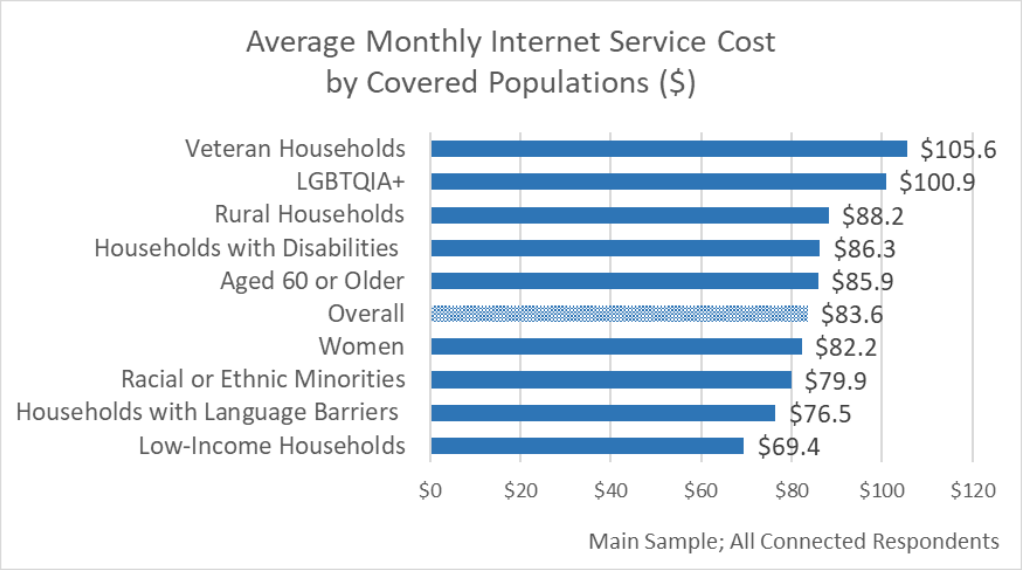


Figure 20: Average of Self-reported Monthly Cost of Internet Service (2023)

As expected, low-income households report paying significantly less for broadband than the general population. This is likely related to self-selection into lower speed/lower cost service tiers offered by ISPs, though it may also reflect discounts associated with programs such as Lifeline or ACP (this is further discussed below). Non-English-Speaking households also report lower service costs, which is partly explained by the fact that this population significantly overlaps with low-income households.

Living in a rural area is, as expected, associated with higher broadband costs, although the difference (less than $5/month) is perhaps smaller than anticipated. However, note

[5] See https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources

this self-reported cost metric does not consider service speed, which tends to be lower in rural areas. In other words, the difference would likely be higher if normalized to cost per unit of speed. Finally, Veteran Households report a higher cost for service, a surprising result that deserves further study to explicate. This is also the case for individuals who identify as LGBTQIA+, though as noted previously the sample size for this group is too small for reliable estimates.

Using data from the Rural Counties Oversample allows for estimating differences in monthly service cost across regions. As shown in Figure 21, the lowest costs are reported in the San Joaquin Valley ($77.8 p/month) while the highest are reported in San Diego County ($93.9 p/month). Again, it is worth noting that costs are not normalized to a common service quality metric. In other words, it is possible that reported costs are lower in the San Joaquin Valley because respondents are selecting lower cost tiers that provide lower speeds than in San Diego County. Further research is needed to validate these findings.

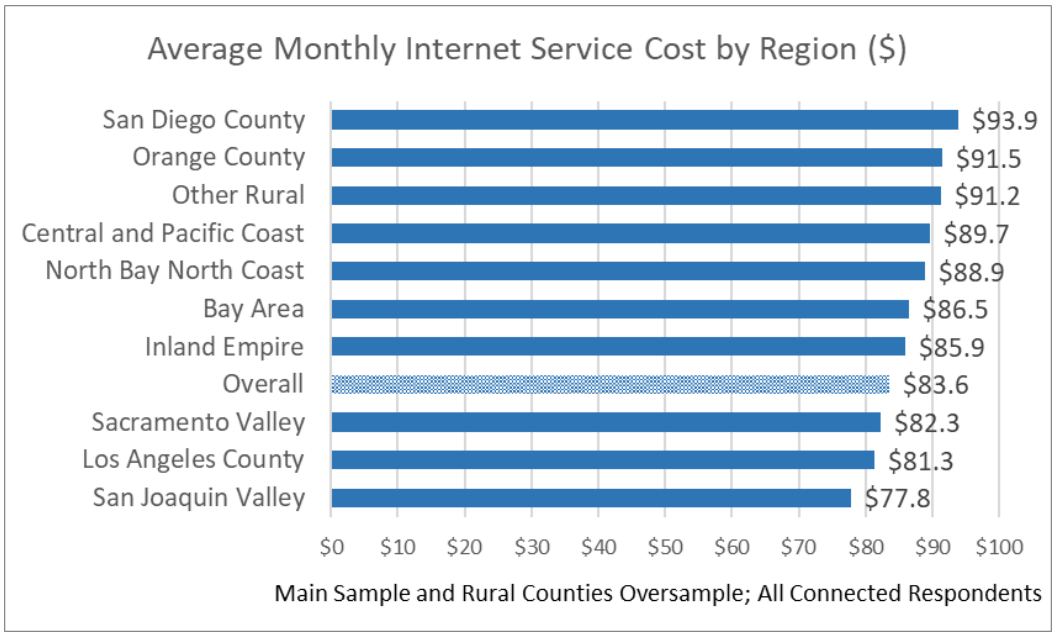


Figure 21: Average of Self-Reported Monthly Cost of Internet Service by Region (2023)

Respondents were asked which company provides their home broadband service, which allows for examining reported costs by Internet Service Provider (ISP). This analysis must be interpreted as indicative only for at least two reasons: first, although respondents were asked about the cost of broadband service only, it is possible that some are reporting the cost of bundled services (for example, broadband and cable services); second, the sample size is small but for the three largest providers (AT&T, Charter and Comcast). Finally, it is important to recall that costs are not normalized to a common service speed unit.

Figure 22 below presents the mean and median results for the seven largest ISPs. As shown, Cox and Comcast customers report higher monthly service costs while customers of mobile broadband providers such as T-Mobile and Verizon report lower median monthly costs. These differences may reflect different types of contracted services, and as such must be interpreted carefully.

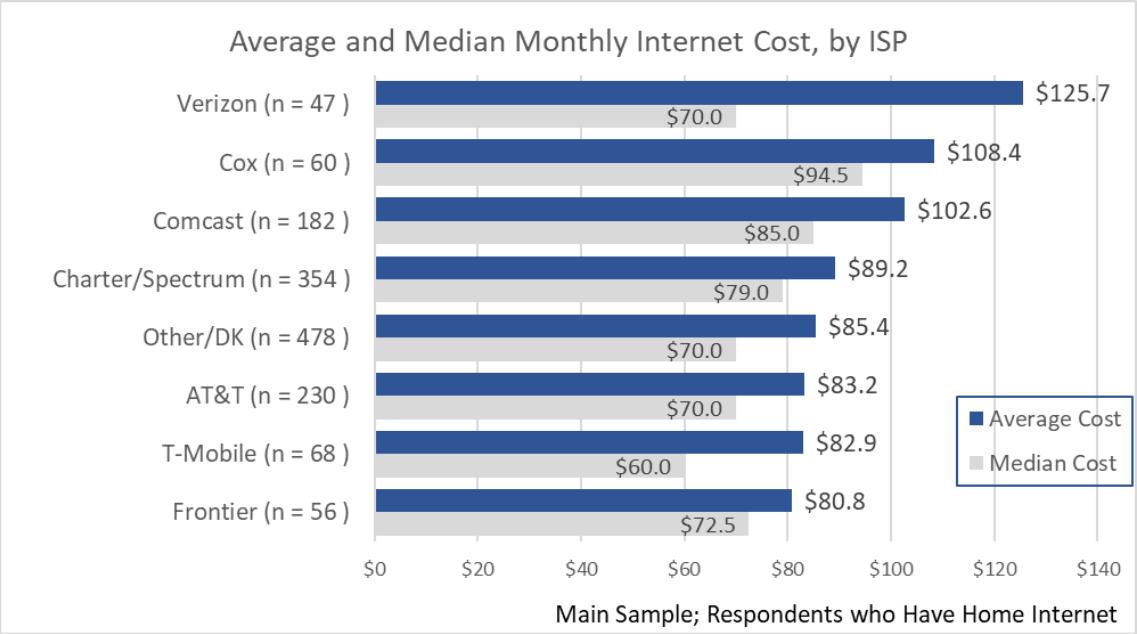


Figure 22: Average and Median Monthly Internet Cost, by ISP (2023)

Service Reliability and Customer Service

Using a rating scale of 1 to 5, with 5 being the highest rating, respondents were asked about their level of satisfaction with the reliability of their broadband service. The results reveal modest variations across Covered Populations (Figure 23). Nearly two-thirds of respondents (about 62%) rate the reliability of their service at "4" or "5" (highest possible). The percentage is lower among low-income households (58%), Households with Language Barriers (54%), and Rural Households (54%), likely because these groups have fewer service options and are often priced out of higher-speed service tiers. By contrast, about 64% of older adults give high ratings (4 or 5) to their service. Overall, the results indicate a moderately high level of satisfaction with services that present several variations of interest across Covered Populations.

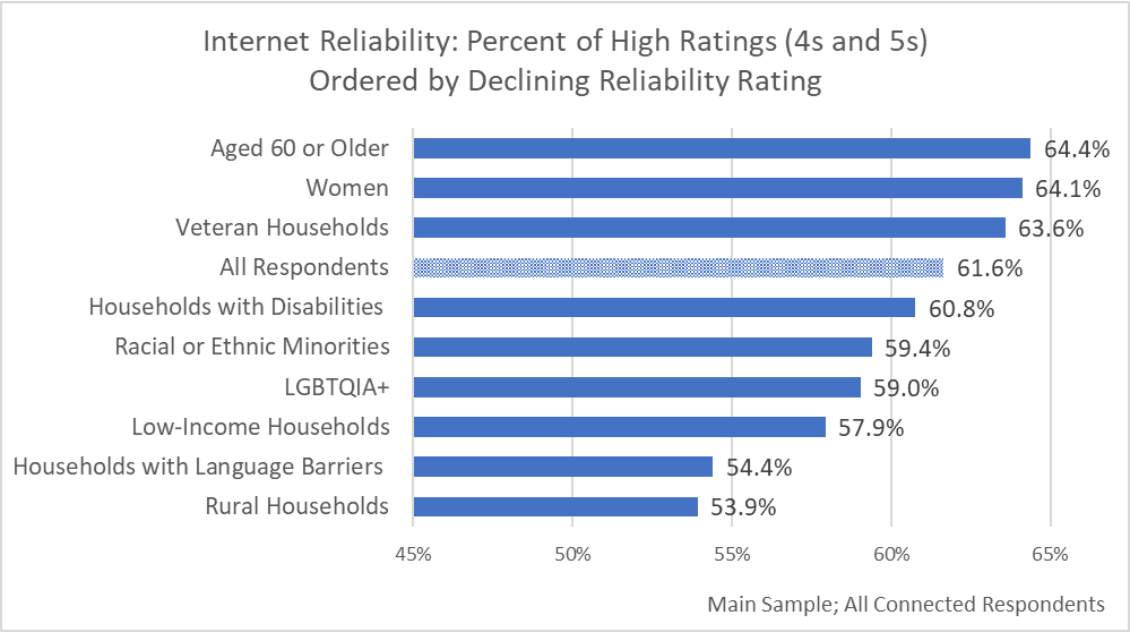


Figure 23: Internet Service Reliability: Percent of High Ratings (4s and 5s) Across Covered Populations (2023)

The survey also asked respondents to rate the customer service offered by their Internet service provider using a similar rating scale of 1 to 5, with 5 being the highest rating. Ratings for this question are somewhat lower (Figure 24), with 53% selecting "4" or "5" (highest possible rating) in the overall population. In this case there are only small variations in satisfaction with the customer service across Covered Populations. The most notable difference is for residents in rural areas, where satisfaction levels with customer service are slightly lower (about 49%).

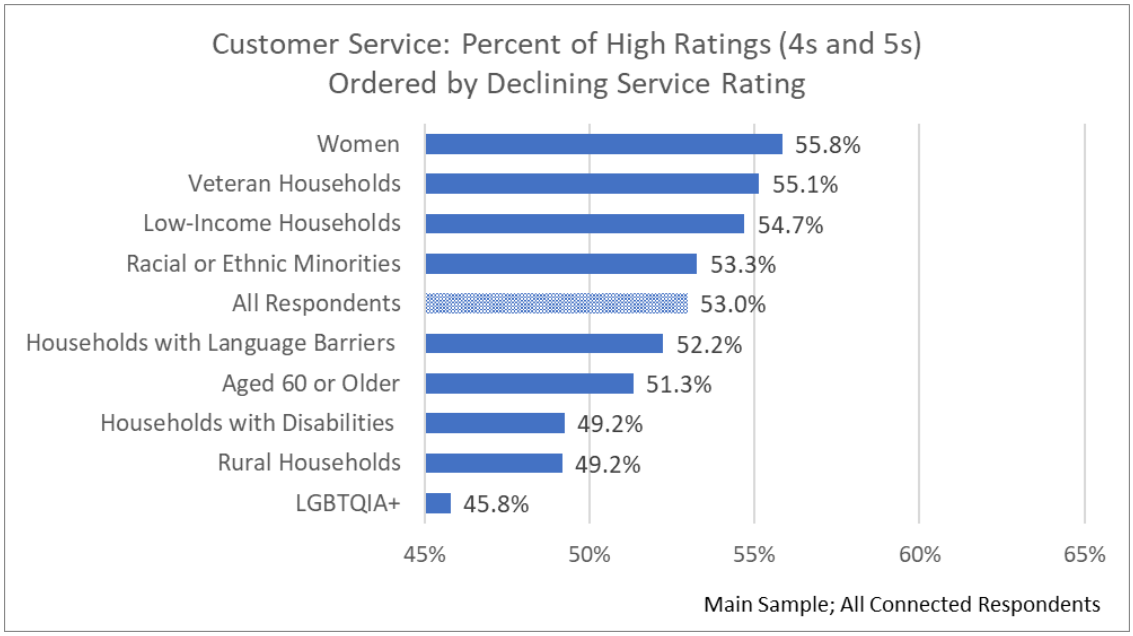


Figure 24: Internet Customer Service: Percent of High Ratings (4s and 5s) Across Covered Populations (2023)

Examining these results across ISPs reveals that customers rank Verizon and Frontier high on service reliability, while AT&T and T-Mobile receive lower ratings (Figure 25). Ratings for customer service are general lower across all ISPs, but particularly low in the case of Frontier and Comcast (Figure 26). Again, the same caveats noted above related to sample size and lack of a common unit of service speed apply to these results, which must be interpreted as indicative only.

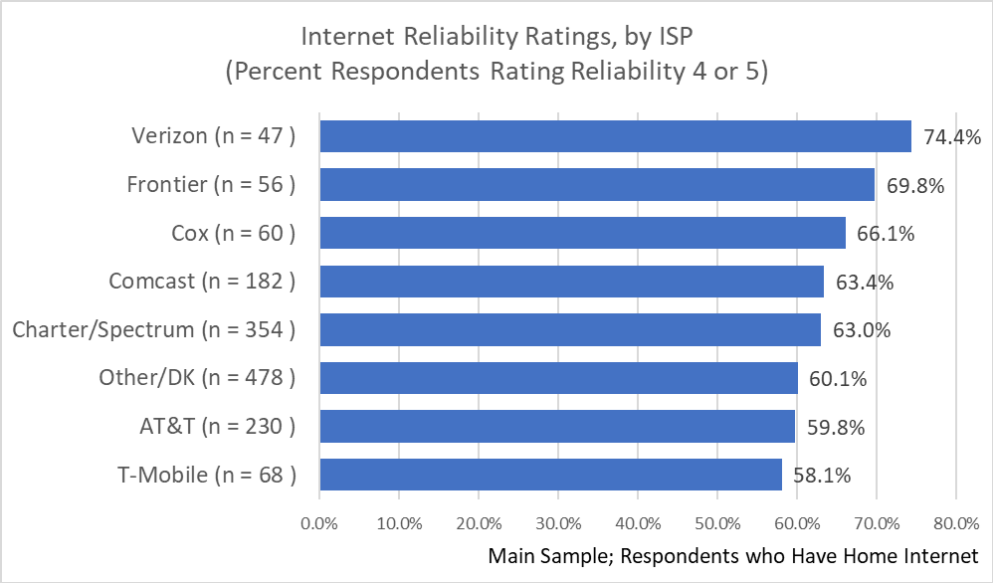


Figure 25: Internet Reliability Ratings, by ISP (2023)

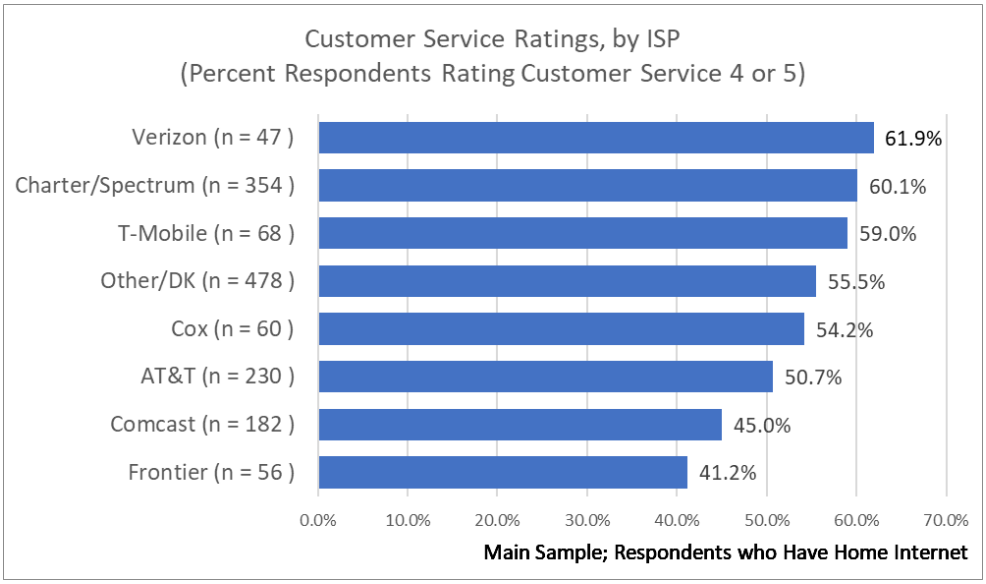


Figure 26: Customer Service Ratings, by ISP (2023)

Service Adequacy

Finally, to assess whether households are generally satisfied with the broadband service received, respondents were asked whether the service was adequate for their needs. The majority of respondents (82%) indicated that the service is adequate for their household needs (Figure 27). However, satisfaction levels decrease among low-income respondents (about 76%), for those living in rural areas (about 76%), and for Households with Disabilities (about 74%). These results indicate the need to improve the availability of high-speed services that are affordable to low-income and rural households. In addition, the low level of satisfaction among Households with Disabilities suggests that service providers may not be offering adequate accessibility options to accommodate the needs of this population. The analysis of results by region does not indicate any relevant variation in satisfaction levels across the state.

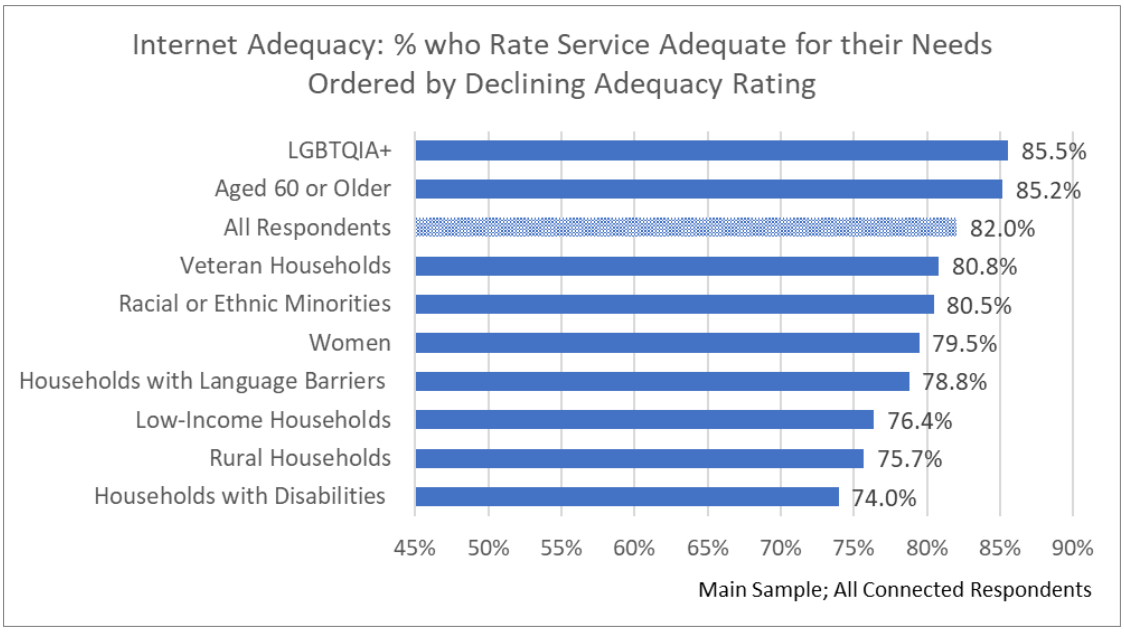


Figure 27: Internet Service Adequacy: Percent who Rate Service Adequate for their Household Needs, Across Covered Populations (2023)

Examining whether respondents consider the service provided adequate for their needs across ISPs suggests that respondents are generally satisfied with the broadband service offered by their provider. The exceptions are AT&T and T-Mobile, for which about 1 in 4 respondents mention that the service provided does not meet their needs (Figure 28). The caveats related to sample size and lack of a common metric for service quality also apply to the interpretation of these results, which must be interpreted as indicative only.

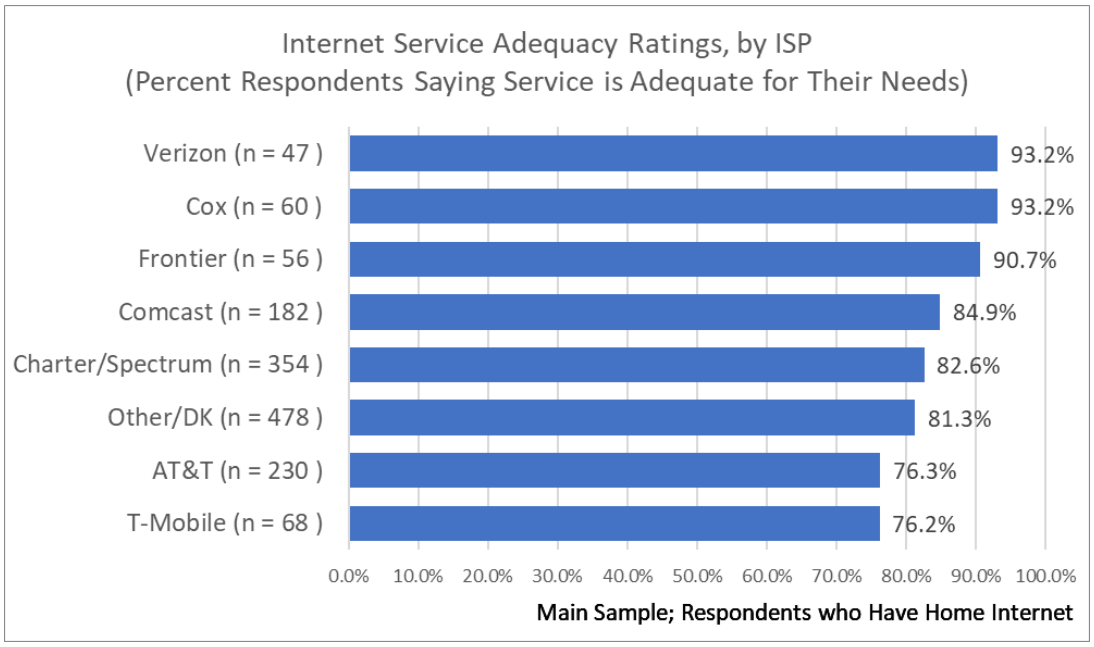


Figure 28: Internet Service Adequacy Ratings, by ISP (2023)

D. Broadband Cost for Low-Income Households

Even when low-income households subscribe to home broadband, the cost burden of the service often requires sacrifices in other essential expenses. It is therefore not uncommon for these households to drop the service when it becomes unaffordable, as household income is often volatile for those in low-paying occupations. While there is no agreed-upon yardstick for what households are reasonably expected to pay for broadband, since 2016 the FCC has used a benchmark of no more than 2% of disposable household income to monitor progress on the affordability of broadband services.[6]

Using this yardstick, the study examines to what extent the reported cost of broadband for low-income households in California falls below this affordability threshold. Because household income information was collected in predetermined income brackets (in $10,000 increments), the analysis uses the midpoint of each income bracket to approximate the true value. In addition, the FCC benchmark is based on disposable income (after taxes) while the survey recorded gross income (before taxes). For these reasons, the analysis below must be interpreted as merely indicative.

[6] See In the Matter of Lifeline and Link Up Reform and Modernization (FCC, 2016), available at https://docs.fcc.gov/public/attachments/FCC-16-38A1.pdf

The results suggest that the majority of low-income households (nearly 70%) spend more than the FCC-recommended 2% of their household income on broadband services. On average, Low-Income households spend about 3.3% of monthly household income on broadband services. For comparison, non-Low-Income households spend on average about 1.4% of their monthly income on broadband. In other words, the relative expenditure on broadband services is more than twice for Low-Income households.[7] Figure 29 shows the distribution of broadband cost as a share of household income for Low-Income households, with the red vertical dashed line representing the 2% FCC yardstick. These results indicate that affordability remains a challenge for low-income earners despite policy initiatives aimed at lessening the cost burden of broadband, including the ACP program, which is discussed in the next section.

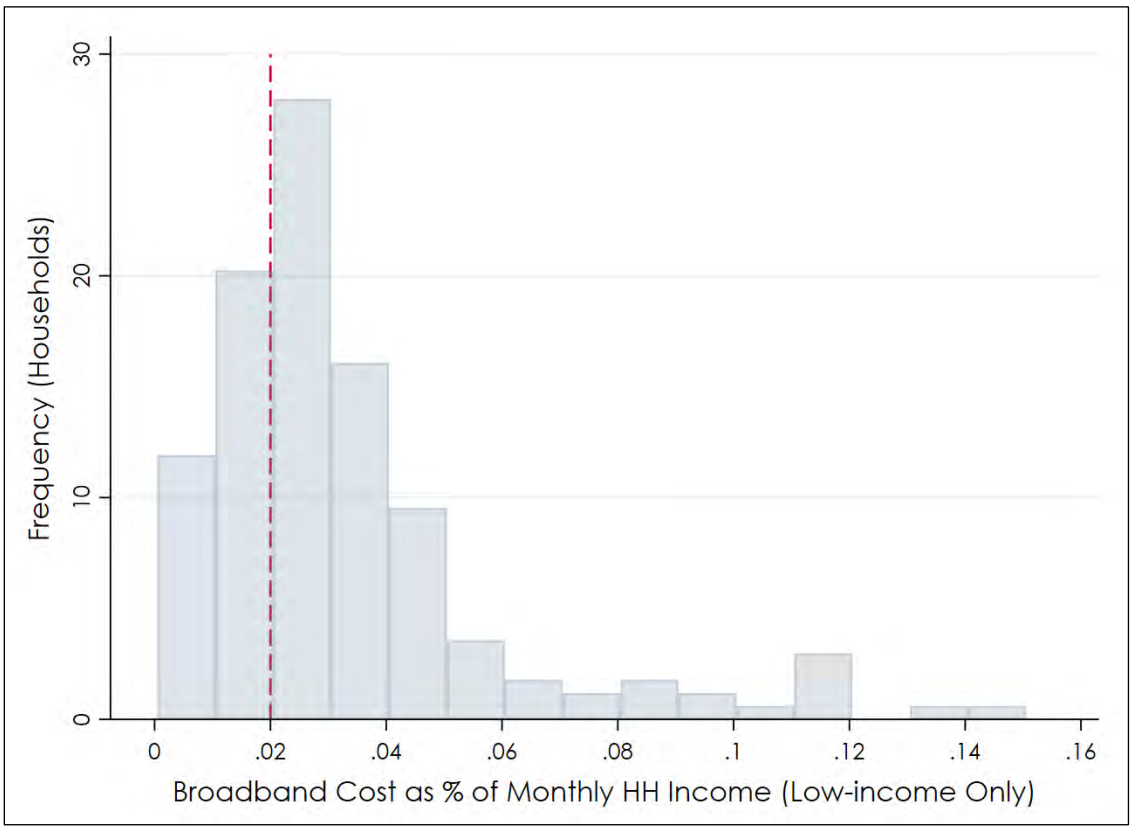


Figure 29: Distribution of Broadband Cost as Percent of Monthly Household Income, Among Low-Income Households (2023)

[7] Because respondents were asked about household income in predetermined brackets, households in the lowest income bracket (less than $20,000 annual income) were coded at the maximum possible income value ($19,999) while households in the highest bracket (more than $150,000 annual income) were coded at the minimum possible value ($150,001). As such, the analysis likely underestimates the difference in relative broadband expenditure between low-income and non-low-income households.

4. OBSTACLES TO HOME BROADBAND AND ALTERNATIVE ACCESS LOCATIONS

The Statewide Survey on Broadband Adoption seeks to better understand the barriers that prevent unconnected or underconnected (smartphone only) households from having home broadband. Following best practices in digital equity research, the survey first presented a list of potential reasons for not having broadband at home, asking respondents to select all reasons that applied to them (multiple choice question). This was followed by a single option question in which respondents were asked to select the *most important* reason among those selected in the previous question.

Overall, the results confirm that cost is the main barrier to home broadband (Figure 30). Almost two-thirds (61%) of respondents without broadband at home mention cost as one of the reasons for not having the service, followed by concerns about privacy (about 42%) and those reporting a mobile data connection is adequate to do all they need online (about 42%). Note also that nearly 1 in 3 respondents mention that home broadband services are either not available or not adequate at their place of residence.

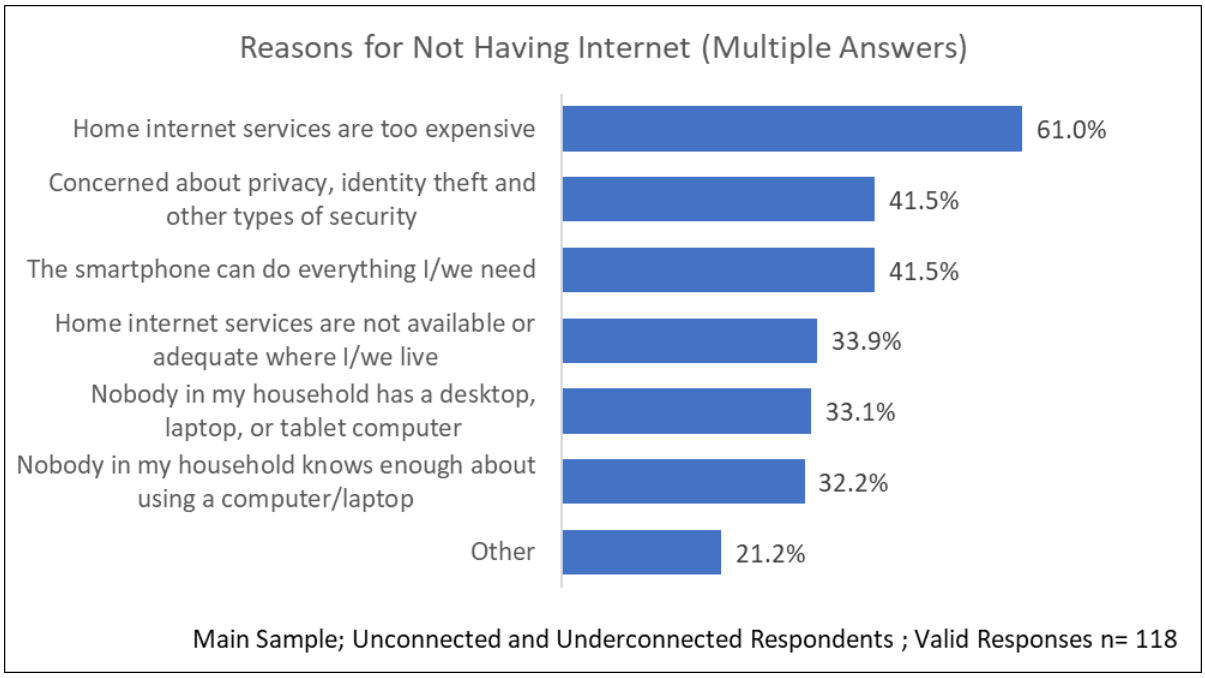


Figure 30: Reasons for Not Having Internet, Among Unconnected and Underconnected Respondents (2023)

When probed about the main reason in the follow-up question, cost again is prominently at the top with over a third of respondents (about 36%) reporting that home broadband is too expensive for them, followed distantly by doing everything with a mobile data connection, limited digital skills, and privacy concerns (Figure 31). Taken together, these results provide strong validation to policy actions and programs that help alleviate the cost burden of home broadband, particularly for disadvantaged populations. It is worth noting that the small number of respondents who report not having broadband at home (unconnected or underconnected) in the sample prevents any further analysis of results across Covered Populations.

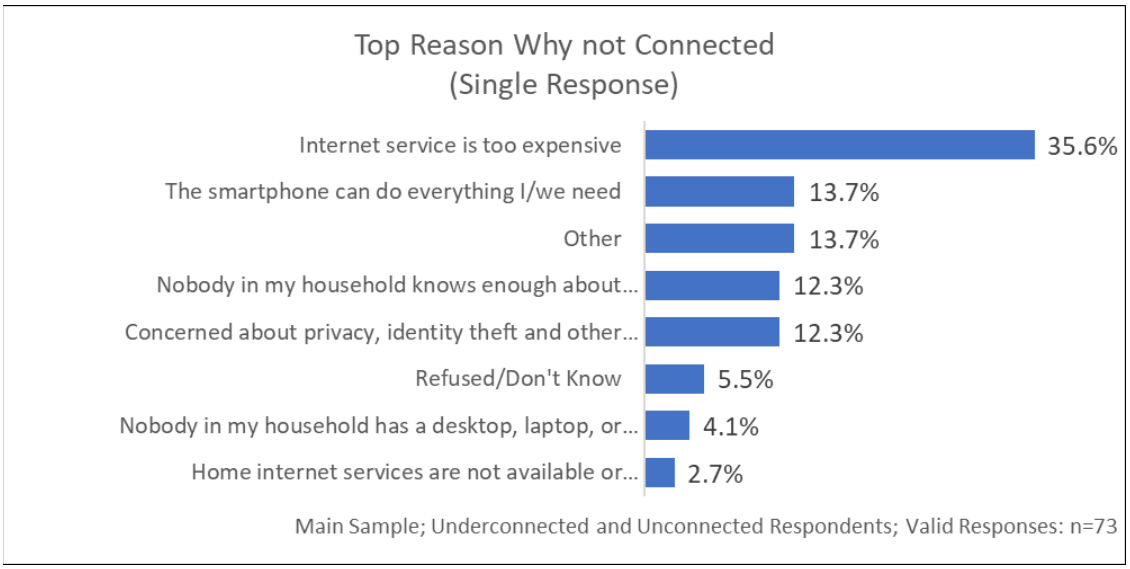


Figure 31: Top Reason for Not Having Internet, Among Unconnected and Underconnected Respondents. (2023)

When underconnected and unconnected, respondents are asked whether they use broadband in other locations (other than at home), almost half report connecting in other places such as retail stores and other public locations. This suggests the existence of an unmet demand for more affordable connectivity options. As shown in Figure 32, when asked about which other places are most often used to connect to broadband (multiple option question), restaurants or cafés and similar locations are the most common option (about 50%), followed closely by the home of a friend or relative (about 41%) and schools and libraries (about 41%). Note also a small but significant share who report connecting in other public spaces (29%), through community Wi-Fi networks, and at the parking lot of school or libraries (22%). Overall, these results suggest that public and community locations (including libraries and schools) continue to play a critical role in providing connectivity alternatives to those who lack home broadband.

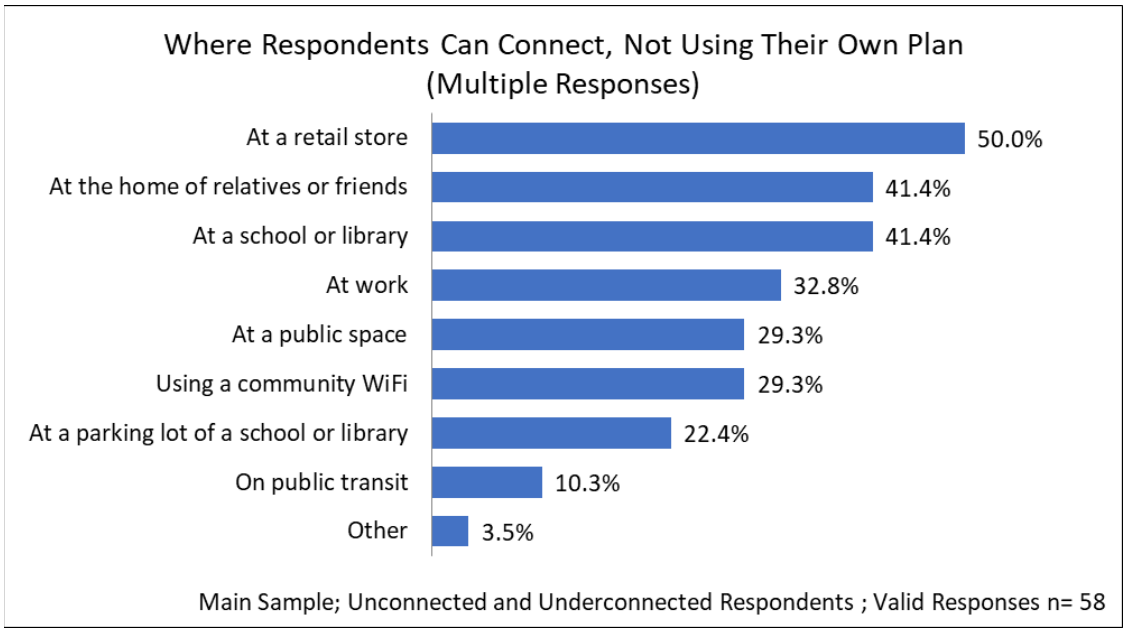


Figure 32: Where Unconnected and Underconnected Can Connect, Not Using Their Own Internet Plan (2023)

5. ACP AND OTHER SUBSIDY PROGRAMS

A. *Program Awareness*

The Affordable Connectivity Program (ACP) is a means-tested program launched in January 2022 to help middle and low-income families pay for Internet access. Households are eligible for ACP when annual household income is at or below 200% of the Federal Poverty Level (FPL) or if any household member participates in a designated assistance program such as SNAP, Medicaid, SSI, Pell Grants, and the National School Lunch Program (NSLP), among others. Since its launch, about 2.4 million households in California have enrolled in ACP (as of August 2023), which represents about 40% of eligible households.

There are multiple outreach efforts underway across the state to increase awareness and promote enrollment in the ACP program. This study probes into program awareness as well as the reasons given by respondents who live in households that are likely to be eligible but are not enrolled in the ACP program. It also probes for awareness and participation in subsidized broadband programs offered by ISPs. For reference, about 45.5% of California's households (around 6 million households) are eligible to receive ACP benefits.[8]

The results generally indicate that the level of awareness about the ACP program is low (Figure 33). Overall, more than two-thirds of respondents have never heard of the ACP program. Further, the fact that nearly 77% of unconnected households are not aware of the program indicates the urgent need to invest in outreach for those who lack broadband access at home.

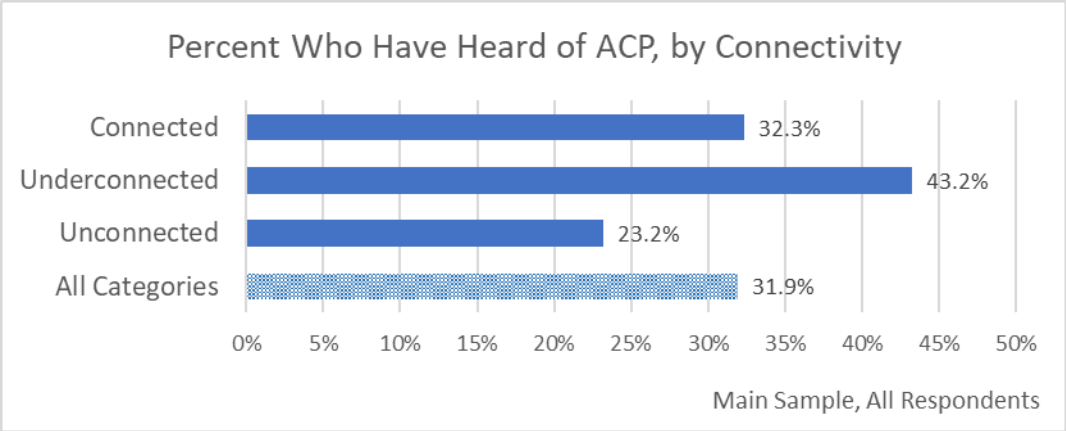


Figure 33: ACP Awareness by Connectivity (2023)

[8] For discussion of the ACP program and how eligibility is estimated see "Estimating participation in the Affordable Connectivity Program (ACP)" (Galperin, 2022).

ACP awareness is somewhat higher among some Covered Populations, including Low-income Households (defined as annual household income at or below 150% of the federal poverty level), Women and Households with Disabilities, and slightly lower for Households with Language Barriers (Figure 34).

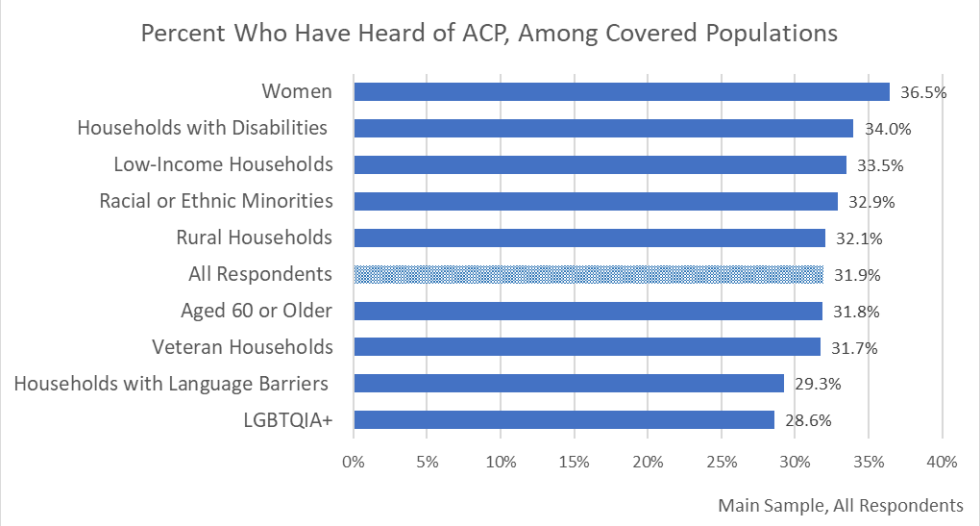


Figure 34: Percent Respondents Who Have Heard of ACP, Among Covered Populations

To probe for awareness among households that are likely eligible to receive ACP benefits, the study combines information about household income and participation by members in four qualifying programs (MediCal /Medicaid, CalFresh, WIC and Pell grants). The results indicate that only about 1 in 3 households (about 35%) who are likely eligible have heard about the ACP program. Further, among ACP eligible households who are aware of the ACP program, less than 1 in 5 are enrolled (Figure 35). The study further probes into the reasons behind this low level of participation in the subsequent section.

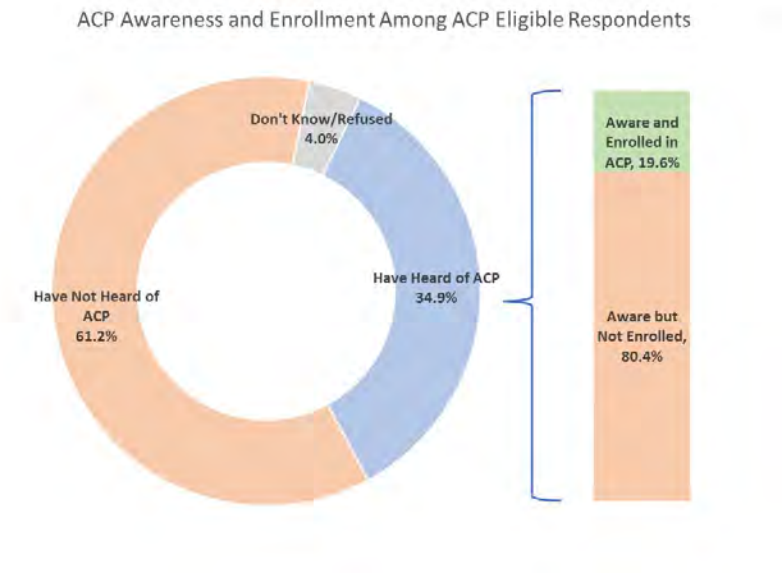


Figure 35: ACP Awareness and Enrollment Among Eligible Respondents Aware of the Program

Using the Rural Counties Oversample allows for estimating variations in ACP awareness across regions. Interestingly, the results reveal several differences in ACP awareness across the state (Figure 36). In the San Joaquin Valley region, about 41% of respondents have heard about the program, while only about 29% in San Diego County and about 27% in the Inland Empire region indicate they know about the ACP program. These differences suggest that local efforts matter to increase awareness about the program, and that outreach efforts must be targeted and appropriate to the different characteristics of the population across regions.

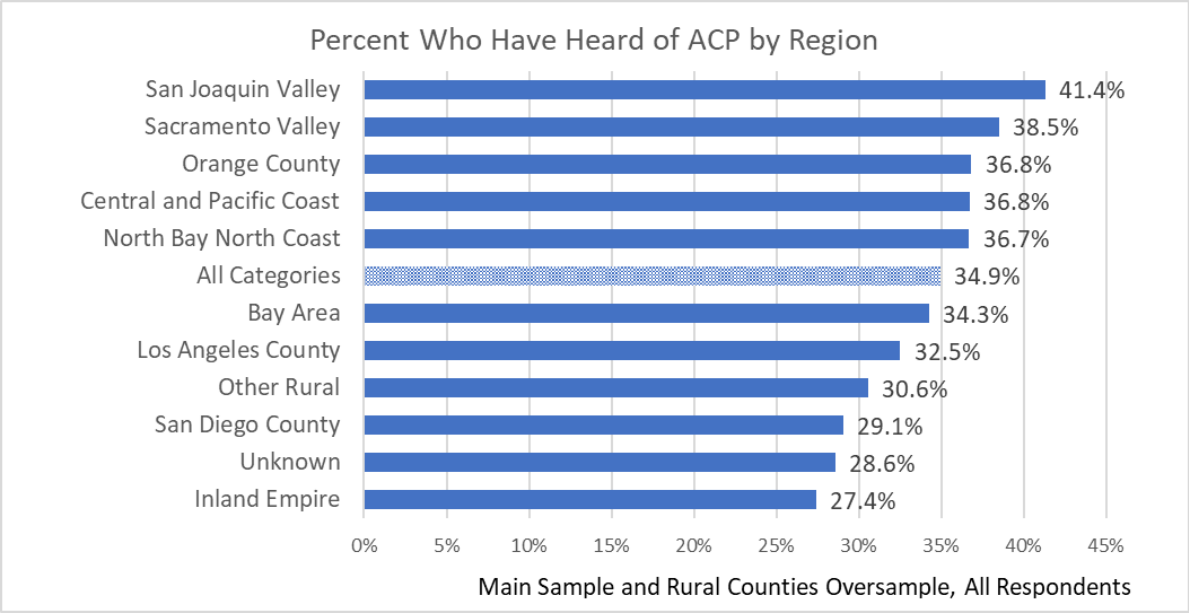


Figure 36: ACP Awareness by Region (2023)

While the launch of the ACP program represented a milestone in federal broadband policy, a number of other programs aimed at promoting adoption among disadvantaged households already existed in California before 2022. They include Lifeline, a joint state-federal program, as well as multiple discount offerings by service providers. Each of these programs has somewhat different eligibility requirements, typically a combination of income threshold and participation in qualifying social programs. As a reference point to the findings about ACP, the study probed for awareness about these other low-cost programs.

The results indicate that awareness levels are even lower for these programs, as less than 1 in 4 respondents say they have heard about Lifeline or similar discount broadband alternatives (Figure 37). Unconnected respondents are only slightly more aware of these discount programs at about 26%. Further, among those eligible for ACP, and therefore likely to be eligible for these other programs, the level of awareness is similarly low (only about 23%).

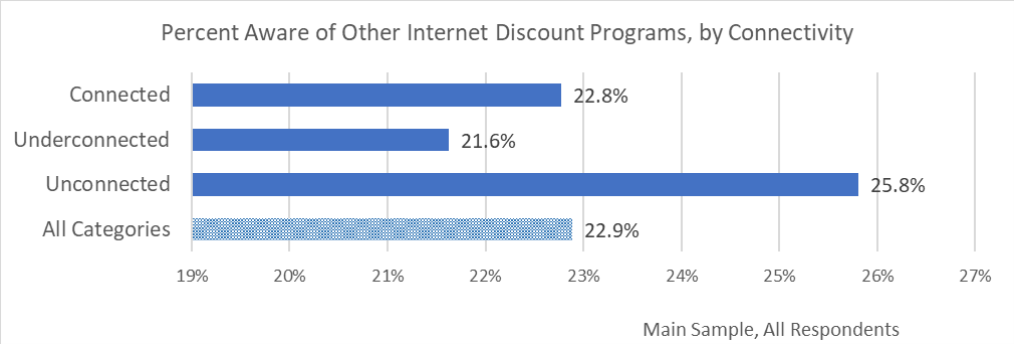


Figure 37: Awareness of Internet Discount Programs Other Than ACP, by Connectivity (2023)

There are only small variations in awareness across Covered Populations, with the exception of Households with Disabilities for which awareness of other discount programs climbs to 28% (Figure 37).

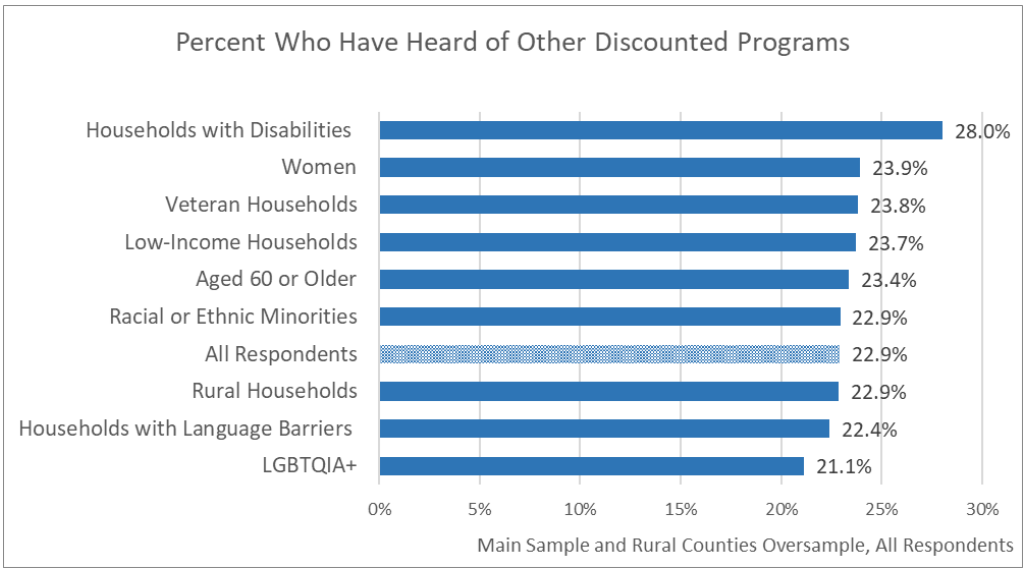


Figure 38: Percent Respondents Who Have Heard of Other Discount Programs, Among Covered Populations (2023)

Similarly, significant regional variations in levels of awareness are observed, with only about 19% of San Diego County residents reporting to have heard about discount broadband programs other than ACP, compared to nearly 30% in the Central and Pacific Coast region (Figure 39). Again, these variations highlight how local outreach efforts matter for promoting awareness about discount Internet programs.

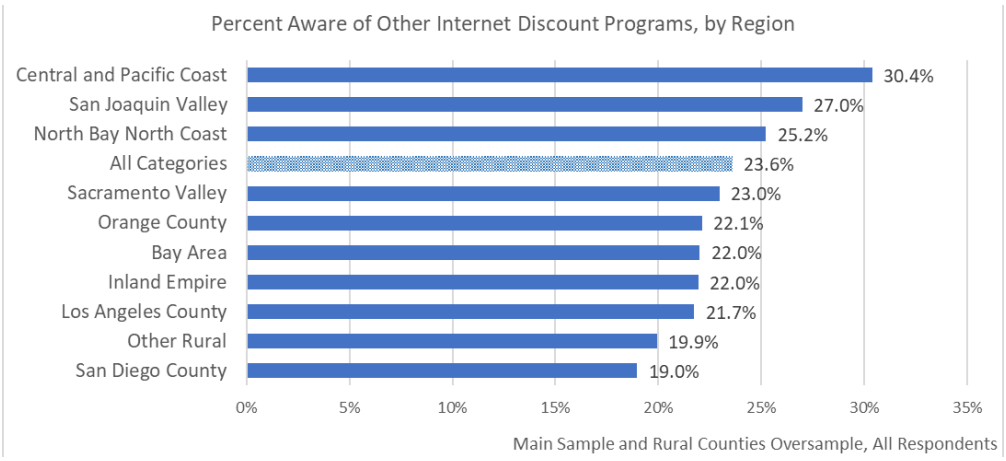


Figure 39: Awareness of Internet Discount Programs Other Than ACP, by Region (2023)

B. *Program Participation*

Respondents who have heard about ACP or Lifeline were asked whether they are enrolled in these programs. Note this question was asked regardless of whether the respondent was determined to be eligible for the program (see below for further analysis restricted to those who are likely eligible). Overall, almost 12% or respondents who have heard about the ACP program self-reported to be enrolled (Figure 40). As expected, enrollment is higher for most Covered Populations, in particular for Low-income Households (nearly 19% enrolled), Households with Disabilities (nearly 17% enrolled) and Racial or Ethnic Minorities (nearly 14% enrolled). On the other hand, enrollment is found to be below average for Aging Individuals (about 7%) and for those with Language Barriers, which suggest the need for targeted ACP outreach efforts for these groups.

Among respondents who have heard about the Lifeline program, participation levels are found to be much lower, with fewer than 5% self-reporting to be enrolled. Similar to ACP, enrollment is higher for Low-Income Households (nearly 13% enrolled), but this is not the case for other Covered Populations. Veteran Households, in particular, are found to have below-average enrollment in Lifeline.

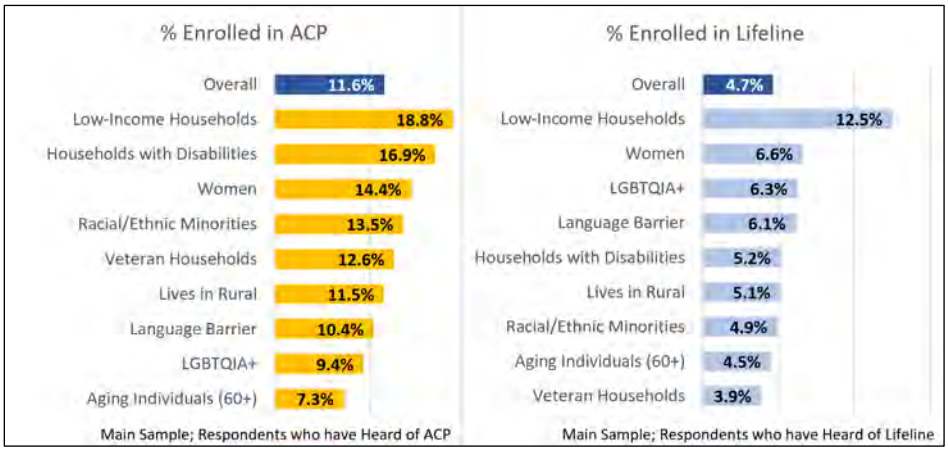


Figure 40: Enrollment in ACP and Lifeline, by Covered Population (2023)

C. *Reasons for not Participating*

For respondents who have heard about ACP or other broadband discount programs and are identified as eligible but are currently not enrolled, the study probed about the reasons for not being enrolled (multiple options question). Interestingly, about 29% stated that they will probably not qualify, even though they likely would be eligible based on annual household income or participation in qualifying programs (Figure 41). This is followed by about 23% who reported not knowing how to apply. These results indicate that program awareness is not enough to effectively increase enrollment among eligible households, and that local outreach efforts must not only counter misinformation about program eligibility and other program components but also include assistance in navigating the enrollment process.

Further, the results suggest that the enrollment process needs to be streamlined, as about 15% of respondents mention that the application "takes too much time," is "too difficult," or that they never received a response. Combining information campaigns with on-site enrollment assistance, as well as reducing the administrative burden of enrollment, are priority actions to maximize the impact of ACP and similar discount programs in California.

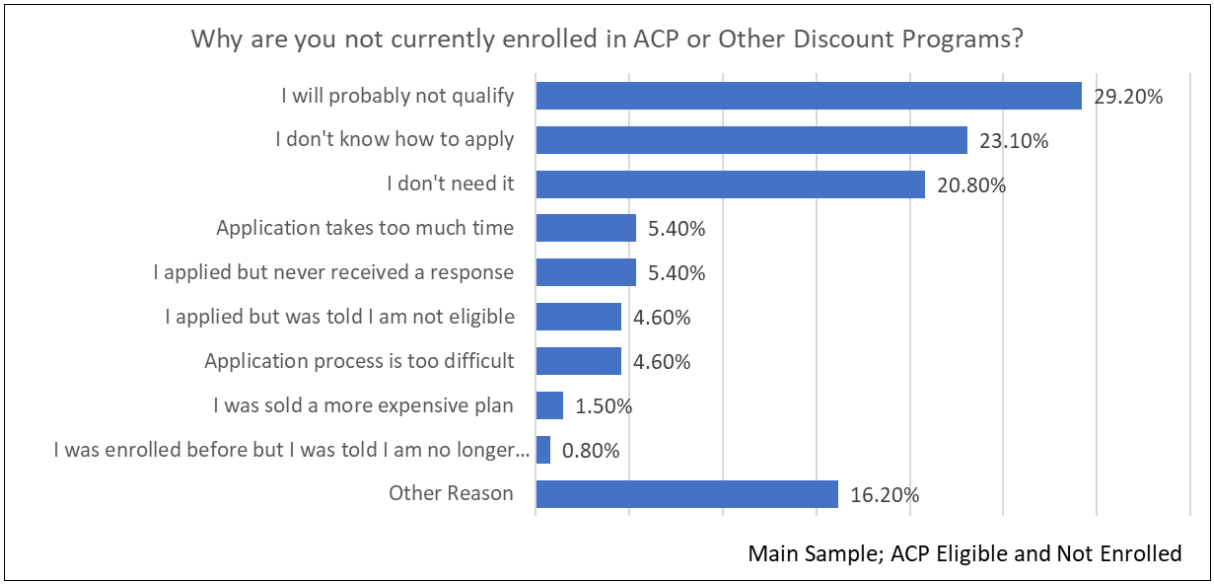


Figure 41: Reasons Why Not Enrolled in ACP or Other Programs, Among Respondents Eligible and Aware of the Program (2023)

6. **DIGITAL SKILLS**

Studies consistently show that the lack of digital skills is among the most relevant barriers for digital equity. This is particularly true as adoption levels increase and cost barriers are addressed through subsidy programs, such as ACP, such that households that remain unconnected are more likely to have low digital literacy levels. Recall that nearly 1 in 3 respondents who lack broadband at home cite limited digital skills as one of the reasons for not subscribing to the service (Figure 30, in section 4).

This study adapts a validated scale for measuring digital skills based on a set of four questions that ask respondents to self-report whether they are capable of performing different tasks. The questions range from rather simple tasks such as "sending an email with an attached image or document" to more complex tasks such as "setting up protection against phishing and spam email," with respondents being asked to self-report their ability to perform the task on a scale that ranges from "very comfortable" (highest in the scale) to "I don't understand what the item is about" (lowest in the scale). Following previous studies, the analysis designates as "high skills" those respondents who report being "somewhat comfortable" or "very comfortable" performing all four scale items.

Overall, just over half of respondents are found to be high-skills users (about 56%). However, as shown in Figure 42, the share of high-skills users is significantly lower among some Covered Populations, in particular for Non-English-Language households (40%), among low-income residents (42%), and Households with Disabilities (43%). These results point to the compounding effect between human capital barriers and other barriers to broadband adoption.

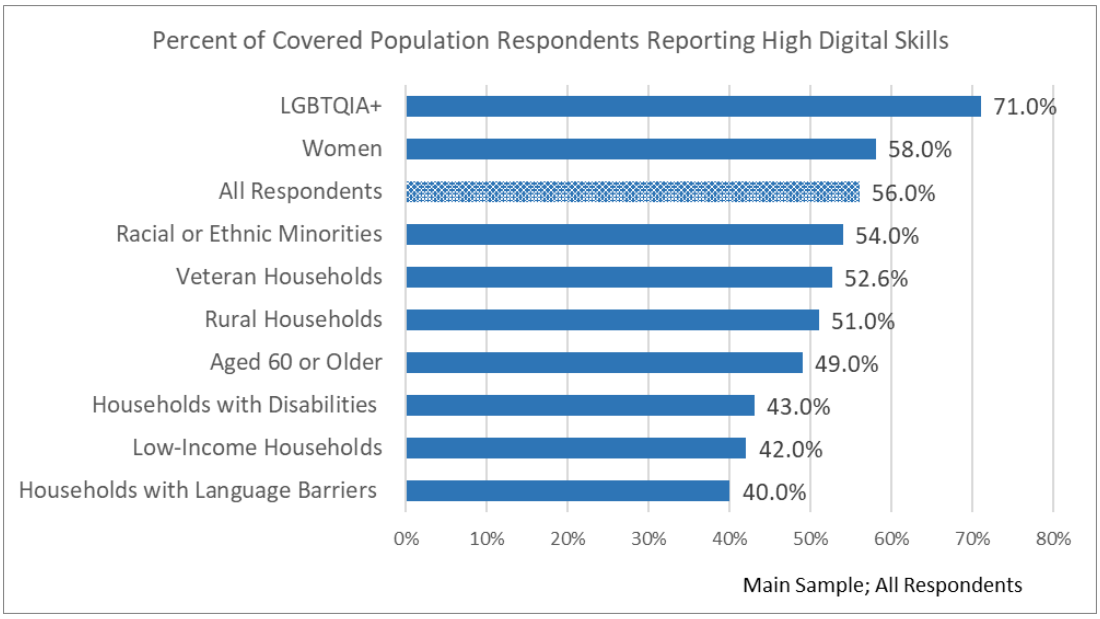


Figure 42: Digital Skills Among Covered Populations: Percent Reporting High Digital Skills (2023)

Further, as expected, respondents who either lack broadband at home or connect only through a smartphone (underconnected) self-report digital skills significantly below the general population, with only 28% categorized as high skills. Taken together these results suggest that increasing adoption among Covered Populations will require the articulation of investments in connectivity infrastructure and subsidy programs, such as ACP with literacy programs aimed at increasing digital skills among Covered Populations.

7. TELEHEALTH

A. *Historical Trends*

The use of telehealth services increased exponentially during the pandemic, fueled by a combination of patient demand for remote health services, investments in platforms and training by health service providers, and regulatory changes that expanded the range of services and providers that can participate in telehealth programs. Questions about telehealth utilization were first introduced in the 2021 Statewide Survey of Broadband Adoption, which captured some of the changes discussed previously and uncovered significant differences in utilization across populations.

Overall, telehealth utilization has dropped from nearly 51% in 2021 to about 46% in 2023. As shown in Figure 43, a large drop in utilization is observed among older adults (65 years and older). In terms of regional differences, the largest drop is observed in the more rural and less populated counties -- grouped under "Rest of California" (Figure 44). No major differences are observed for other Covered Populations, except for those living in rural areas, among which telehealth use fell from nearly 52% in 2021 to about 44% in 2023.

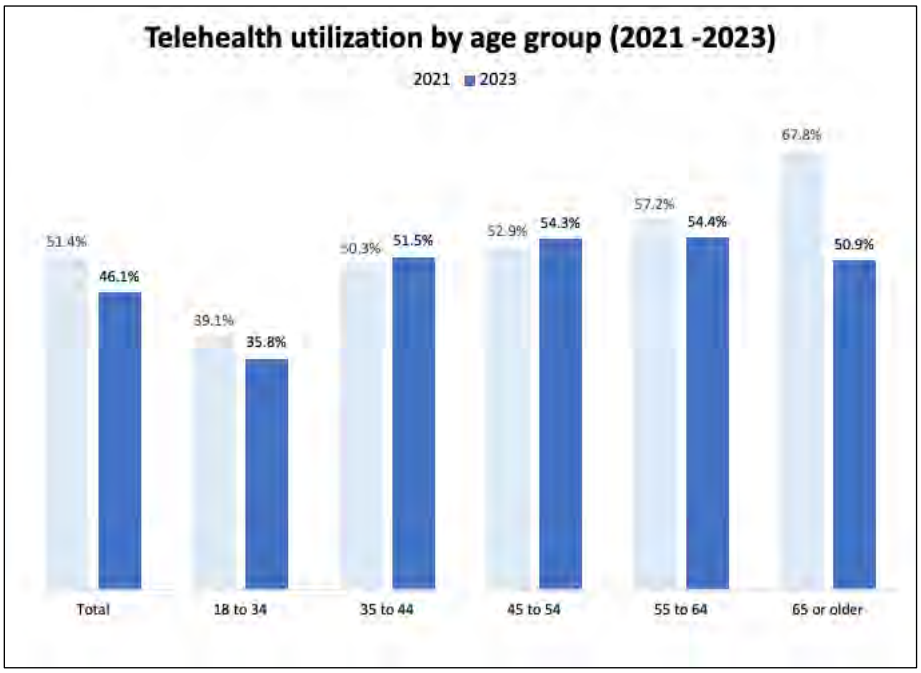


Figure 43: Telehealth Utilization by Age Group (2021 – 2023)

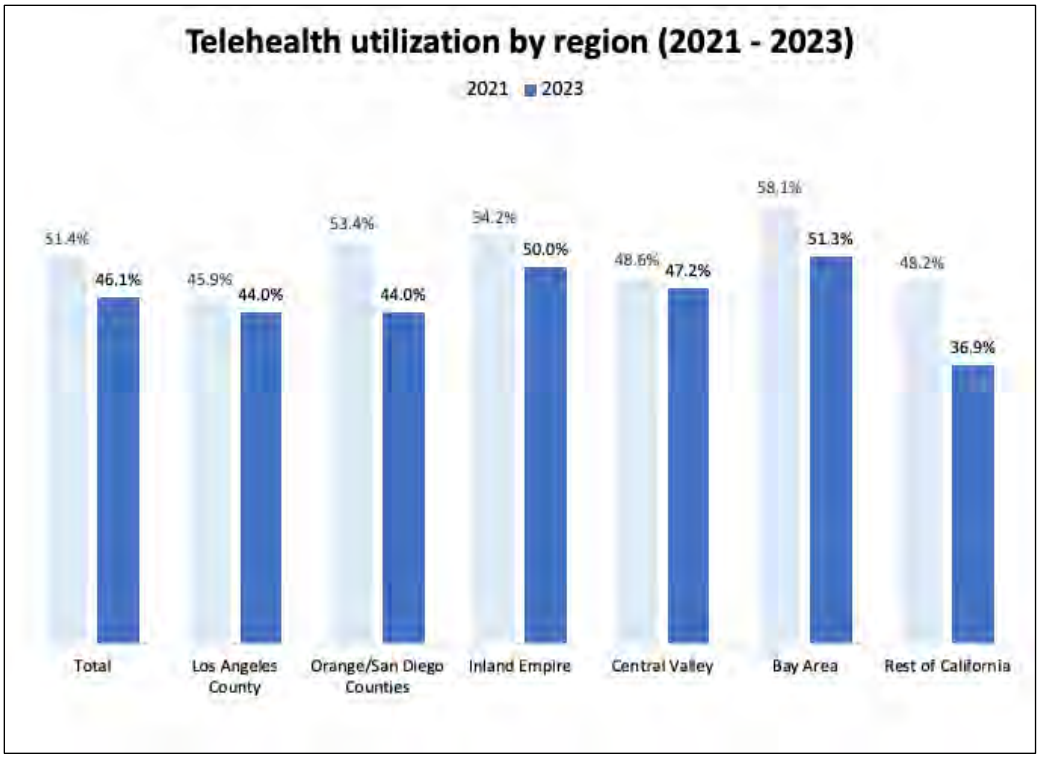


Figure 44: Telehealth Utilization by Region (2021 – 2023)

The observed declines in telehealth use are somewhat expected as the gradual return of in-person health services reduced demand for remote consultations and other telehealth services. At the same time, these trends will need continued monitoring to ensure that the expansion of telehealth services that took place during the pandemic continue to improve health delivery to those who can most benefit from remote services, such as the elderly and those living in areas with the least access to health facilities.

Finally, looking at trends for which device is primarily used for telehealth consultations indicates a small increase in the use of a computer or tablet (using both audio and video) as well as an increase in smartphone use (using both audio and video). At the same time, the results show a decrease in consultations that rely on telephone audio only, from nearly 34% in 2021 to about 30% in 2023 (Figure 45). While the differences are not large, the results are trending in the direction for increased use of devices with more capabilities that can deliver a better telehealth service experience to patients.

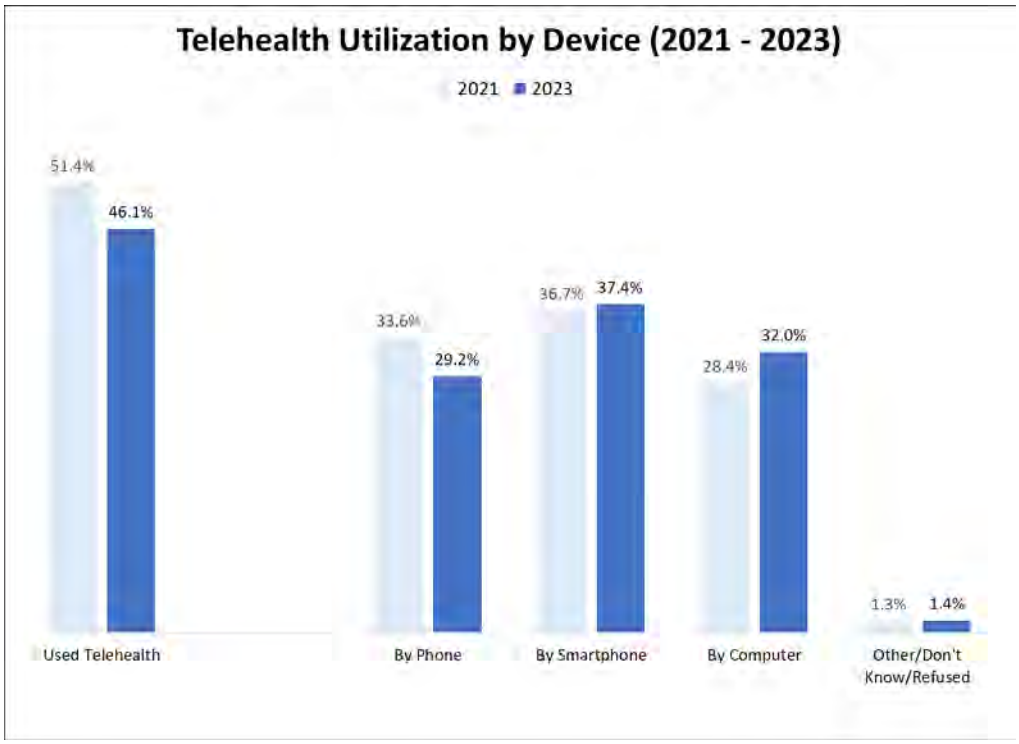


Figure 45: Telehealth Utilization, by Device (2021-2023)

B. Utilization by Connectivity and Device

As expected, telehealth use among those who lack broadband at home (unconnected or underconnected) is well below the overall rate (46.1%) at just around 21%. This result underlines the compounding disadvantages faced by those without home broadband, who are prevented from taking advantage of the expansion in telehealth services availability during the COVID-19 pandemic.

For those reporting use of telehealth services in the past year, the survey asked a follow-up question about which device is primarily used in telehealth consultations. Interestingly, the most common device for telehealth consultations is the smartphone using both audio and video capabilities, followed by a telephone or smartphone using audio only and a computer or tablet using both audio and video (Figure 46). These results suggest that many telehealth users are choosing the convenience of the portable device but at the same time may be compromising the quality of the telehealth experience.

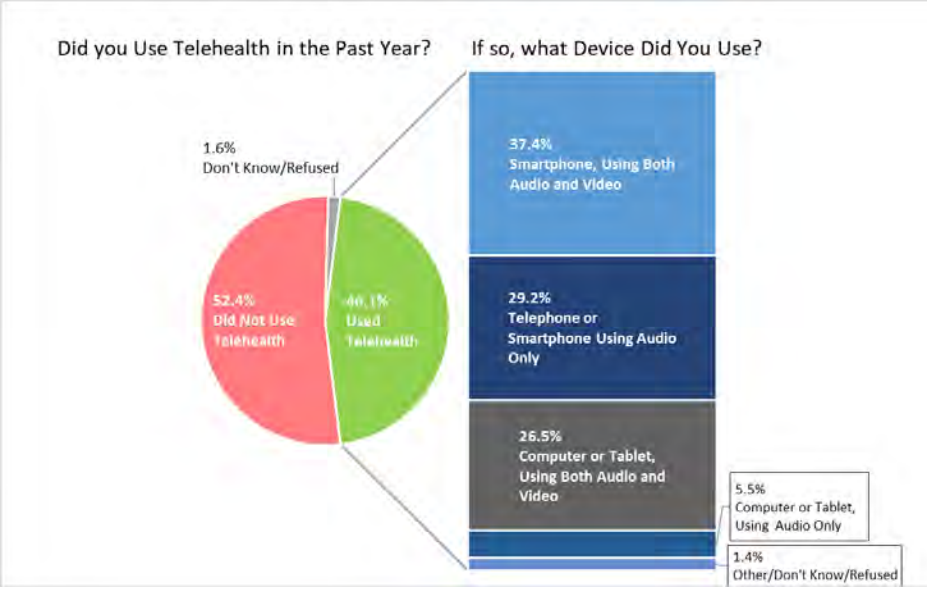


Figure 46: Telehealth Use in Past Year, and Device Used (2023, Main RDD Sample)

C. *Utilization by Covered Population*

The examination of results across Covered Populations reveals significant differences in telehealth use. Despite the general downward trend in utilization, households where at least one member reports a disability continue to use telehealth at much higher rates than other groups (Figure 47). Interestingly, there are notable differences by gender with women using telehealth significantly more than men (55% vs. 41%). Further, Veteran Households are also more likely to use telehealth (59%), which may reflect the success of targeted efforts to increase access to telehealth among this population, such as the U.S. Department of Veteran Affairs' Bridging the Digital Divide program. At the same time, telehealth use among low-income residents and Non-English-Speaking Households is significantly below average, suggesting the need to strengthen the provision of telehealth services for these disadvantaged groups.

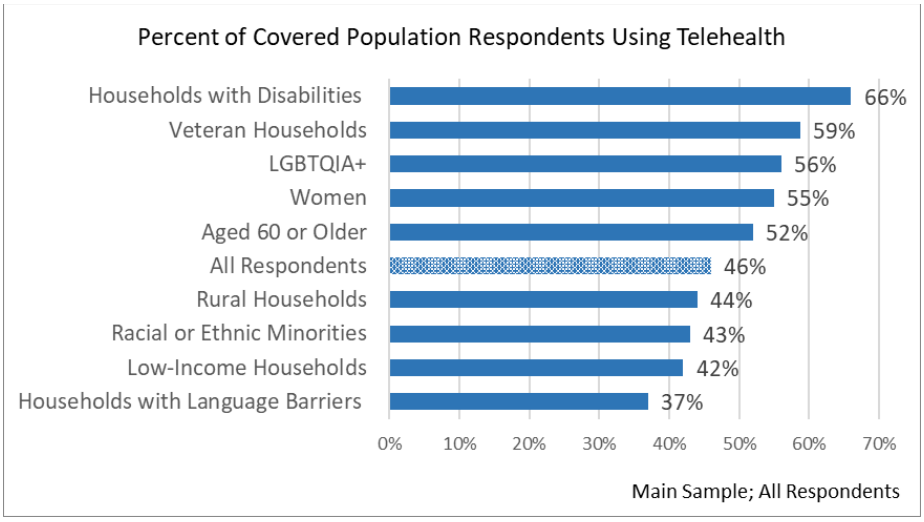


Figure 47: Percent of Covered Population Respondents Using Telehealth (2023)

Further examining differences in telehealth devices most commonly used across Covered Populations reveals that Racial/Ethnic Minorities, Veteran Households, and Households with Disabilities tend to use the smartphone (using both audio and video) for telehealth at higher rates than other groups (Figure 48). Interestingly, Aging Individuals use a computer or tablet for telehealth at higher rates than most other groups, despite having lower levels of digital literacy on average. Whether this is due to their more intensive use of health services in general or other reasons is worth examining in future studies.

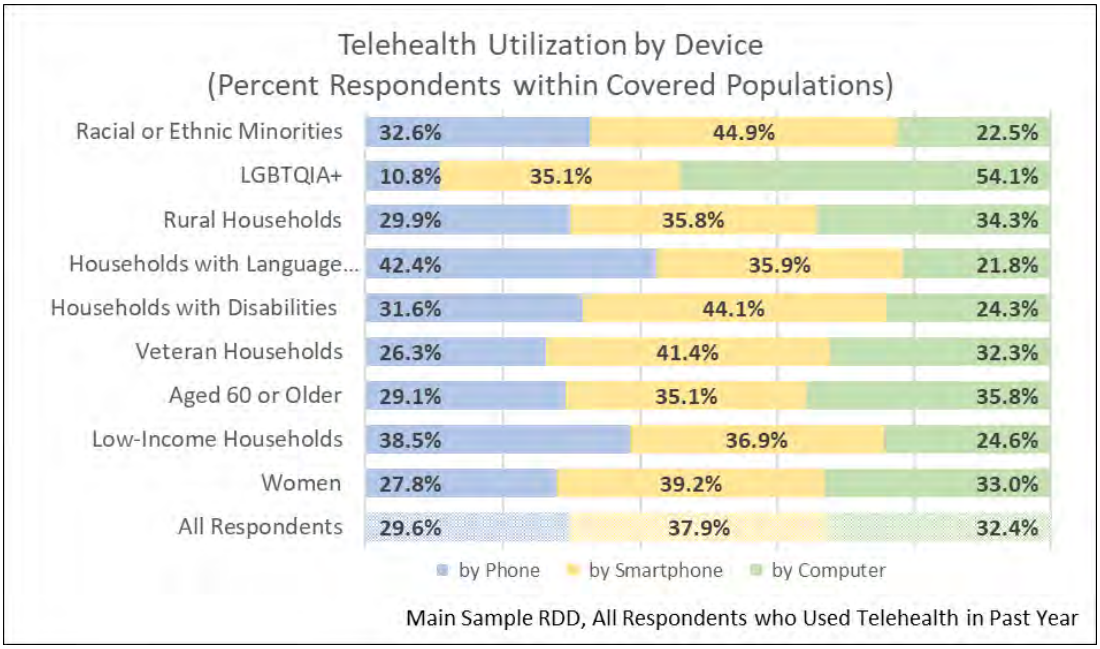


Figure 48: Telehealth Utilization by Device (2023)

D. Satisfaction with Telehealth Services

When asked whether the quality of care received via telehealth was the same, worse, or better than the quality of care generally received in-person, most respondents (about 59%) say that their telehealth experience is similar to traditional in-person health services, with about 11% expressing that the quality was in fact higher via telehealth. From the perspective of patients, this generally validates telehealth consultations as an adequate substitute for in-person services.

However, about 1 in 4 respondents express dissatisfaction with telehealth compared to in-person services, with only small variations across Covered Populations (Figure 49). The notable exception is the population of respondents with language barriers, who express higher dissatisfaction with telehealth services (about 1 in 3 mentioning a worse experience). This result suggests the need for further investments to promote the availability of more culturally appropriate telehealth services in languages other than English.

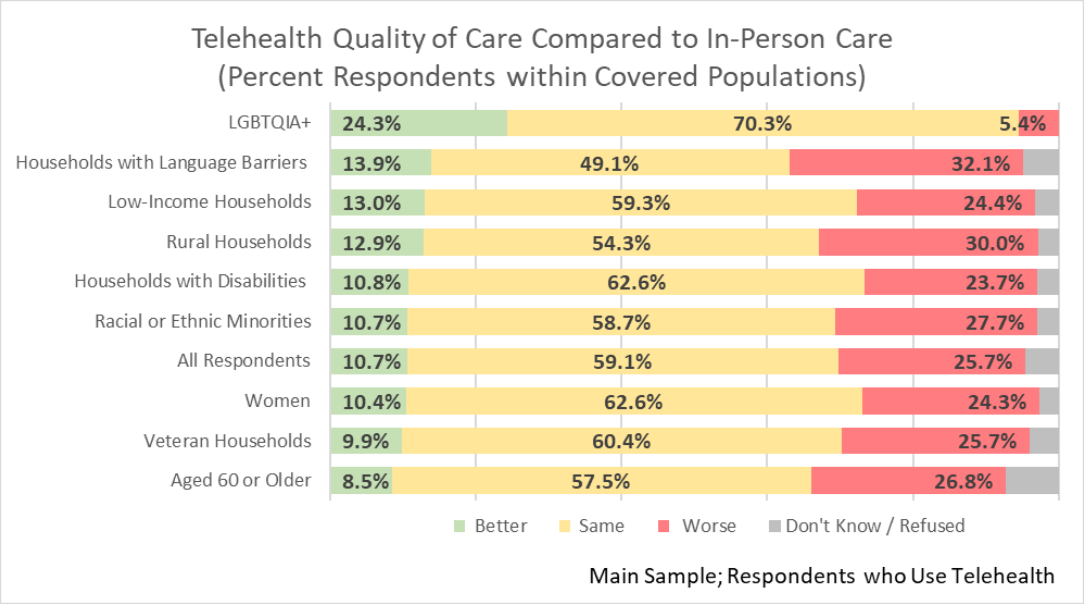


Figure 49: Telehealth Quality of Care Compared to In-Person Care (2023)

For respondents who expressed not having used telehealth in the past year, the survey asked whether they would be interested in having consultations with a doctor or health professional from home using a phone, computer, or tablet computer instead of going to a health facility. Overall, only about 1 in 4 (26%) expressed interest in using telehealth in the future, suggesting relatively weak demand among those who have not used telehealth in the past year (Figure 50). Interest is even lower among some Covered Populations, including Households with Language Barriers (about 20%) and Households with Disabilities (22.2%). It is also worth noting interest in telehealth services is low among populations that tend to be more intensive users of health service, such as Households with Disabilities (about 22%) and Aging Individuals (about 23%).

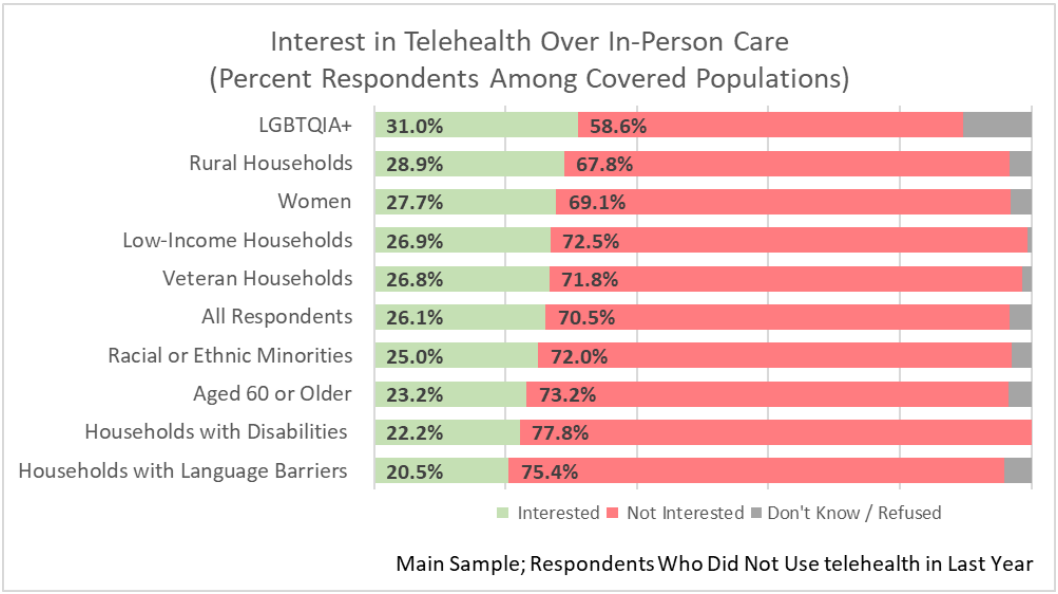


Figure 50: Interest in Telehealth Over In-Person Care (2023)

8. K-12 HOUSEHOLDS

A. *Connectivity Analysis and Time Trends*

Given the evidence about the positive impact of having home broadband for children's educational achievement, increasing adoption among households with children of school age is a policy priority that goes beyond the need to support remote classes that existed during the pandemic. The Statewide Survey on Broadband Adoption has been tracking adoption among K-12 families since 2014, and the results show a steady increase in broadband access that peaked during the pandemic in 2021 at 97%. The latest estimates for 2023 put adoption among this group at 93%, a small but non-negligible drop compared to 2021, and also below the 96% adoption level observed in 2019.

While overall connectivity among K-12 households remains higher than for households without children (Figure 51), the difference has now decreased to only 4 percentage points, about half of the difference observed in 2021 (nearly 8 percentage points). There are a number of potential factors affecting these results, including the expiration of several school-based programs that supported connectivity for disadvantaged families during the pandemic. This is reflected in the share of K-12 households reporting that their broadband connection is paid for by the school, which dropped sharply from about 15% in 2021 to just 3% in 2023.

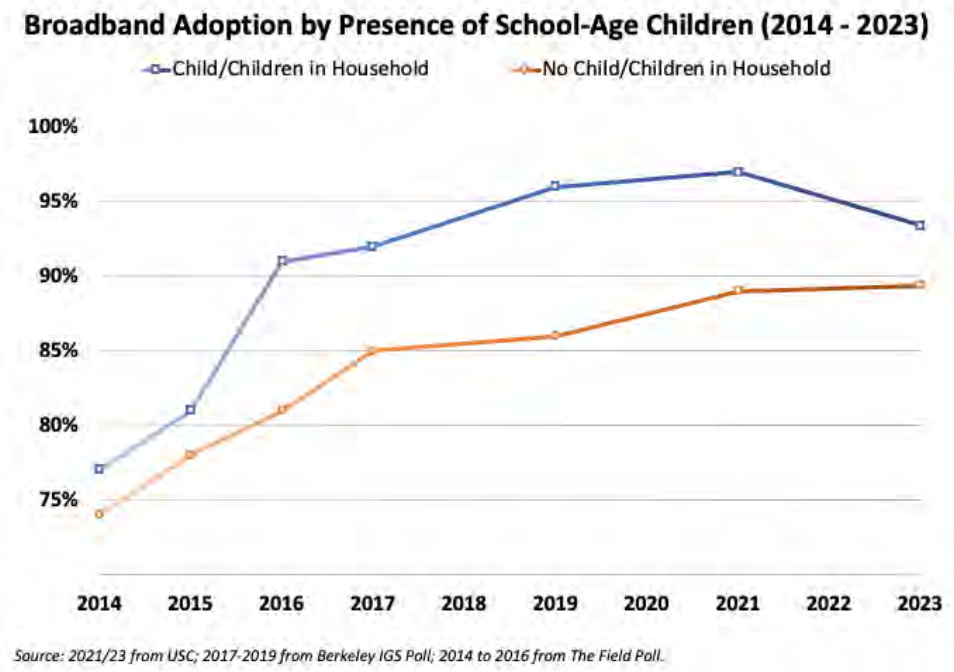


Figure 51: Broadband Adoption by Presence of School-Age Children (2014 - 2023)

Similarly, the results indicate a steep drop in the share of K-12 households who report that their child or children has a desktop, laptop, or tablet computer available at home to use for school activities that is not shared with other family members, from nearly 95% in 2021 to about 72% in 2023 (Figure 52). Again, it is important to note that the 2021 Statewide Survey was conducted at the height of the pandemic when several school districts in California (including the largest ones, such as LAUSD) were remote-only, and as a result schools heavily invested in connectivity programs for families. This is reflected for example in the share of K-12 families that report having a device provided by the school, which fell from nearly 70% in 2021 to about 58% in 2023.

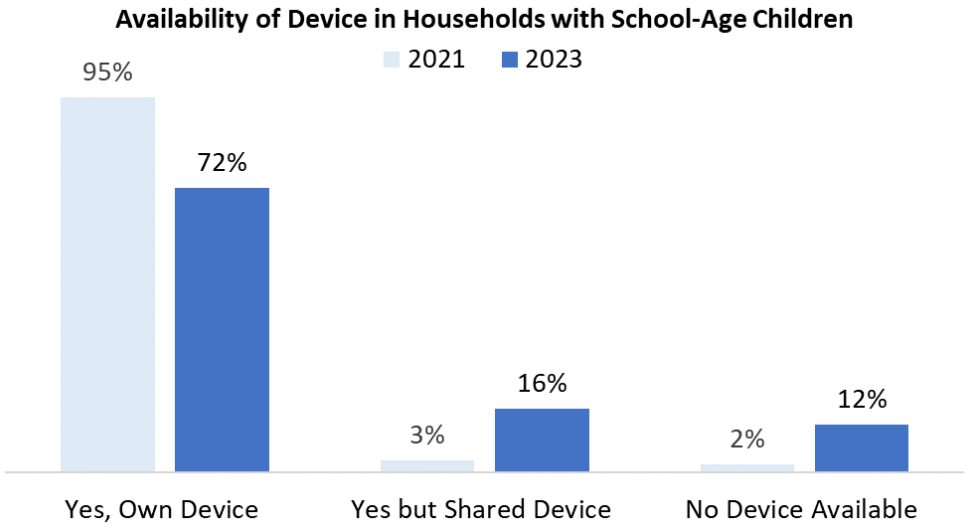


Figure 52: Availability of Device in Households with School-Age Children (2023)

While the context has dramatically changed between 2021 and 2023, the downward trend in the share of K-12 households reporting to have broadband at home and reporting that their child or children have a device for school activities raises concerns and deserves close monitoring in future studies. Overall, it is important to sustain a policy commitment to supporting connectivity as the evidence conclusively points to positive impacts of home broadband and device availability on student learning.[9]

[9] See for example Hampton, K. N., Fernandez, L., Robertson, C. T., & Bauer, J. M. "Broadband and Student Performance Gaps". James H. and Mary B. Quello Center, Michigan State University, March 3, 2020.

B. Connectivity by Covered Population (K-12 Households)

Examining differences in broadband adoption for K-12 households across Covered Populations reveals only minor variations, though it is worth noting that for several populations the sample size is too small for reliable estimates. Perhaps the most relevant difference is for non-English-speaking K-12 households, for which the share of households with home broadband drops from 93% in the overall population to about 89% (Figure 53).[10]

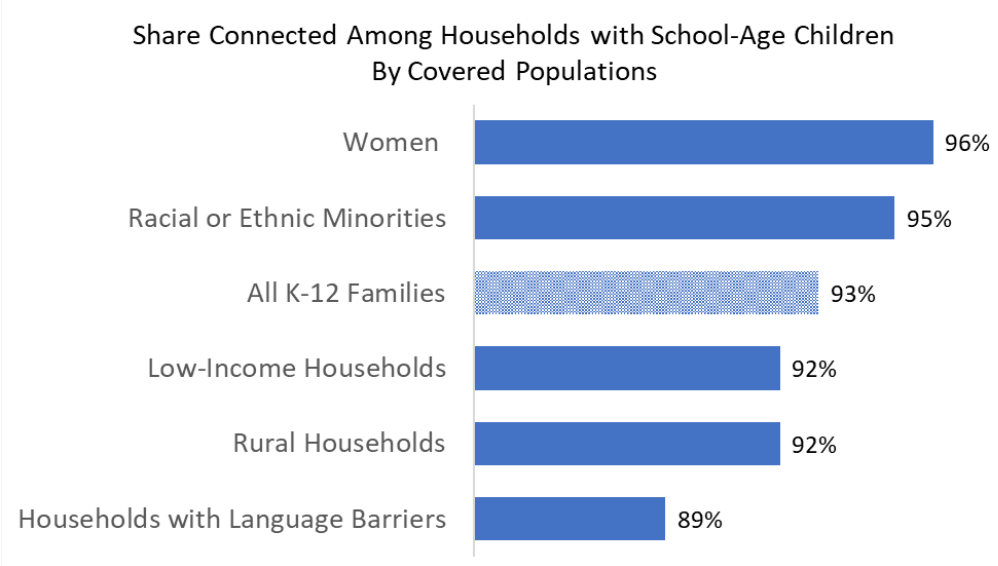


Figure 53: Share of Households with School-age Children that Are Connected (2023)

In a separate survey question, K-12 households were asked how often their child or children were able "to connect to the internet at home for homework or other school activities" using a 4-point scale that ranged from "always able to connect" (highest) to "never able to connect" (lowest). Surprisingly, only about 72% of families report that their child or children are always able to connect to the Internet at home for school activities. This represents a modest but significant drop from 2021, when nearly 78% of K-12 families reported that their child or children were always able to connect. Once again, this trend deserves monitoring and appropriate policy interventions to prevent further losses in connectivity among K-12 households.

C. Low-Income K-12 Families

Supporting connectivity for low-income families with children of school age is arguably one of the most important goals of digital equity policies, for it represents an investment in human capital and social mobility for the next generation. The results indicate that the drop in broadband adoption levels observed in the overall population of K-12 households is somewhat smaller among low-income families with children, from nearly 95% adoption in 2021 to about 92% in 2023. This is encouraging given the expiration of

[10] The figure only includes Covered Populations for which the sample size allows for reliable estimations.

funding for several school-based connectivity programs for low-income families and may reflect the impact of alternative programs such as ACP (recall that having a student enrolled in a free or reduced-price meal program makes a household eligible for ACP).

A dramatic drop is nonetheless observed in the share of low-Income K-12 households reporting that each child or children has access to a non-shared computing device for school activities, from nearly 98% in 2021 to 62% in 2023 (Figure 54). Perhaps even more dramatic is the increase in households reporting that students lack a device altogether, which now represents almost 1 in 5 low-income K-12 households. Interestingly, however, the share of low-income K-12 households reporting to have devices provided by the school rose slightly from 59% in 2021 to 63% in 2023. As noted above, these trends deserve further monitoring so that the broadband and device adoption gains made during the pandemic are sustained over time.

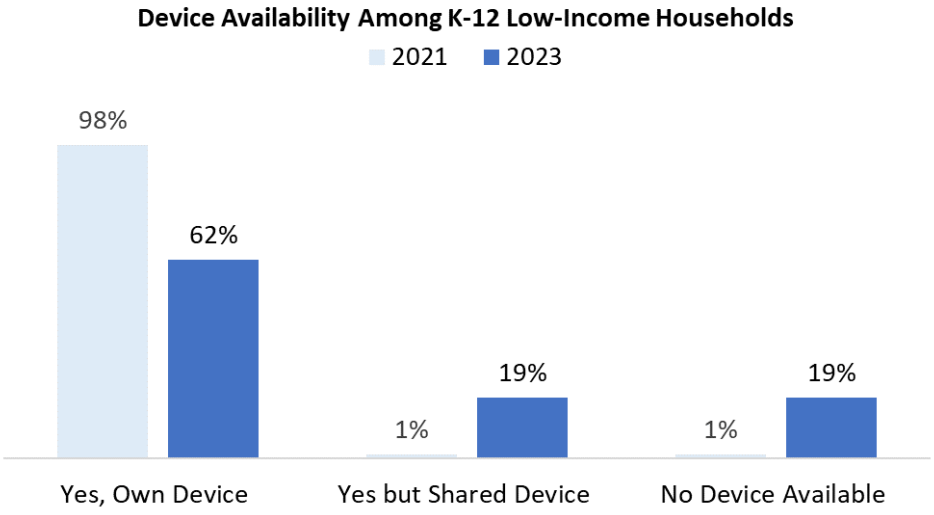


Figure 54: Availability of Device in Low-income Households with School-age Children (2023)

9. RURAL AREAS

A. *Connectivity by Neighbor Regions*

The examination of connectivity in the Neighbor Regions seeks to capture differences in adoption for rural and less populated counties in the state. The results indicate a modest but significantly lower level of broadband adoption in the Central East region, comprising the San Joaquin Valley and the Central and Eastern Sierra counties, where about 11% of respondents report not having broadband at home (Figure 55). On the other end is the North East region, comprising the Northeastern counties, the Gold Country, and counties in the Sacramento area, where the share of unconnected households (about 4%) is less than half of the state's average (9% unconnected).

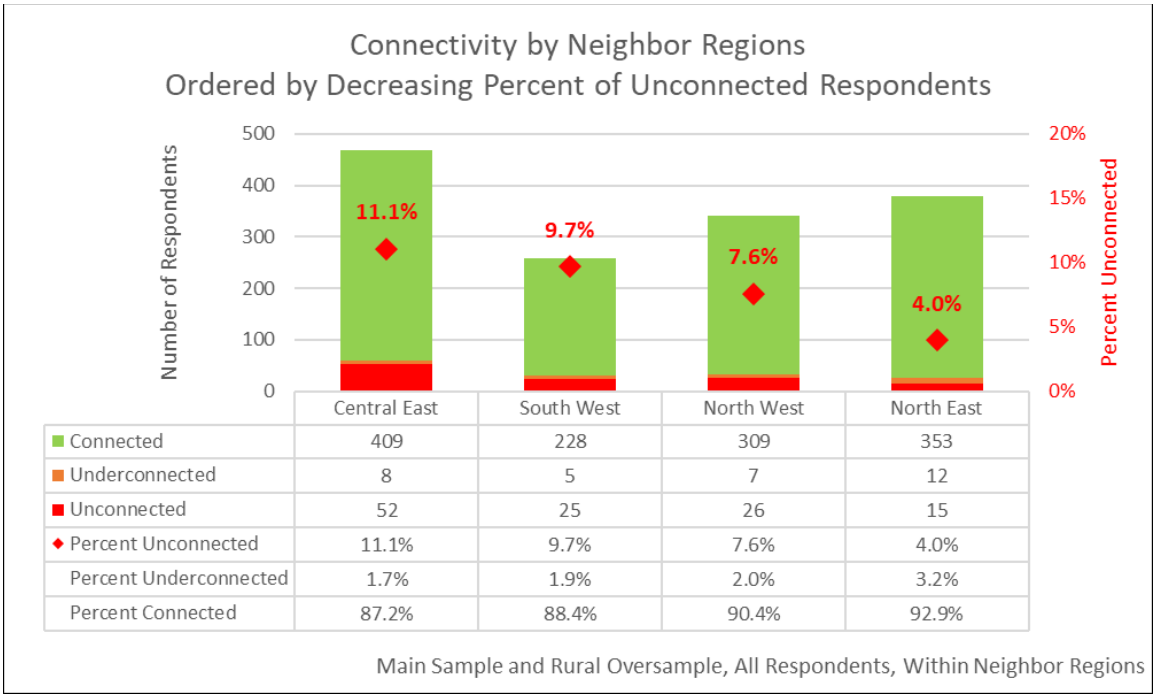


Figure 55: Connectivity by Neighbor Regions (2023)

B. Service Cost and Reliability (Self-Reported)

The monthly cost of broadband service reported by respondents also varies across the four Neighbor Regions. It is significantly lower in the Central East region (San Joaquin Valley and the Central and Eastern Sierra counties) at $77.6 p/month, while somewhat higher in the North West region (Redwood Coast and North Bay North Coast) at $90 p/month (Figure 56). It is worth noting that in three of the four Neighbor Regions the cost of service is higher than the state average ($83.6 p/month), which confirms that home broadband tends to be more expensive in more rural and less populated areas. Again, recall that service cost is self-reported and the metric is not normalized by service speed.

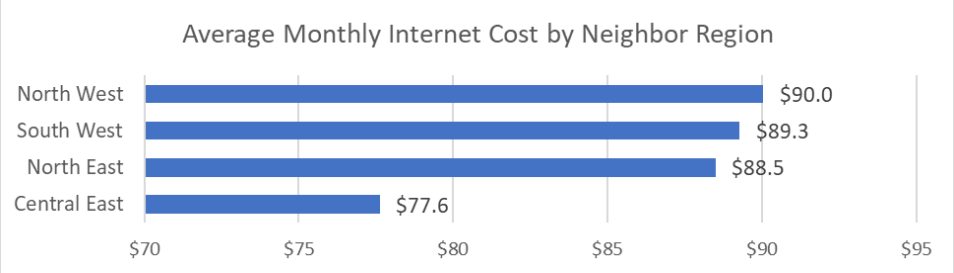


Figure 56: Average Monthly Cost for Internet Service by Neighbor Region (2023)

Interestingly, respondents in the four Neighbor Regions tend to rate the reliability of their broadband service higher than in the rest of the state. While the overall share of respondents in the state that rate their service reliability at "4" or "5" (highest possible) stands at 62%, this share is between 67% and 71% in the four Neighbor Regions (Figure 57). Respondents in Neighbor Regions generally rate their broadband provider's customer service in line with the rest of the state, with the exception of the North West region (Redwood Coast and North Bay North Coast) where satisfaction is somewhat lower at 48%. Finally, results for service adequacy are in line with the state average (82% of service adequacy) with only minor variations across the four Neighbor Regions.

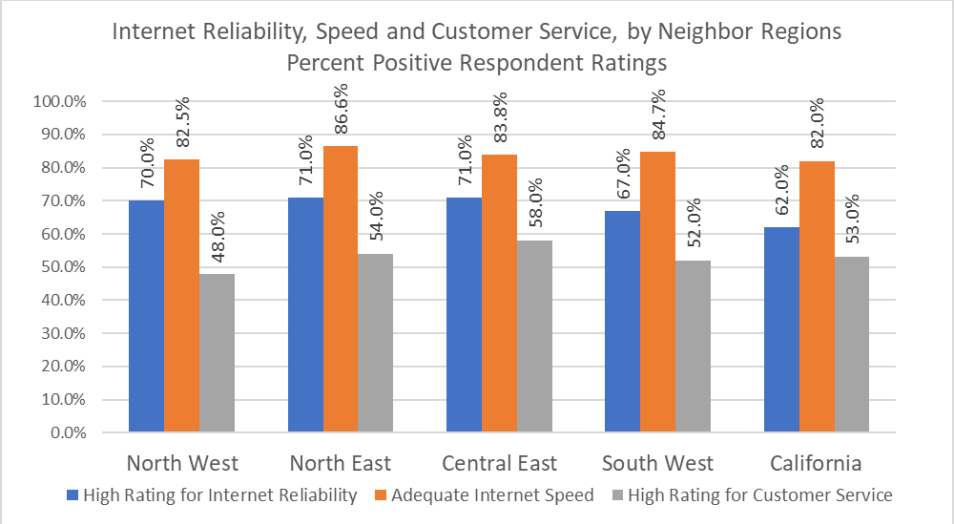


Figure 57: Share of Connected Respondents Who Rate Internet Reliability, Customer Service and Service Adequacy at "4" or "5" (1 to 5 Scale) by Neighbor Region (2023)

C. *ACP Awareness*

The level of awareness about the ACP program is somewhat higher in all four Neighbor Regions except in the North East region (Northeastern counties, the Gold Country, and counties in the Sacramento area), where it stands at 32% in line with the state average (Figure 58). The Central East region (San Joaquin Valley and the Central and Eastern Sierra counties) stands out with 42% of respondents having heard of ACP, followed by the South West region (Central and Pacific Coast) with 39%. This is somewhat surprising given that residents in these counties are often more isolated from outreach efforts by government agencies and nonprofit organizations that promote social programs, such as ACP.

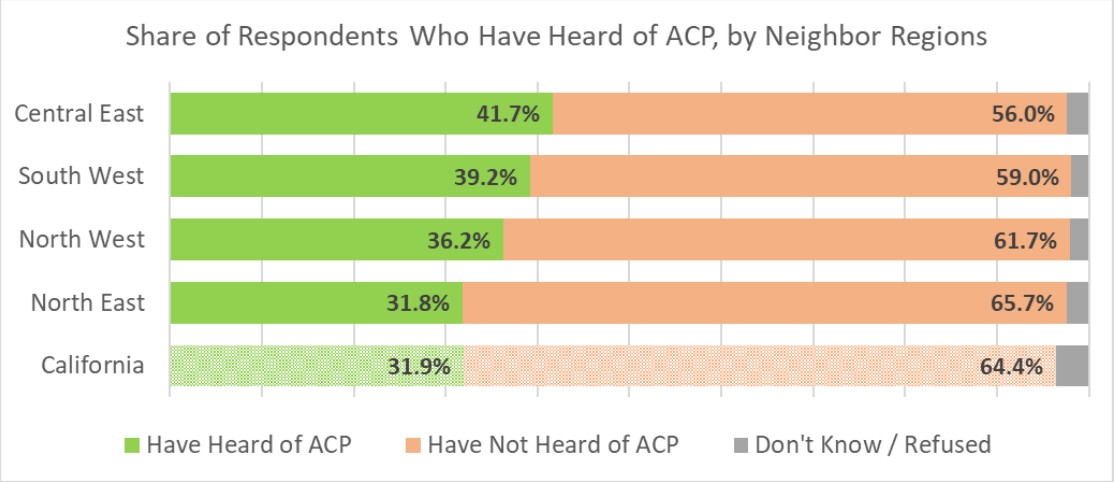


Figure 58: Share of respondents who have heard of ACP by Neighboring Region (2023)

10. **KEY TAKEAWAYS**

The present study seeks to inform broadband policymaking in California at the state and local levels, with particular attention to regional variations in broadband adoption and differences among Covered Populations. Capturing these variations is a key goal of this study, as statewide averages mask a more nuanced picture, with trends pointing to increased levels of digital equity across California and for several Covered Populations. However, the findings also reveal that much remains to be done to achieve the State's connectivity goals and maximize the impact of existing broadband support programs.

The Key Takeaways of the study can be summarized as follows:

1. **Statewide broadband adoption remains high**: 91% of respondents report being able to connect to the Internet from home. This is the same level reported in 2021 and reflects continuing challenges to connect those that remain unconnected. However, the share of underconnected (smartphone only) respondents declined by half, from 6% in 2021 to 3% in 2023. This suggests significant progress is being made to meet universal connectivity goals.

2. **Key Covered Populations and disadvantaged groups have made significant progress in broadband adoption**. They include:
    - Older adults: from 78% adoption in 2021 to 91% in 2023
    - Households with Disabilities: from 83% adoption in 2021 to 91% in 2023
    - Women: from 88% adoption in 2021 to 93% in 2023
    - Residents without a high-school degree: from 64% adoption in 2021 to 79% in 2023

3. **The income gap in broadband adoption has decreased**, thanks to a large jump in adoption among the poorest households (below $20,000 annual household income) from 70% in 2021 to 85% in 2023. While still trailing in adoption with respect to the next income bracket (annual household income between $20,000 and $39,999) by about 5 percentage points, these gains indicate strong demand for affordable broadband services from households on the lower end of the income distribution.

4. **Broadband adoption among respondents with school-age children has decreased** to just below pre-pandemic levels at 93%, after peaking in 2021 at 97%. This likely reflects the expiration of school-based programs that supported connectivity for disadvantaged families during the pandemic, as the share of K-12 households reporting that their broadband connection is paid by the school has dropped sharply from about 15% in 2021 to just 3% in 2023.

5. **Fewer children in K-12 households have a desktop, laptop, or tablet computer available at home to use for school activities** that is not shared with other family members, a decline from nearly 95% in 2021 to about 72% in 2023. A similar decline is observed in the share of K-12 families that report having a device provided by the school, from nearly 70% in 2021 to about 58% in 2023. These results highlight the need to continue supporting connectivity for K-12 families as the evidence conclusively points to positive impacts of home broadband and device availability on student learning.

6. **Californians spend an average $83.60/month on broadband**, with notable variations among Covered Populations. Low-income households report paying significantly less for broadband ($69.40/month), likely due to self-selection into lower speed/lower cost service tiers and participation in discounted service programs. Living in a rural area is associated with higher broadband costs ($88.20/month). Regional variations in cost are also observed, with the lowest costs reported in the San Joaquin Valley ($77.80/month) and the highest reported in San Diego County ($93.90/month).

7. **The majority of respondents (82%) indicated that the service is adequate for their household needs**. However, satisfaction levels decrease among low-income respondents (about 76%), for those living in rural areas (about 76%), and for Households with Disabilities (about 74%).

8. **Nearly two-thirds of respondents have never heard of the ACP program**, including about 77% of those who are unconnected. Among households who

are likely to be eligible based on income or participation in qualifying social programs, only about 35% have heard about ACP and only about 23% have heard about other discount broadband programs. These low levels of awareness confirm the urgent need for investments in outreach efforts to further promote participation in ACP and similar programs.

9. **Just over half of respondents (56%) are high-skills Internet users**. However, the share of high-skills users is lower among several Covered Populations, in particular Non-English-Language households (40%), low-income residents (42%), and Households with Disabilities (43%). Further, respondents who either lack broadband at home or connect only through a smartphone report digital skills significantly below the general population. Taken together these results suggest that increasing adoption among Covered Populations will require addressing digital literacy deficits that prevent disadvantaged groups from benefiting from investments in connectivity infrastructure and service subsidy programs.

10. **Telehealth utilization has declined from 51% in 2021 to 46% in 2023**, following a surge during the pandemic. This is especially true among older adults (65 years and older), whose use of telehealth declined from nearly 68% in 2021 to about 51% in 2023. As expected, telehealth use among those who lack broadband at home is well below the overall rate at just 21%. This underlines the compounding disadvantages faced by those without home broadband service, who are prevented from taking advantage of expansion in telehealth services availability.

11. **Broadband adoption lags in the Central East Neighbor Region**, comprising the San Joaquin Valley and the Central and Eastern Sierra counties, where about 11% of respondents report not having broadband at home. By contrast, in the North East Neighbor Region, comprising the Northeastern counties, the Gold Country, and counties in the Sacramento area, the share of unconnected households (about 4%) is less than half of state's average (9% unconnected).

12. **The monthly cost of broadband is significantly lower in the Central East Neighbor Region** (San Joaquin Valley and the Central and Eastern Sierra counties) at $77.60/month, while somewhat higher in the North West Region (Redwood Coast and North Bay North Coast) at $90/month. It is worth noting that in three of the four Neighbor Regions the cost of service is higher than the state average ($83.60/month), which confirms that home broadband tends to be more expensive in more rural and less populated areas.

13. **Cost is the main barrier to home broadband adoption**. Almost two-thirds (61%) of respondents without home broadband report cost as one of the reasons for not having the service, followed by concerns about privacy (about 42%) and those reporting a smartphone is adequate to do all they need (about 42%). When probed about the main reason, cost again is at the top with over a third of respondents reporting that home broadband is too expensive for them.

14. **Public and community broadband continue to play a critical role** in providing connectivity alternatives to those who lack home access, with 41% reporting

they connect in schools or libraries, 29% in parks or similar public spaces, 29% through community Wi-Fi and 22% at the parking lot of school or libraries.

APPENDIX: METHODS

Fieldwork for this study was conducted by Davis Research, an independent public opinion research organization headquartered in Calabasas, California. Davis Research has extensive experience in survey studies for academic organizations and was responsible for data collection in the 2021 Statewide Survey on Broadband Adoption.

For the development of the survey instrument, the USC research team worked with CDT, CETF and Davis Research to adapt the 2021 questionnaire. Key changes include greater focus on understanding Californians' awareness of, and enrollment in, discount Internet programs such as ACP. The questionnaire asked questions about connectivity status, telehealth use, digital skills, internet costs, reliability and satisfaction with internet services, and barriers to connectivity. For respondents identified as underconnected or unconnected, the survey probed for reasons why respondents did not have at-home internet services and whether they connected to the internet outside of their home.

Respondents were also asked a series of demographic questions. Some questions established the respondent's demographic characteristics while others probed for household-level characteristics. As some characteristics are specific to the respondent (e.g., age), it is important to note that the results are affected by who answered the call or received the invitation text message. For example, a respondent may not be an aging individual, but an aging individual may be present in the household. This is important when interpreting results for the Covered Populations. See Table A1 for demographic questions, separated between individual and household-level unit of analysis, and the correspondence to Covered Populations.

Demographic Questions	**Survey Question**	**IIJA Covered Population**
Individual unit of analysis	What is the highest degree or level of school you have completed?	
	Are you Latino/a or of Hispanic origin?	Members of a racial or ethnic minority group.
	Which of the following best describes your race?	Members of a racial or ethnic minority group.
	What is your current employment status?	
	What is your age?	Individuals 60 years of age or older.
	What is your gender?	Women
	Do you identify as a member of the LGBTQIA+ community?	Individuals who identify as LGBTQIA+
Household unit of analysis	Is your total annual household income before taxes more or less than [number in $ depending on household size]?	Households whose income is at 150 percent of the federal poverty level or less for the prior calendar year.
	Is there someone in your household who is at least 14 years old and speaks English at least "very well?"	Individuals with language barriers, such as English

		learners and individuals with low literacy levels.
	What is the primary language spoken in your household?	Individuals with language barriers, such as English learners and individuals with low literacy levels.
	Have you or anyone in your household ever served on active duty in the US Armed Forces, Reserves or National Guard	Veterans
	Do you or someone in your household have a disability, impairment or chronic illness that prevents you or them from fully participating at work, school, domestic chores or other daily activities?	Individuals with disabilities.
	Which of the following best describes the area where you live?	Residents of rural areas.

Table A1: Demographic Questions and Correspondence to IIJA Covered Populations

A. *Sampling and Data Collection*

The survey was conducted via telephone using a random sample of numbers for California adults. Davis worked with Marketing Systems Group (MSG) to develop a sample frame combining landline numbers and cell phone numbers. Cell phone numbers include California area codes as well as non-California area codes to account for residents who migrated from out of state and retained their mobile number. MSG relies on enriched data sources that are continuously updated and validated by over 200 authoritative sources to confirm all mobile numbers are within the state of California.

All surveys were administered from Davis Research's computer-assisted telephone interviewing (CATI) call center in Calabasas. The initial collection period was from February 16, 2023, to April 25, 2023. Table A2 summarizes the outcome of the data collection effort, including response rates, as provided by Davis Research. Estimates of survey cooperation and response rates were calculated using the American Association for Public Opinion Research's (AAPOR) response rate calculator v4.1.

In this report, we refer to surveys as "Basic" when telephone respondents either refused to finish the survey and/or could not be reached later to complete the survey (similar to the AAPOR's definition of "partials"). Non-complete surveys for which the connectivity status of the respondent could be established are referred to as Basic in the tables below. Since AAPOR only recognizes partial completes as those who answered at least 80% of the survey questions, Basic surveys are not included in the cooperation and response rates calculated in the following summary tables.

	Total	CELL	LAND	ASIAN	PRE-PAID
Total Records	**99,053**	85,000	2,988	6,000	5,065
Total Surveys Completed (A)	**1,000**	804	35	100	61
Total Basic Surveys	**249**	196	10	20	23
Basic Surveys – Refused to finish	***93***	*71*	6	9	*7*
Basic Surveys – Not reached to finish	***156***	*125*	*4*	*11*	*16*
Refused to Participate / Opt-Out (B)	**6,083**	5,063	132	458	430
Invalid Contact Information (C)	**17,821**	14,827	1,605	572	817
Language Problem (D)	**151**	121	8	14	8
Not Available for duration of study (E)	**71,787**	62,380	1,178	4,632	3,597
Not eligible for Study (F)	**2,211**	1,805	30	224	152
COOPERATION RATE 1 (AAPOR)= (A)/(A+B+D)	**14%**	13%	20%	17%	12%
RESPONSE RATE 1 (AAPOR)= (A)/(A+B+D+E)	**1%**	1%	3%	2%	1%

Table A2: Summary of Telephone Data Collection – Main Sample

Davis Research further conducted a text-to-web campaign from May 25, 2023, to June 21, 2023, that supplemented the telephone (RDD) data collection. A text message was sent to 62,380 non-responders from the initial telephone attempt with a link to complete the questionnaire via web. A total of 650 people responded, for a response rate of approximately 1%. The online survey was hosted by the California Department of Technology, and the data was processed by Davis Research and provided to the USC research team, which matched responses to the RDD cases. This resulted in a multimodal survey (RDD + text-to-web) with a total of 1,899 cases in the Main Sample.

B. Oversampling

From May 1, 2023, to June 5, 2023, Davis Research conducted additional phone surveys with oversampling from prepaid cell numbers and phone numbers associated with rural counties.[11] The Rural Counties Oversample was conducted to increase the precision of estimates for rural and small population areas. The goal of the Prepaid Oversample was to increase the number of low-income respondents.

[11] Rural counties: Amador, Butte, Calaveras, Colusa, Del Norte, El Dorado, Fresno, Glenn, Humboldt, Inyo, Kern, Kings, Lake, Lassen, Madera, Marin, Mariposa, Mendocino, Merced, Modoc, Monterey, Napa, Nevada, Placer, Plumas, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Santa Cruz, Shasta, Siskiyou, Sonoma, Stanislaus, Sutter, Tehama, Trinity, Tulare, Tuolumne, Yolo, and Yuba.

See Table A3 below for a summary of the fieldwork outcome for these oversamples.

	Total	RURAL CELL	PRE-PAID
Total Records	**63,119**	53,132	9,987
Total Surveys Completed (A)	**1,130**	904	226
Total Basic Surveys	**212**	155	57
Basic Surveys – Refused to finish	**108**	81	27
Basic Survey – Not reached to finish	**104**	74	30
Refused to Participate / Opt-Out (B)	**3,440**	2,615	825
Invalid Contact Information (C)	**6,374**	4,775	1,599
Language Problem (D)	**49**	30	19
Not Available for duration of study (E)	**51,335**	44,252	7,083
Not eligible for study (F)	**791**	556	235
COOPERATION RATE 1 (AAPOR)= (A)/(A+B+D)	**24%**	25%	21%
RESPONSE RATE 1 (AAPOR)= (A)/(A+B+D+E)	**6%**	5%	8%

Table A3: Summary of results outcome of telephone data collection – Prepaid and Rural Counties Oversample

In addition, Davis Research completed additional phone surveys from July 24, 2023, to July 29, 2023, for an oversample of cases drawn from a list of numbers provided by the California Department of Rehabilitation (DOR), with the goal of increasing the number of respondents with a reported disability. See Table A4 for a summary of the data collection with the DOR Oversample.

	DOR
Total Records	4,997
Total Surveys Completed (A)	251
Total Basic Surveys	68
Basic Surveys – Refused to finish	18
Basic Survey – Not reached to finish	50
Refused to Participate / Opt-Out (B)	207
Invalid Contact Information (C)	258
Language Problem (D)	19
Not Available for duration of study (E)	4,201
Not eligible for study (F)	61
COOPERATION RATE 1 (AAPOR)= (A)/(A+B+D)	53%
RESPONSE RATE 1 (AAPOR)= (A)/(A+B+D+E)	4%

Table A4: Summary of results outcome of telephone data collection – DOR oversample

C. Comparison of Demographics and Results Across Samples

Figure 59 compares the demographic composition of respondents in the four samples – the Main Sample, the Rural Counties Oversample, the Prepaid Oversample, and the DOR Oversample. As expected, there are notable differences as the goal of the oversamples is to increase the number of respondents in three demographic groups of interest: Rural residents, Low-income households, and Households with Disability. For reference, the figure also includes the Census Bureau's ACS 2021 1-year estimates. Recall that the ACS records veteran status and disabilities at the individual level, while in this study both are recorded at the household level. In other words, the study considers whether any household member is a veteran or has a disability, which explains why in the various samples, the proportion of households including a veteran or a person with disability is substantially larger than the proportion of veterans or individuals with disability in the California population.

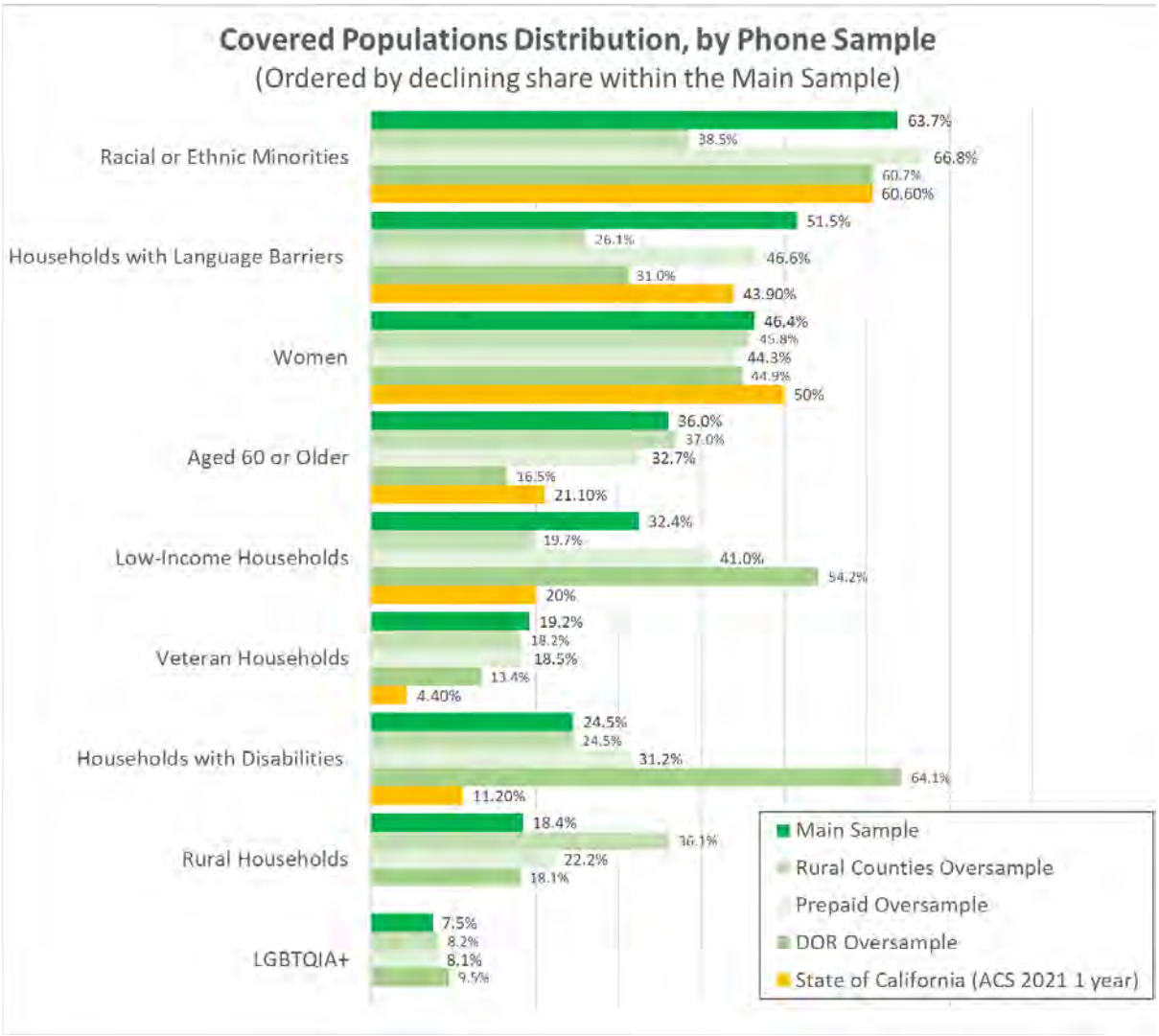


Figure 59: Covered Populations Distribution, Across the Four Phone Samples, Compared to California Population (2023)

The Prepaid Oversample yielded 283 cases. However, only approximately 41% of this oversample was determined to be low-income, compared to about 32% in the Main Sample. Therefore, due to the small sample size for low-income respondents in the Prepaid Oversample (n=87, after accounting for cases whose income status cannot be determined), the results below must only be interpreted as indicative.

When comparing low-income respondents in the Main Sample with low-income respondents in the Prepaid Oversample, there are notable differences. For example, low-income respondents in the Prepaid Oversample are more likely to be unconnected (Figure 60) but also more likely to have heard of ACP and other internet discount programs (Figure 61). When examining monthly internet cost, the averages for low-income respondents in both samples are virtually identical at about $69/month.

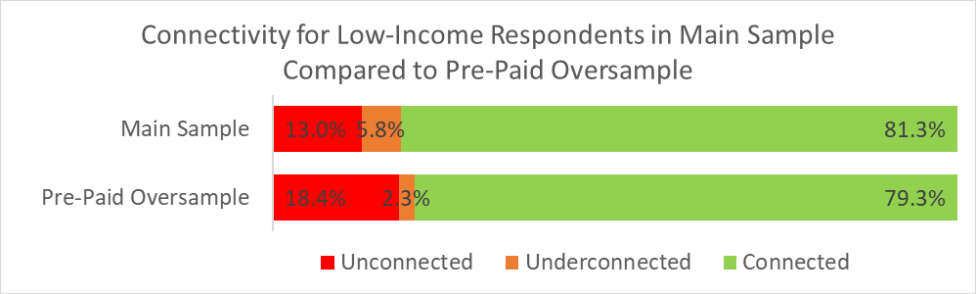


Figure 60: Connectivity of Low-income Respondents in Main Sample and Prepaid Oversample (2023)

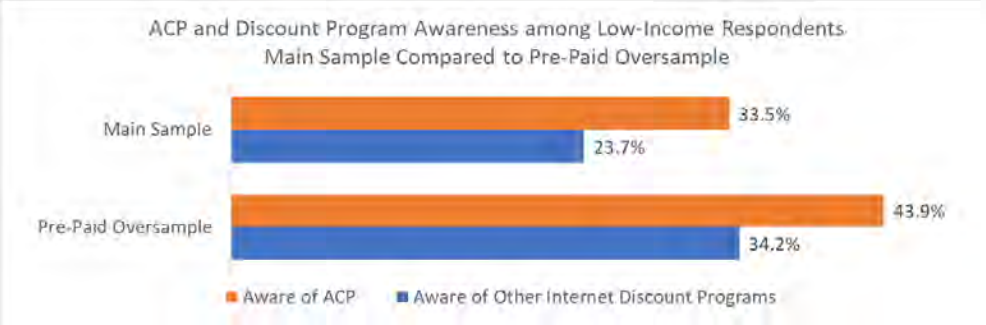


Figure 61: ACP and Internet Discount Awareness of Low-income Respondents in Main Sample and Prepaid Oversample (2023)

The Rural Counties Oversample resulted in 1,059 cases. Of these, 33% are determined to be respondents living in rural areas compared to 16% in the main sample. At 94%, rural residents in the Rural Counties Oversample are more likely to be connected than rural residents in the Main Sample (Figure 62). Rural residents in the Rural Counties Oversample, report paying $86/month for broadband on average, slightly less than the average of $88/month of rural residents in the Main Sample.

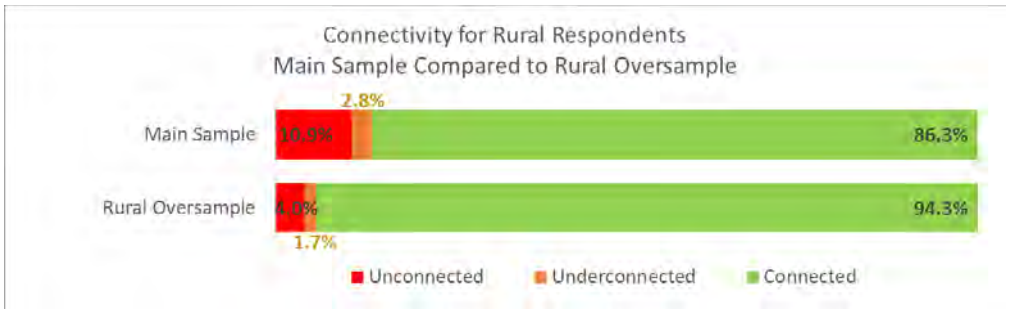


Figure 62: Connectivity for Rural Respondents in Main Sample Compared to Rural Oversample (2023)

Further analysis based on the Neighbor Regions shows that there are also differences in connectivity when comparing respondents from the Main Sample with those in the Rural Counties Oversample. Respondents located in one of the four Neighbor Regions are more likely to be unconnected in the Main Sample than they are in the Rural Counties Oversample. For example, about 21% of respondents in the Main Sample located in the South West Region are unconnected compared to nearly 6% of respondents in the Rural Counties Oversample residing in the same region. As shown in Figure 63, rural respondents in the Main Sample are more likely to be unconnected than rural respondents in the Rural Counties Oversample across different measures.

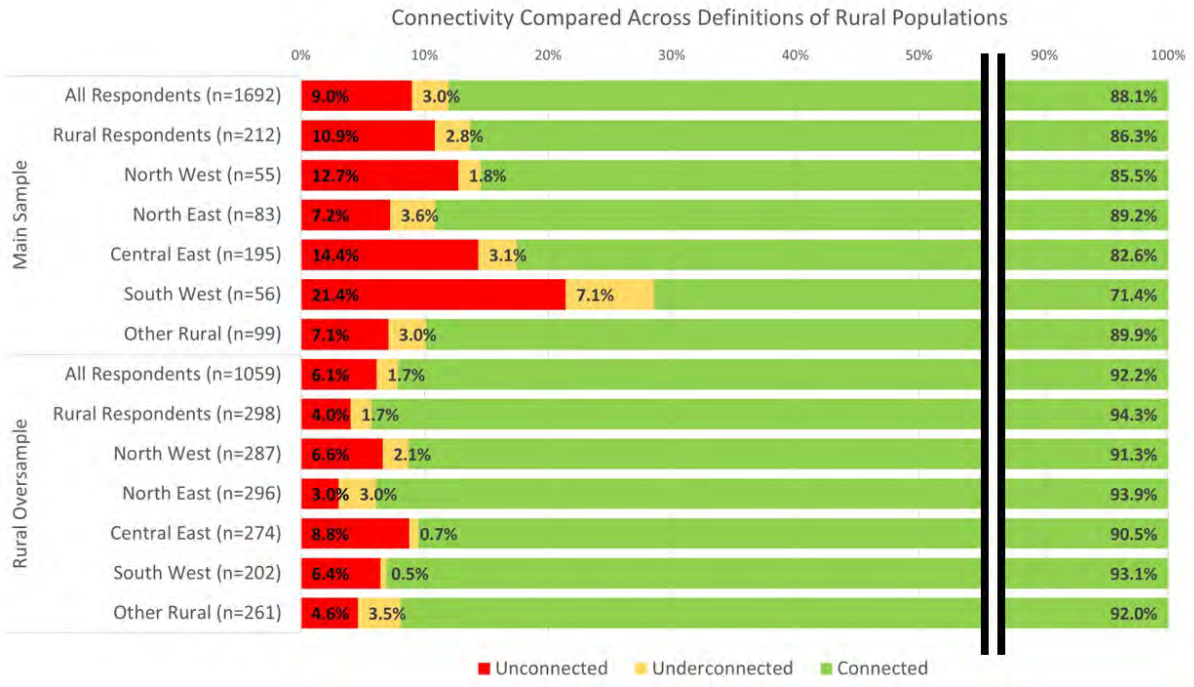


Figure 63: Connectivity Compared Across Definitions of Rural Populations (2023)

The oversample using phone numbers provided by DOR yielded 319 cases. Of the 258 survey respondents who provided sufficient demographic information, 62% (161) reported that they or someone in their household has a disability, compared to just 24% (313) in the main sample. At 97%, Households with Disabilities in the DOR Oversample

are more likely to be connected than their counterparts in the Main Sample (Figure 64). Households with Disabilities in the DOR Oversample are also paying less for their monthly internet cost, with an average of $73/month compared to the average of $86/month among Households with Disabilities in the Main Sample.

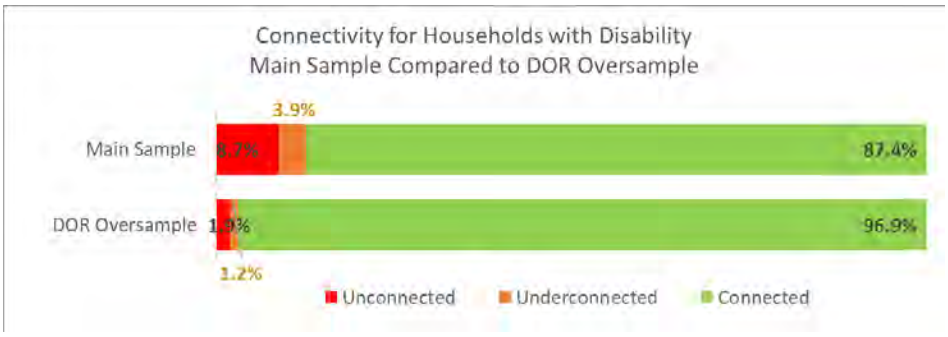


Figure 64: Connectivity for Households with Disability in Main Sample and DOR Oversample

D. Distribution and Overlap of Covered Populations in the Main Sample

Overall, 96.4% of respondents in the Main Sample belong to one or more Covered Populations. In fact, most respondents (about 60%) belong to two or more Covered Populations (Figure 65).

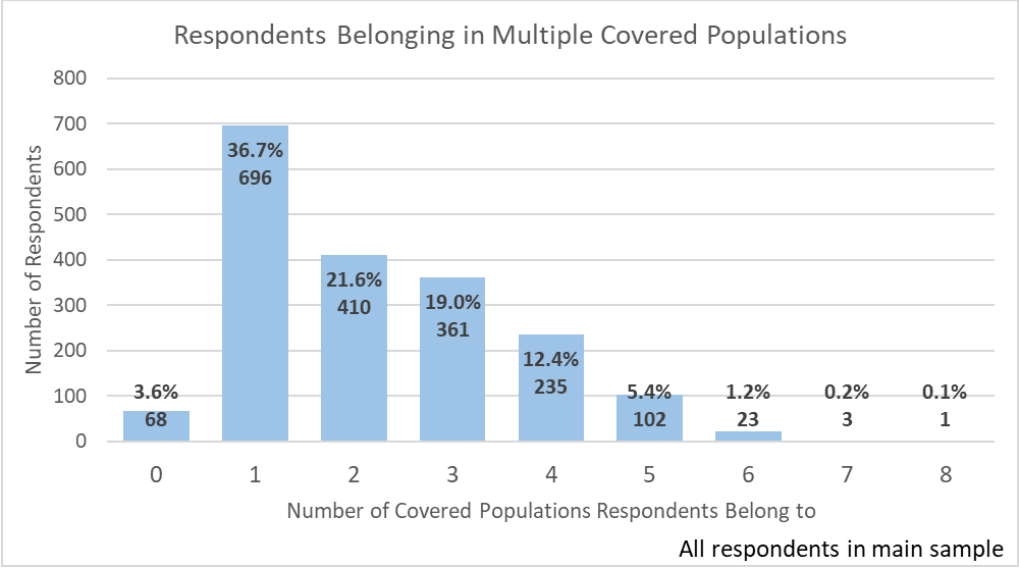


Figure 65: Respondents in Covered Populations (2023)

Table A6 below provides greater detail about the overlap within Covered Populations in the Main Sample. The table is best read in columns. For example, in the second column (Low-income), 32.8% of low-income respondents also report they or someone in their household has a disability (first row), while 17.2% report to live in a rural area (ninth row).

Within this Population: / Percentage of:	Households with Disabilities	Low-Income Households	LGBTQIA+	Racial or Ethnic Minorities	Households with Language	Women	Aged 60 or Older	Veteran Households	Rural Households
Households with Disabilities	100.0%	32.8%	18.9%	24.3%	16.7%	27.3%	33.5%	38.0%	23.7%
Low-Income Households	44.1%	100.0%	34.9%	42.2%	50.2%	38.1%	29.1%	25.6%	33.3%
LGBTQIA+	5.5%	7.6%	100.0%	6.6%	4.7%	8.1%	4.0%	6.8%	6.6%
Racial or Ethnic Minorities	64.6%	80.4%	59.6%	100.0%	87.8%	62.7%	45.6%	49.0%	53.9%
holds with Language Barriers	21.7%	56.3%	20.9%	53.3%	100.0%	29.5%	21.0%	16.0%	27.5%
Women	52.3%	54.6%	56.5%	46.0%	45.0%	100.0%	47.5%	38.8%	43.3%
Aged 60 or Older	49.2%	32.7%	19.8%	25.8%	25.0%	37.4%	100.0%	56.7%	38.9%
Veteran Households	30.5%	15.3%	18.7%	14.6%	10.2%	16.1%	30.5%	100.0%	24.5%
Rural Households	16.2%	17.2%	15.4%	13.8%	14.3%	15.5%	17.8%	21.0%	100.0%
Total n	**313**	**428**	**91**	**902**	**976**	**594**	**450**	**251**	**212**

Table A6: Overlapping Belonging to Multiple Covered Populations (2023)