Broadband adoption in urban and suburban California: information-based outreach programs ineffective at closing the digital divide

Lloyd Levine
School of Public Policy, University of California, Riverside, California, USA

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Abstract

Purpose – The digital divide has persisted in California and the USA as a whole at approximately the same level for the past decade. This is despite multiple programs being created and billions of dollars being spent to close it. This paper examines why the efforts to date have been ineffective and to offers policy alternatives that might be more successful.

Design/methodology/approach – Using data from three, variable constrained projects in California, this paper examines the effectiveness of information-based outreach efforts at closing the digital divide. The projects tested various outreach and enrollment methods to see which, if any, could increase broadband adoption in low-income households.

Findings – This project found that providing low-income households' information about low-cost broadband offerings was ineffective at closing the digital divide. The findings in this paper were similar to those of two other works that examined the federal Broadband Technology Opportunities Program (BTOP) grants under the American Recovery and Reinvestment Act.

Practical implications – The findings of this paper along with the works cited that evaluated the BTOP program should be enough to change public policy. For the past ten years, efforts to close the digital divide have focused on providing information to low-income households. However, two independent surveys show broadband adoption has remained virtually flat during that period.

Social implications – The digital divide brings concomitant economic and education harms and challenges that plague those unable to access information, services, educational and employment opportunities with the same ease, speed and sufficiency as their connected peers and neighbors. Those harms exacerbate the already existing education and income divides. This paper shows that without a change in strategy, those harms will persist.

Originality/value – This paper breaks new ground and addresses one of the weaknesses identified in existing research. To the best of author's knowledge, this is the first paper of its type to use programs designed to generate data that can be empirically evaluated for effectiveness. Prior studies attempted to assess program effectiveness by using data generated from fully implemented government programs. However, those programs contained a vast number of unidentified variables and insufficient data collection. They were not designed to facilitate academic evaluation, and as such made a true effectiveness evaluation challenging.

Keywords Broadband adoption, Digital divide(s), Broadband, Internet as a utility, Low-income broadband adoption, Meaningful internet access

Paper type Research paper

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1. Introduction

Silicon Valley is synonymous with the cutting edge of internet technology. It is home to Facebook, Apple, Twitter, Hewlett-Packard, eBay, Pay-Pal, and thousands of other lesser known global technology companies. Yet, despite the presence of these global technology titans, close to 100,000 residents of the City of San Jose–the hub of Silicon Valley–lack meaningful internet access (Levine, 2018). To address this inequality, the city has launched a massive digital inclusion project funded through fees on communications equipment (City of San Jose and CETF, 2019). Being the largest city in the Silicon Valley makes San Jose's digital divide ironic, but in no way unique. The digital divide exists in the rest of California, and across the USA in similar numbers. Along with the digital divide comes the concomitant economic and education harms and challenges that plague those unable to access information, services, educational and employment opportunities with the same ease, speed and sufficiency as their connected peers and neighbors. Those harms foster and exacerbate the education and income divides and make closing the digital divide imperative.

Those who lack of meaningful internet access face clear and demonstrable harms. In 2020, both governmental and quasi-governmental entities – hospitals, utilities and similar – have long since moved most of their services and communications to websites and apps. Those without meaningful internet access are not able to access employment, educational or government information or perform the same tasks with the same ease as their connected peers (Levine, 2018). The historically developed responsibility of governments in most Western democracies indicate those governments have a moral and ethical responsibility to prevent the disenfranchisement of low-income and rural residents because of lack of broadband. The evidence of that acknowledged responsibility can be found in the creation of past policies such as the many state and federal programs to ensure the deployment and affordability of telephonic communications. Those programs acknowledged the challenges of participating in civic life without the most current communications technologies. These past programs – LifelLine, CA High Cost Funds A and B – were created specifically to ensure both rural and low-income households had access to affordable telephone service. Support for the moral imperative can also be implicitly found in more recent policies (California Law, 2002) and billions of dollars in spending that seek to expand internet access in rural areas and government projects and programs designed to spur adoption in low-income households.

The current policy discussions and actions around broadband access and adoption indicate it is only a matter of time before programs are created to bring broadband into parity with telephony. However, there are key differences between telephony – and other utilities – and broadband that will make it more challenging to facilitate broadband adoption.

This paper examines national and California data on the persistence and scope of the digital divide, and efforts to close it over the past decade, including the policies that underpin those efforts. Bringing together multiple data sets, this paper provides an understanding of the knowledge about and perception toward broadband in low-income households and assesses the effectiveness of various outreach efforts aimed at increasing meaningful internet access (Levine, 2018) in urban and suburban, low-income households. Using data derived from three pilot projects in California along with two studies of the predominant federal effort, we find that the current methods of attempting to close the digital divide in low-income households have been ineffective. Given the failure of current and past policies, this paper concludes by proffering new policies and strategies to close the digital divide.

2. Scope of the problem

The digital divide in 2020 is different from the digital divide of the early 21st century. Broadband was a new technology in the early 2000s and, as with any such technological innovation, there is a "ramp up" period where the adoption curve steepens as more and more people adopt. The shape and steepness of the adoption curve was in large part driven by the deployment of the technology. Simply put, it was not possible to adopt what was not physically available. As such, the digital divide was initially an infrastructure access problem. Over the past 10–15 years, networks have been rapidly deployed, particularly in urban and suburban areas, to the point where the majority of Californians have access to at least two Internet Service Providers (ISPs) capable of delivering broadband to the premises at speeds meeting or exceeding California's minimum definition of "served" (6 mbps/1 mbps) (California Law, 2017).

Figure 1, from the 2019 survey conducted by the Pew Research Center on the Internet and Technology, shows nationwide home Broadband adoption – and logically therefore meaningful internet access[1] – increased steadily from 2000 through about 2010. However, after 2010, home broadband adoption slowed, and as of the most recent survey is at 73% (Pew Research Center Internet and Technology, 2019). Figure 2, from the 2017 Annual Broadband Adoption Survey by the California Emerging Technology Fund (CETF), shows a similar shape to the adoption curve with home broadband adoption gradually increasing from 2008 through 2010 and then flattening out at around 70% penetration (Berkeley Institute for Government Studies, UC Berkeley, 2017).

From 2000 to 2010, network deployment spread rapidly in urban and suburban areas; Web content increased in quantity and relevance; and the ISPs promoted both the availability and benefits of broadband. This drove the decade-long growth in broadband adoption seen in Figure 1. However, the infrastructure-driven divide in rural areas persisted. According the CPUC's 2018 CASF Annual Report, broadband is available for 98.7% of urban and suburban California households. For rural households, the same report shows only 71.5% of rural households have access to that infrastructure (CPUC, 2019a). Using data from the California Public Utilities Commission (CPUC), the California Department of Finance (2018), and the 2017 Broadband Adoption Survey (Berkeley Institute for Government Studies, UC Berkeley, 2017), Levine (2018) found that just 4.78% of the total digital divide is attributable to the lack of physical access in rural areas.

The challenges to closing the rural divide are different from the urban divide and necessitate infrastructure specific policy solutions. Programs such as the American Recovery and Reinvestment Act (ARRA), the California Advanced Services Fund (CASF) and the Connect America Fund have focused attention and money on the rural divide over the past decade.

However, the success of those programs should be judged by a different metric and with a different analysis than the urban divide. The rural divide is closing, but it is closing incrementally in small absolute numbers. Combined with a growing urban and suburban population, the closing of the rural divide is not going to be reflected in the year over year; national and statewide data are shown in Figures 1 and 2.

The urban divide is magnitudes larger than the rural divide but lacks the same public and policymaker awareness. And, the urban divide receives far fewer resources and lacks meaningful policies and programs aimed at closing it. As such, this paper focuses exclusively on the urban divide.

Figures 3 and 4 show the divide by household income and illustrate that the lack of broadband at home is closely correlated with income level. Low-income households

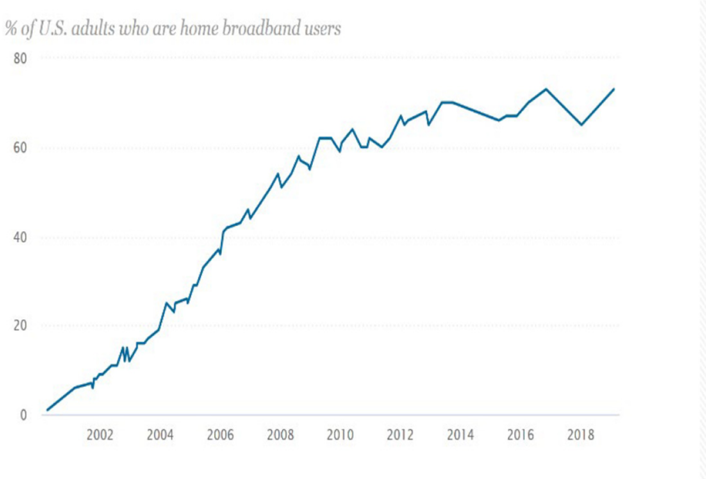


Figure 1.
Broadband adoption over time – United States

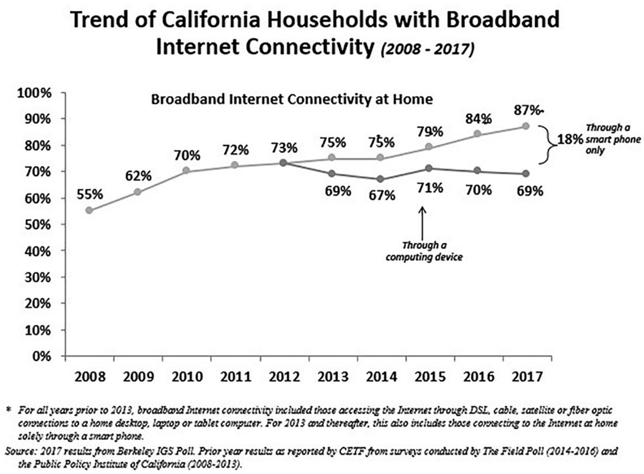


Figure 2.
Broadband adoption over time: California

comprise the biggest portion of the disconnected in both the USA as a whole and California. In Figure 3, the Pew study shows US households with an annual income of less than $30,000 have a broadband adoption rate of 56% (Pew Research Center Internet and Technology, 2019). Similarly, Figure 4 from the 2019 CETF survey shows California households with annual incomes below $20,000 have a broadband adoption rate of 52% (Berkeley Institute for Government Studies, UC Berkeley, 2019).

The 2018 data led Levine to conclude the free market has pushed broadband adoption – meaningful internet access – as far as it can, and that to increase adoption further would take new technologies and/or government intervention. Two independent, respected organizations using valid research methodology both independently reached the same conclusions, almost to the exact number. The 2019 data does nothing to change the validity of the conclusion that new technologies or government interventions are necessary. The data from the survey indicates the 2019 increase in adoption was likely because of government policy and program changes at the school district level. This will be discussed further in the policy recommendations in Section 7.

3. Literature on closing the digital divide – recent policies and their effectiveness

We will not conduct a full taxonomy of efforts to close the digital divide in the USA. Efforts varied widely over time and had different purposes. As this paper is focused on closing the urban and suburban digital divide via increasing meaningful internet access at home, we will focus exclusively on programs that were designed for that purpose and literature related to those efforts.

The largest of those efforts was the ARRA, created by then President Obama, which spent $7.2bn nationally to increase meaningful internet access (ARRA, 2009) through adoption and deployment programs. ARRA funded a number of broadband initiatives through the Broadband Technology Opportunities Program (BTOP), including 44 grants of $215m for sustainable adoption. The programs funded for sustainable adoption are similar in concept to the pilot projects analyzed in this paper. Specifically, the programs provided information but not economic subsidies [National Telecommunications and Information Administration (NTIA), 2011].

There have been numerous papers that looked at factors influencing broadband adoption in general and at the BTOP grants specifically. Many of the early papers indicated lack of relevant content was a frequently cited reason for lack of adoption. However, as with many

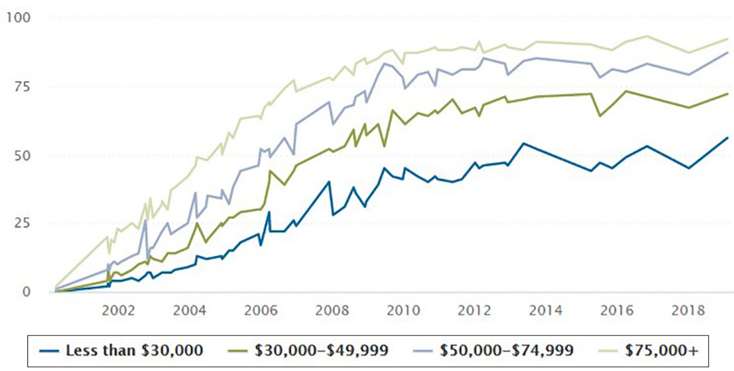


Figure 3. Home broadband use by household income over time – United States

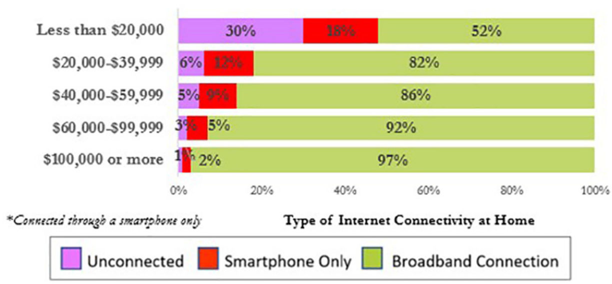


Figure 4. 2019 home broadband use by household income in California

things in society, the pace of technological change can also quickly render research obsolete. The iPhone was not launched until the middle of 2007 and it was only available through AT&T until 2011, which is also when Samsung first produced its "Galaxy." In terms of apps and services, social media was not launched until the mid- to late 2000s, Facebook was not opened to the public until 2006, Twitter was founded in 2006 and in 2007 had only 1.2 million tweets sent (that grew to 400 million tweets the following year) (Beaumont, 2010), and Instagram was not founded until 2010. And, as we saw in Figures 1 and 2, broadband did not reach 70% of households until 2010. Over the past 10 years, the infrastructure, devices, applications and users of the abovementioned technologies have all changed dramatically, calling into question the current validity of the conclusions of earlier research.

There is no clearer example of this shift than the change in the significance of cost as an impediment to adoption. In 2010, "Broadband Adoption and Use in America" (Horrigan, 2010) found that only 36% of those who did not have broadband cited cost as the main reason. The data from the broadband adoption surveys reported in Table 5 directly indicates the findings of Horrigan may no longer be accurate. Further, a 2015 Pew Research Center study, coauthored by Horrigan, found 59% of households without broadband cited the monthly service cost as the primary reason for lack of adoption (Horrigan and Dugan, 2015). Horrigan recently evaluated the two main methods for assessing the main impediment to meaningful internet access. Horrigan concludes that the earlier research was likely flawed by the methodology and that current research conducted by different entities indicates cost is the biggest impediment to meaningful internet access, and that, importantly, there are also multiple factors impeding individuals (Horrigan, 2020).

Horrigan does allow that in addition to problems with the methodology, it is possible the increased availability of content and services as well as higher levels of adoption at middle and upper incomes has made economic factors the primary impediment to adoption, in 2020, particularly as the divide primarily exists in households with annual incomes below $30,000. This born out in a paper by Reisdorf *et al.* (2018) where they found that low-income households were aware of the benefits of broadband access but were unable to afford it. This finding is also reflected in the 2017 and 2019 Annual Broadband Adoption Surveys.

With cost being established as the primary cause of the current digital divide, this paper examines the effectiveness of information-based outreach programs at closing the divide. We find studies by Hauge and Prieger in 2015 and Manlove and Whitacre in 2019 to be most relevant to this evaluation. Both examined BTOP sustainable adoption grants to determine if there was a positive, causative relationship between the BTOP grants and broadband adoption.

Hauge and Prieger (2015) conducted regression analyses to account for multiple variables and externalities. Their thorough examination looked at all possibilities that might support a positive causal relationship, but found none existed. They also found the BTOP grants were not set up in a way that could facilitate a rigorous, outcome-based, academic evaluation. The projects discussed in this paper were constructed to allow for effectiveness evaluations.

Manlove and Whitacre (2019) used difference-in-differences methodology and looked specifically at the BTOP programs run by Connected Nation. Again, the Connected Nation programs for sustainable adoption were similar in nature and concept to those analyzed later in this paper. That is, they focused on providing information to encourage adoption with no rate subsidies provided. They connected people to information and discounted resources but provided no resources themselves. As with Hauge and Prieger, the Manlove and Whitacre study also found no evidence of a positive causal relationship between the Connected Nation adoption programs and broadband adoption.

Combined, these two papers provide the most thorough and detailed analysis of the BTOP sustainable adoption program, and both found no positive, causal relationship between the spending/programs and an increase in broadband adoptions.

An earlier paper by La Rose *et al.* (2014) examined the BTOP applicants and recipients and the funds disbursed. They found that most of the empirical studies conducted at the time were correlative not causative. However, as their work was also not empirical and was conducted prior to the completion of the BTOP sustainable adoption programs, we will not rely on this paper for our analysis.

Since 2008, CA has funded its own broadband adoption efforts with the CASF. CASF offsets the excess costs associated with connecting rural areas (CPUC, 2019a) to the internet. That program was later expanded several times to include some limited adoption efforts as well. While Levine (2018) looked at the adoption spending and its potential impact on per capita GDP, there has been no rigorous examination of the effectiveness of the adoption programs at driving sustainable adoptions.

In addition to CASF, CETF created and funded additional efforts to increase broadband adoption. The CETF projects analyzed in this paper focused on using outreach by electric and natural gas utilities to their low-income customers. Those projects were aimed at increasing adoption in urban areas and assessing the effectiveness of those methods. While the BTOP grants funded many different types of organizations and projects, the CETF projects were narrowly focused and variable-constrained.

The various BTOP and CETF adoption programs had two key factors in common:

1) They were primarily built on the outreach efforts of community-based organizations (CBOs) but did not involve the broadband providers themselves.

2) They were limited-time outreach efforts designed to overcome the perception gap – discussed in the next section – and did not provide a monthly subsidy to help sustain adoptions.

While the projects under BTOP and those analyzed in this paper used outreach to close the digital divide by providing information about the internet and discounted offers to those who are likely not connected, it is important for this work to note that there was one effort at using subsidies to bridge the digital divide. In 2016, the FCC under then President Obama redefined broadband as a "Title 2 Common Carrier Service." This changed broadband from an information service to a communication service and gave the FCC regulatory authority (FCC, 2016). The FCC also began to expand LifeLine to broadband giving a $9.25 monthly subsidy – for both mobile and fixed broadband – to qualified individuals to help defray the cost of the monthly service. With the change of administrations in January of 2017, the FCC Commissioners changed and scaled back the program. While Wallsten (2016) found adoptions trailed expectations in the LifeLine pilot projects, the duration of the project left more questions than answers. Given the effectiveness of LifeLine with telephony and California's rate assistance programs for electricity – both of which provide monthly subsidies for low-income end-users – it seems the lack of adoptions was because of factors that could be overcome with more time and better program design.

Finally, Manlove and Whitacre (2019) noted in their literature review that many of the ISPs provide reduced rates for qualifying individuals. Those rates are provided in Table 6. They further note they are unaware of research examining the effect of these rates on broadband adoption. As such, this paper breaks new ground by answering that question.

4. Perception gap

While the rural divide is mostly attributable to a lack of infrastructure that is not true of the much greater urban and suburban divide. According to the data from the 2019 Annual Broadband Survey (IGS Berkeley, 2019) shown in Figure 4, broadband adoption is lowest at the lowest levels of household income. Those households cannot afford the monthly service, an appropriate computing device, or both. Table 5 shows households without internet access at home consistently list cost and lack of computing device as the primary reason they are not connected (Berkeley Institute for Government Studies, UC Berkeley, 2019; Davis Research LLC, 2018) (Table 1).

Like the findings by Reisdorf *et al.* (2018), those households consistently respond they are aware of the ways they are being disenfranchised, listing tasks such as helping children with school work, gaining job skills, keeping up with the news, getting health and medical information, learning about government services and finding new job opportunities as just some of the things they are unable to do (Berkeley Institute for Government Studies, UC Berkeley, 2019).

In California, most major internet providers (Comcast/Xfinity, Charter, Frontier, AT&T and Cox) all offer a low-income, stand-alone internet product. Prices range from $9.95/month (Cox Communications, 2018) to $14.99 per month (Charter Press Release, 2017) (Table 2).

But those rates are not commonly advertised. Low-income households reading general interest publications or watching television will see the providers' ads for their standard, monthly rates. Those standard rates vary by provider, but are significantly higher than the "affordable offers."

In additon to discounted service rates, consumers looking for a computing device with the functionality necessary to meet the definition of meaningful internet access have the ability to obtain a free or low-cost device from a CBO. There are also commercially available

Table 1. Reasons for lack of home broadband

Survey year	2016	2017	2018	2019
Internet service too expensive/no comp or smart phone at home	74%*	69%	82%	51%
Too expensive	59%			
No computer or smartphone	42%			

Note: *For 2016, the data was also reported separately

Table 2. Cost of internet service

Company	Affordable offer	Standard offer**
AT&T	$10/mo. (free modem only)*	$49.99/mo.
Basic Internet	$72 hot spot, plus $10/month	N/A***
Charter	$14.99/month (free modem)	$49.99/month
Comcast	$10/month (free modem/router)	$79.99/month
Cox	$9.95/month (free WiFi modem)	$59.99/month
Frontier	$13.99/month (free modem/router)	$34.99/month

Notes: *$5 per month if only 5 Mbps available. **Standard offer is the first offer shown or most popular or middle most stand-alone broadband offer, depending on provider. Most offers are for a one-year term and have varying levels of included equipment and fees. Speeds vary from provider to provider. ***basic internet is a low-cost only provider and does not have a standard offer devices for $99.00 that would fulfill the definition of the type of appropriate computing device necessary for meaningful internet access. However, given the amount of advertising and the prices of widely available, mass-marketed computers – and the paucity of information about free or discounted equipment – it would be reasonable to assume there a disconnect between the perceived cost of computing equipment and the actual cost of devices, potentially leaving low-income households with the impression that a computing device is beyond their means.

These factors – expressed knowledge of missing out, citing cost as the primary impediment to adoption and the availability of discounted service rates – combine to indicate there is a "perception gap." The perception gap can be defined as the difference between what an individual perceives as the cost of broadband and a computing device and the actual cost.

The perception gap theory is verified by data from a series of focus groups in Fresno county in 2017 and the 2019 Broadband Adoption Survey. The data illustrate two key points:

(1) Most low-income households are unaware of the availability of the ISPs stand-alone, low-income offers.

(2) When asked, most low-income households respond they would like information regarding those affordable offers.

The focus groups in Fresno had 307 total participants, all of whom would be eligible for one of the ISPs' low-income offers. Of those participants, 77.5% had the internet at home (including via smartphone only), which reflects the totals illustrated in Table 3.

However, despite all being eligible, only 78 of the 238 households with internet (33.33%) were enrolled in one of the low-cost offerings. Removing the 33% (78) households who have internet access and are on an affordable rate, we are left with a reduced universe of 229 households who do not have low-cost internet at home. Those 229 households are composed of two groups, those with internet service and those without. Table 4 shows us that 70% (160 of 229) have the internet service but are not on a discounted rate plan, whereas 69 households have no internet at all. As all 307 participants in the focus group were from eligible households, the 160 who have internet service are paying more than they need for the service.

Further, we find 76% (175 of 229) of the households who are not currently enrolled in a low-cost program want information about affordable offers. And, perhaps most importantly, cross-referencing the households who do not have internet with those who reported wanting

Internet in the home (Yes)	238
Internet in the home (No)	69
Low-cost internet (Yes)	78
Low-cost internet (No)	229

Table 3. Internet and low-cost internet status

Internet in the home (Yes)	160
Internet in the home (No)	69
Would like to receive information on low-cost internet	175
Would NOT like to receive information on low cost internet	54

Table 4. Households wanting information on low-cost internet service

information about low-cost internet options, we see that 88% of households want the information. Even among those with internet access, the desire for information on affordable offers is still high, with 71% of households wanting the information.

The findings from the Fresno Pilot Projects were verified in the 2019 Broadband Adoption Survey with Figure 5 showing similar percentages for the all of California.

The data from the past four annual broadband adoption surveys shows cost is the biggest impediment to broadband adoption in low-income households. The data also conclusively shows that despite every major ISP in California having an affordable broadband offer, the majority of eligible households lack information about those offers. As a result, they are either overpaying or have forgone the service completely. Yet, when specifically asked, we see the vast majority of those who are not receiving low-cost internet want information about discounted offers. This illustrates a severe disconnect – the perception gap – between the availability of the programs and enrollment in the programs.

5. Overcoming the urban divide – an evaluation and analysis of the effectiveness of programs

To date, efforts in California and those funded by ARRA grants have sought to close the low-income digital divide by using information to address the "perception gap." Information-based efforts have sought to raise awareness of the availability of affordable rates, free and low-cost computing devices and digital literacy training.

This section analyzes the data from each pilot project and their respective components individually. This section also looks at the money spent on each project and generates cost per adoption data. While meaningful internet access consists of three different elements (Levine, 2018), the purpose of the pilot project was to facilitate broadband adoption. As such, the analysis of the data will focus only on the referrals to ISPs and the adoption status. This level of analysis will provide us with raw numbers and ratios along with common terminology that will facilitate the cross-comparisons between the projects in Section 6.

The pilot projects analyzed here attempt to overcome the perception gap by using trusted messengers to outreach the identified low-income households. CETF is an advocacy organization with little to no consumer presence or "brand recognition." To overcome this, CETF partnered with three California utilities to provide information to households enrolled in their low-income rate programs. It was thought that customers' prior familiarity with the utility would make them more receptive to and trusting of the broadband information.

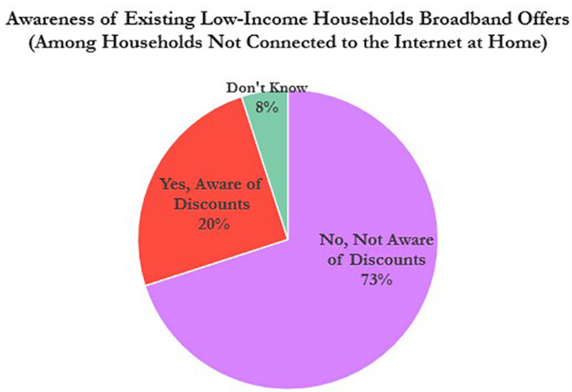


Figure 5.
Awareness of low-cost broadband

As shown in Table 5 (CPUC, 2019), there are strong similarities between income eligibility levels for utility bill assistance programs such as the California Alternative Rates for Energy (CARE) and the income levels associated with lack of broadband, as shown in Figure 1 and Table 2. This income eligibility correlation makes this population an ideal target group to test programs designed to close the digital divide by eliminating the information or "cost perception gap."

5.1 Sacramento Municipal Utility District outreach project

In 2015, CETF began to explore the possibility of using third-party, "trusted messengers" to close the "awareness gap" and connect eligible households to discounted broadband rates. CETF approached the Sacramento Municipal Utility District (SMUD) to partner with them on this effort. As a municipal utility, SMUD had the flexibility to engage in this effort without permission from the CPUC [2]. SMUD recognized the value in having as many customers digitally connected as possible and agreed to the partnership.

The SMUD program for qualified low-income individuals called Energy Assistance Program Rate (EAPR) and the 2018 income eligibility levels are shown in Table 5. Households whose income does not exceed 200% of the federal poverty level are eligible for the program.

The SMUD EAPR program is solely dependent on income level (as opposed to programs, which require children in school or other eligibility criteria). Combining the meaningful internet access of 48% for households making less than $20,000/year (Table 1) with the data in Table 5, we would expect that large percentages of EAPR-enrolled households lack meaningful internet access. And, at the time of the project, the adoption rate at the $20,000–$60,000 level was also lower. Given that the bulk of the digital divide resides almost exclusively at the lower income levels, and that eligibility for the ISP's affordable broadband offers are restricted to low-income households, it was most efficient and cost-effective to target only those households who qualified for the discounted energy rate.

The project was built on the concept of:

- outreach;
- assessment; and
- assistance.

SMUD used their brand and served as the "Trusted Messenger," informing their EAPR customers that they may also be eligible for affordable broadband.

The outreach portion of this project was conducted via a "single-subject" letter from SMUD, on their letterhead, to EAPR-enrolled households. The letter only contained

	2020–2021 CARE eligibility
Household size	Upper income limit
1 or 2	$34,480
3	$43,440
4	$52,400
5	$61,360
6	$70,320
7	$79,280
8	$88,240
Each additional person	Add $8,960

Table 5. Household size and income level for discounted electricity service

information about affordable broadband and provided basic information, in layman's terms, on the program and what the consumer may be eligible for. The letter then gave a name and phone number to call for more information and assistance, referring the individual to the California Foundation for Independent Living Centers (CFILC).

CFILC received a grant from CETF to function as the "call center" for the project. CETF trained the CFILC staff on how to conduct the broadband screenings and assist with adoptions and other referrals. CFILC would ask the callers a series of questions to determine their need and their eligibility and would directly and immediately assist the individual with signing up for broadband service. This is a key distinction from the other programs and one significantly impacts the effectiveness of the program as we will see in the data.

The lack of a sufficient computing device and digital literacy skills is an impediment to meaningful internet access (Levine, 2018). As such, in addition to adoption assistance, CFILC would refer callers to local organizations that provided free or low-cost computing devices and free digital literacy training classes in an effort to remove additional barriers to sustainable adoptions.

The letters sent by SMUD generated 4,055 calls to CFLIC (CFILC, 2016) and resulted in 1,093 adoptions. Table 6 shows the raw numbers and the conversion percentages. We will put these numbers in context and compare them with other efforts below.

The SMUD project was the first of this type conducted by CETF and the project described here was a full project, implemented after several smaller test projects were conducted. The data from those test projects was not kept. Because SMUD did not need CPUC approval to spend money, they paid the cost of printing and mailing the letter to the customers while CETF paid the costs associated with the call center. Finally, because of the way the project was conducted, the full amount spent on the effort was also not recorded in a way that allows for easy reporting.

SMUD spent $37,500, or $0.42 per letter, to send out 90,000 letters to their low-income customers (CFILC, 2016). The funding for the screenings was paid on a per adoption basis with CETF paying $250/per adoption for a total of $273,250. Including the cost of the mailing, the total cost per adoption was $284.31.

This data gives us a baseline for comparison on effectiveness at driving adoptions, and cost-effectiveness for the other projects.

5.2 San Diego Gas and Electric – 2–1-1 San Diego

After the completion of the SMUD project in 2015, CETF sought to conduct similar efforts in the territories of the much larger Investor Owned Utilities (IOUs). However, the smallest IOU, San Diego Gas and Electric (SDG&E), had more than three times the number of households enrolled low-income customers than SMUD did. Each of the three largest

Table 6. SMUD low-income qualification

SMUD EAPR income levels Persons in house	Annual income
1	$24,276
2	$32,916
3	$41,556
4	$50,196
5	$58,836
6	$67,476
Each additional person	$8,640

utilities had over one million enrolled low-income customers. The cost conducting the outreach efforts in IOU territories was beyond the ability of CETF to fund. As such, CETF spent two years in discussions with the utilities and the CPUC in an attempt to have the utility pay for the project out of an existing fund. The IOUs are subject to regulation from the CPUC. Because of this, there were limits on what moneys they could spend without CPUC permission. Similarly, despite two years of trying, the CPUC felt existing rules and law did not permit the funds to be used for the purpose CETF desired.

In an attempt to demonstrate the validity of the effort to the IOUs and the CPUC and permit the use of the existing funds, CETF engaged with SDG&E and 2–1-1 San Diego to conduct a pilot project with the objective the same as the SMUD project, to connect SDG&E's CARE customers with affordable broadband offers, resources for free or low-cost computing devices and digital literacy training. While the purpose and target populations were the same, the methodology was different. The pilot project was funded by a $50,000 grant from CETF and a $10,000 contribution from SDG&E's charitable division. The project tested three different methods of providing information to CARE customers, with 211 San Diego functioning as the "call center." The outreach methods were as follows:

(1) utility caller screening;

(2) interactive voice response message (IVR); and

(3) direct text messaging.

During the pilot project, all callers to 2–1-1 San Diego who sought assistance with a utility issue (water, gas or electricity service) or information about discount products from SDG&E were also asked about their home high-speed internet (broadband) access and connectivity status. Customers who did not have home broadband service and were interested in subscribing were screened for eligibility and then were referred to AT&T or Cox, the dominant ISPs in the area, both of whom offer reduced-cost broadband as we saw in Table 1. Callers were also asked about their access to various computing devices at home and their digital literacy skills. Callers needing and requesting appropriate affordable devices or digital literacy training were referred to CBOs for assistance.

For one month of the project, 2–1-1 recorded an IVR to educate and prompt callers to the general 2–1-1 (non-utility) line to inquire with an agent about how to subscribe to low-cost broadband service. The message only ran for one month as there was a limited amount of time/space available in 2–1-1 San Diego's system.

Finally, during initial meetings to set up the project, 2–1-1 indicated they believed a text message outreach campaign would be effective in generating calls and adoptions. To conduct this campaign, 2–1-1 identified English- and/or Spanish-speaking clients with qualifying incomes who did not have an e-mail address on file in their system [3]. Each week 250 of those identified clients received a text message about affordable broadband and instructed them to call 2–1-1 for more information.

A key difference between the SDG&E and SMUD projects was in how the call center (2–1-1) processed the calls. There was less funding available for this project which necessitated a different, less expensive method of processing the calls. After 2–1-1 conducted the initial screening to assess a caller's interest and eligibility for broadband, interested individuals were provided basic information about the available rates and other aspects of the affordable offers and were then given the phone number of either AT&T or Cox [4]. Individuals interested in signing up for the affordable offers were not provided immediate and direct adoption assistance. For this project, they had to call the ISP and navigate the enrolment process without any further information or assistance from the call center.

Differences in the adoption process also made it considerably more difficult to collect the data on the adoption status. Unlike the SMUD project where adoptions were verified at the time of assistance, for this project, adoptions were verified by 211 staff. Clients were asked in the initial call if they would allow 211 to follow up to verify the adoption. Multiple attempts were made to contact each consenting, referred client. Of the 791 total referrals across all three outreach methods, 756 (96 %) agreed to follow-up. A total of 1,180 follow-ups were conducted from June 2018 to May 2019 (752 first attempts and 428 second attempts). It is possible, but not likely that there were additional adoptions that were not reported.

The campaign in total obtained the following results:

- 19,647 total individual contacts;
- 4,492 broadband screenings completed;
- 772 unique referrals to Cox or AT&T;
- 66 verified subscriptions;
- 289 referrals for free or low-cost device; and
- 77 referrals for digital literacy training.

To assess the effectiveness of the campaign, we will convert these raw numbers to percentages that can be compared to different methods of outreach and other projects. Table 7 shows the rate of success of converting the overall population (19,647) to screenings, referrals and adoptions. Table 8 shows the conversion rates of just those screened (4,492) to determine, once the individual made contact with 211, how effective was this method at both referring them to a provider and then generating an adoption.

As there were three methods of contact, to determine the effectiveness of each, we will look at the data from each method separately. We will assess each method in two ways. First, we will assess the effectiveness of text messaging, IVR and utility caller screening as methods of generating interest in receiving information about affordable broadband offers. Next, we will look at the adoption rates of those who are screened and referred. This will allow us to compare the methods of generating adoptions to see if there is a difference between the method in the SMUD project where callers received intensive assistance with

Table 7.
Data from SMUD outreach and adoption project

SMUD data	
Raw data	
Letters	90,000
Calls	4,055
Adoptions	1,093
Conversion rates	
Letters to calls	4.51%
Letters to adoptions	1.21%
Calls to adoptions	26.85%

Table 8.
SDG&E/211 San Diego overall contact effectiveness rates

% Total contacts screened	% Total contacts referred	% Total contacts adopting
22.86%	3.93%	0.03%

the broadband adoption process as compared to the 211 San Diego project where callers were simply provided information and the number of the ISP and left to navigate the adoption process without assistance.

5.3 Text message campaign

Over the course of the text message portion of the pilot project, 211 San Diego sent 5,450 text messages. Those texts resulted in:

- 109 individuals screened;
- 79 individuals referred;
- 15 outcomes verified; and
- 4 adoptions.

Table 9 shows this data converted into percentages that can be compared to the other methods of outreach and the SMUD campaign.

Comparing the data in Tables 8-10, we see that the text campaign was very inefficient in converting texts into screenings. The percent of total contacts screened in the overall project was 22.86% (which includes the data from the text portion of the project), whereas the text outreach alone only converted 2% of the contacts into screenings. The only area in which the text campaign can be declared successful is in the conversion of screenings to referrals, with 72.48% of those calling in response to a text message receiving a referral to an ISP, compared with only 17.19% of the total population receiving a referral. This difference is potentially explained by the proactive nature of the text response versus the passive nature of the utility caller screening. The act of calling in response to a text message shows a clear motivation to learn about broadband. However, those who were screened via the utility caller method were passive recipients whose calls to 211 were in regard to other issues, thereby lacking express intentionality. And, although the absolute numbers of callers screened and referred are low, the purpose of the call could also explain the slightly higher success rate of converting screenings into adoptions for the text campaign. However, the text method trailed in converting referrals to adoptions 8.55% to 5.06%. In theory, we would assume that if the text message recipients are more motivated as demonstrated by the proactive nature of their call, we would also assume they would have a higher rate of adoption among those referred to an ISP. The method of collection and recording of the data does not permit us to understand the reason for this disparity. Given the relatively small sample size and the challenges in verifying adoptions, it is possible that this is just an anomaly that would revert to expectations if more data were available.

Table 9. SDG&E/211 San Diego overall screening effectiveness rates

% Screenings referred	% Screenings adopting	% Referrals adopting
17.19%	1.47%	8.55%

Table 10. SDG&E/211 San Diego text outreach effectiveness rates

% of Contacts screened	% of Contacts referred	% of Screenings referred	% of Screenings adopting	Adoption % of referrals
2.00%	1.45%	72.48%	3.67%	5.06%

A sample size of 5,450 randomly identified individuals in the text campaign is enough to draw a meaningful conclusion. With its poor conversion rate from text receipt to screening, and the low absolute number of referrals and adoptions, using text outreach to low-income households seems to be an ineffective method of generating adoptions.

Because of the poor performance of the text campaign for the remainder of the analysis, we will focus on just the IVR and the utility caller screening. Removing the text message campaign data, we are left with the following totals combined between the other two methods:

- 14,197 total individual contacts;
- 4,383 broadband screenings completed (31%); and
- 716 unique referrals to Cox or AT&T (16%).

Table 11 shows the effectiveness of the pilot project with text messaging data removed from the overall data.

Table 12 brings the SMUD project data (from Table 7) together with reduced universe data (no text campaign data) from the 2–1-1 pilot project and modifies the terminology for easier comparison.

Because of the nature of the outreach and referral methods, the comparisons do not align perfectly. Specifically, we modified the terms in the SMUD project and equate those who were interested to those who were referred. In the 211 campaign, the 14,197 "calls received" was the total number of people who either called in for assistance with utility issues or who heard the IVR message. Those equate to the total contacts in each project. As should be clear without seeing the percentages, the 211 San Diego campaign was significantly more effective in converting calls to screenings. However, the lack of "broadband intent" on the part of the caller appears to play a role in the effectiveness in generating adoptions. With the SMUD project, all callers were calling "intentionally" to receive broadband information. In this project, the callers received broadband information while calling in for other reasons. The role of "caller intentionality" will be analyzed further in section 6.

Finally, with regard to cost, with a total project budget of $60,000 and 19,647 contacts, the per contact cost was $3.05. With 66 verified adoptions, the cost per adoption was $909.09. However, the ineffectiveness of the text campaign significantly inflates the cost per adoption for the other methods. Assuming the costs were spread evenly across all contacts regardless of method, at $3.05/contact for 5,450 contacts, $16,644 was spent on the text

Table 11. San Diego pilot project effectiveness rates (minus text message data)

% Callers screened	% Callers referred	% Callers adopted	% Screenings referred	% Referrals adopted
30.87%	5.04%	0.41%	16.34%	1.32%

Table 12. SMUD – SDG&E/211 San Diego data comparison

	SMUD	211 San Diego
Contacts	90,000 letters sent	14,197 calls received
Screenings	6,818 callers screened	4,383 callers screened
Interested	4,055	716 referrals
Outcomes	1,093 adoptions	52 adoptions

message portion of the program. With only four verified adoptions, the per adoption cost was $4,156. Removing the text campaign from the project, we see $43,356 was spent on the other two methods of outreach. With 62 verified adoptions from the IVR and utility caller screening, we get a per adoption cost of $699.29.

5.4 SoCalGas–211 Los Angeles

In 2018–2019, CETF embarked on a pilot project with the Southern California Gas Company (SoCalGas) and 2–1-1 Los Angeles. The purpose of this project was the same as the others:

- to test different methods of outreach to CARE customers informing them of affordable broadband offers, resources for free or low-cost computing devices; and digital literacy training;
- expose the utility company to the concept and convince them of the merit of the project and the need for connectivity among their customers; and
- generate data for use with the CPUC and other policymakers.

Again, while the purpose and target populations were the same, the methodology was different.

Like with SDG&E, SoCalGas, being IOU and subject to regulation from the CPUC, limited what they felt they would be able to do without CPUC permission. The pilot project was structured to work around those limitations. The project tested three different methods of providing information to CARE customers. The outreach methods were as follows:

(1) utility caller screening (the same as SDG&E);
(2) CARE recertification letter; and
(3) stand-alone letter (the same as with SMUD).

5.5 Utility caller screening

During the pilot project, all callers to 2–1-1 Los Angeles who sought assistance with a utility were also asked about their home high-speed internet (broadband) access and connectivity status. Customers who did not have home broadband service and were interested in subscribing were screened for eligibility and then were referred to providers in their area. Callers were also asked about their access to appropriate computing devices at home and their digital literacy skills. Callers needing and requesting appropriate affordable devices or digital literacy training were referred to CBOs for assistance. Table 13 shows the raw numbers and conversion rates at the conclusion of the project.

Of note, when Table 13 is compared to Table 11, we see that 211 Los Angeles had a 10% greater rate of screenings to referrals, and a referral to adoption rate that was more than

Raw numbers		
Screened calls	2,659	
Referred to ISP	724	
Confirmed adoption	23	
Conversion rates		
Screen to referral		27.23%
Screen to adopted		0.86%
ISP referral to adopted		3.18%

Table 13. 2-1-1 Los Angeles utility caller screening data

twice as high as that of 211 San Diego when using the same utility caller screening method. It is possible there was a difference in the level of assistance provided to the callers in Los Angeles, which made them more interested in obtaining broadband and better equipped when they did talk to the ISP. However, we only have the final data, not a qualitative or quantitative report of each call. The data does not permit us to compare the two projects in enough detail to determine the reasons for the disparities.

5.6 Care recertification letter

At the urging of the utility, this pilot project tested the effectiveness of embedding a broadband message in the utility's standard CARE recertification letter [5]. For this portion of the project, 10,000 letters were sent to customers enrolled in the SoCalGas CARE program. The letters were sent to a random sample of the population and informed them that they:

- needed to recertify for CARE eligibility;
- could recertify via the internet; and
- if they did not have internet, they could call 211 to find out about low-cost internet service.

Figure 6 shows a portion of the overall letter. This method of outreach generated eight calls to 211 and three referrals to broadband providers. This response rate is considerably lower than the response rate for the "single-subject" letter from the SMUD project. There are a multitude of factors that could cause the poor response rate, including the topic of the letter and the relative size and placement of the broadband message, causing the message not to be seen because of its lack of prominence.

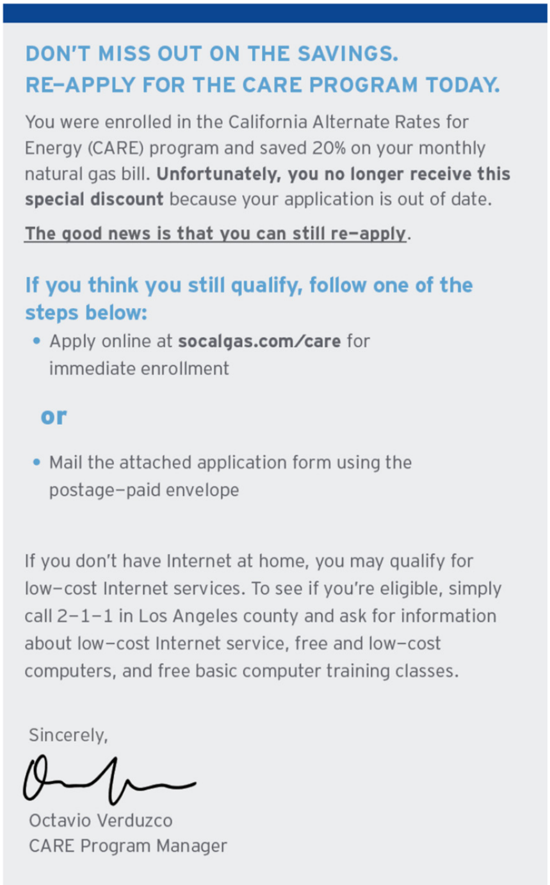
5.7 Single-subject letter

The final method of outreach for this project was a "single-subject" letter of the same type that was used in the SMUD project. However, for this project, we tested two different methods of processing the calls. Letters were sent to 20,000 SoCalGas CARE customers randomly split into two groups of 10,000 each. Each group received a nearly identical letter with the only difference being the phone number to call for more information. One group received a letter instructing them to call 2–1-1 Los Angeles, whereas the other group was instructed to call Internet for All Now (iFAN). The key difference in this part of the pilot project was that each call center had a different protocol for processing the calls.

Callers to 2–1-1 received a basic screening for low-cost broadband eligibility, their digital literacy skill level and whether they had an appropriate computing device. For those who were screened as eligible for an affordable broadband offer, they were referred to an ISP of their choice. The callers were provided information about the affordable offer and the phone number of the ISP but received no assistance with the actual enrollment process. The screening and referral methods were identical to the way callers were referred by 2–1-1 San Diego.

Callers to iFAN, an 844 number under contract with CETF to answer calls from a number of referral sources, had a different methodology for processing and referring the calls. Callers to the 844 number received an eligibility screening. Eligible callers had their information taken and then forwarded on to a specific, pre-arranged, trained CBO in the caller's area. The CBO would then call the low-income household back to follow-up and provide individual assistance with the adoption process (Table 14).

Table 12 shows the data from the "single-subject" letter comparison portion of the pilot project. It is clear from the data the phone line answered by iFan is more successful. It is unclear why the 844 number received more calls than 211. Each letter was sent to a 10,000-



DON'T MISS OUT ON THE SAVINGS.
RE-APPLY FOR THE CARE PROGRAM TODAY.

You were enrolled in the California Alternate Rates for Energy (CARE) program and saved 20% on your monthly natural gas bill. **Unfortunately, you no longer receive this special discount** because your application is out of date.

The good news is that you can still re-apply.

If you think you still qualify, follow one of the steps below:

- Apply online at **socalgas.com/care** for immediate enrollment

or

- Mail the attached application form using the postage-paid envelope

If you don't have Internet at home, you may qualify for low-cost Internet services. To see if you're eligible, simply call 2-1-1 in Los Angeles county and ask for information about low-cost Internet service, free and low-cost computers, and free basic computer training classes.

Sincerely,

Octavio Verduzco
CARE Program Manager

Figure 6.
Low-cost broadband call out box from SoCalGas CARE recertification letter

Effectiveness of letters	211	iFan
Raw data		
Letters sent	10,000	10,000
Calls received	146	431
Verified adoptions	1	38
Conversion rates		
Letters to calls	1.46%	4.31%
Letters to adoptions	0.01%	0.38%
Calls to adoptions	0.68%	8.82%

Table 14.
Comparison between 211 and IFAN

household random sample of the same, much larger data set, and the only variable to the consumer at point of contact was the name of the entity to call. The likeliest explanation is the name of the organization created some perceived difference in the mind of the callers prompting them to call iFan in much greater numbers than 211. More importantly, iFan had much a much better rate of converting the calls received into verified adoptions. We believe this is because of the several factors related to the level and type of assistance provided by the initial call recipient.

With 211, the callers were required to take four actions: calling 211; writing down and remembering the information about the ISP's low-income offer; calling the ISP; and navigating the ISP enrollment process. However, callers to iFan only had to take one action, their call to the iFan number. From there, the CBO called them back, negating the need for a second call, and the CBO assisted with the adoption process, which prevented them from having to remember information and navigate the ISP call center.

For this project, a total of $32,409 was spent on the various methods of outreach and assistance[6]. The total "contacts" for this project is the sum off the three letters and the callers screened, which resulted in 32,659 total contacts. The 10,000 CARE recertification letters were sent as part of SoCalGas' regular business operations and did not add to the cost of the project. Additionally, as with the text campaign in the San Diego project, the effort resulted in so few responses (8 calls out of 10,000 letters) that its lack of effectiveness is obvious without rigorous examination. For the purposes of this analysis, we will remove those letters from the total, leaving us with 22,659 total contacts funded by the project. The overall per contact cost of this project was $1.43.

Per the Memorandum of Understanding between CETF and 211 Los Angeles, 211 was allocated 15,000 to spend on the call screenings. Based on their "Scope of Work" proposal, they projected a cost of $15 per screening. For the purposes of this project, a screening was defined as a caller answering "no" to the initial question asking if they have broadband access at home that is not dependent on a smartphone. The actual cost per screening was $5.64. Because of differences in data reporting, we do not have the cost per screening from the utility caller screenings for the 211 San Diego project. However, as those costs were internal to 211 and the screening process was nearly identical, they would have no bearing on the effectiveness of the method. With 23 verified adoptions[7], the cost per adoption was $652.17, which is not substantially different from the $699.29 per adoption cost in the San Diego project.

For the two single-subject letters, a total of $15,709 was spent to print and mail 20,000 letters or $0.79/letter. Using the data from Table 12, we can compare the cost-effectiveness of each letter (Table 15).

Table 13 shows the cost per call received and cost per adoption of each method, with the data showing the iFan letter was significantly more effective and cost-effective at generating calls and adoptions.

6. Analytic conclusions

This paper examined three different projects to test their effectiveness at increasing meaningful internet access in urban areas. The projects attempted to use information to overcome cost barriers and the perception gap. The premise of the projects analyzed in the paper and the sustainable adoption projects under BTOP was providing information to low-income households would be enough to spur adoption. The data shows cost of service and device are the biggest impediments to meaningful internet access (Berkeley Institute for

Table 15. Outreach letter cost-effectiveness comparison

Project	211	iFan
Cost/call received	$53.80	$18.22
Cost/verified adoption	$7,854.50	$206.70

Government Studies, UC Berkeley, 2019; Horrigan, 2020). Additional data shows that, when asked, low-income households say they want to receive information about affordable broadband options. The projects analyzed were carefully designed to address both of those issues by providing specific information to inform low-income households about the availability of discounted monthly ISP service rates, free and low-cost computing devices and digital literacy training.

The ARRA/BTOP programs were designed by policymakers to spur adoption. Manlove and Whitacre found those programs did not succeed and suggest that future studies use "randomized control trials" to test the effectiveness of different methods of outreach, "[. . .] including those focused explicitly on the cost element." The projects in this paper addressed that gap in the research. Each project had reporting requirements and an adoption verification methodology. And in the case of the SoCalGas project, we were able to test three different versions of outreach letters to 10,000 randomized samples of the same population. We were also able to compare that data to a letter sent to a 90,000 person-sample. This allowed us to compare not only the outreach method, but the processing method.

Of the three projects and multiple variations of outreach methods, the SMUD project and the iFAN portion of the SoCalGas project were the most effective at generating adoptions. Table 16 shows the effectiveness of the SMUD project as compared to the SoCalGas single-subject, iFan letter.

The unexplained element in the table is the difference in the ratio of letters to calls generated by each project. The letter sent by SMUD was more than twice as effective at generating calls than the SoCalGas letter. There were only four elements that varied between these two methods of outreach.

(1) the name of the entity sending the letter (SMUD vs SoCalGas);
(2) the population receiving the letter was geographically distinct (northern vs southern California);
(3) the name of the entity to call (CFILC vs iFan); and
(4) the time period of the project (2015 vs 2018/2019).

Trying to assess which of these differences was the factor and why is not possible with the way the data was collected.

Looking across all of the outreach and call processing methods, these projects had two features in common that were absent from the others:

(1) a separate, targeted message from a known messenger; and
(2) a process that provides more direct assistance with the adoption process.

Effectiveness of letters	iFan	SMUD
Raw data		
Letters sent	10,000	90,000
Calls received	213	4,055
Verified adoptions	38	1,093
Conversion rates		
Letters to calls	2.13%	4.51%
Letters to adoptions	0.38%	1.21%
Calls to adoptions	17.84%	26.95%

Table 16.
iFan vs SMUD effectiveness

We know these two elements are they key factors, by comparing the results to portions of other outreach methods. The text message campaign was not effective at generating calls, but it did have the highest percentage conversion of calls to referrals. This tells us using text messaging as an outreach method is not effective, but it also informs us that the intentionality of calling in direct response to an outreach method is likely key to the success of a program. The opposite was found in the utility caller screenings. Because all inbound callers seeking utility information were screened for broadband, it generated a high percentage of screenings but was unsuccessful at generating adoptions. This was likely because of two factors:

(1) The fact that callers were contacting the call center for assistance with another issue meant broadband was not their highest priority at the time of the call.

(2) The referral process left it to the caller to contact the ISP without assistance.

Like the text campaign, the data shows the "intentionality" of those who called in response to the SMUD and the iFan letter is a significant factor. Those people were calling specifically to obtain information about broadband, as opposed to someone calling a general number to avoid having their service turned off.

But the intentionality of the caller has to be met with a process favorable to generating adoptions. In that regard, the feature that differentiated the SMUD and iFan projects from the others was the level of assistance provided by the call center. The adoption data in Table 16, when compared to the adoption data from the other methods of call processing, shows that having an informed advocate directly assisting with the adoption significantly increases the likelihood of a successful adoption. The slight difference – a one-step vs a two-step process – between the way the two call centers handled the callers likely accounts for the difference in the adoption rate. Callers in the SMUD project received immediate assistance on the first call, whereas the callers in the iFan project received the assistance after a call back. This allowed for the possibility that the caller could not be contacted, or circumstances changed between their initial call and the call back from the CBO.

The projects that required interested individuals to call into the ISP call centers had a lower adoption rate, which we attribute to that process requiring more of the individual than the SMUD or iFan processes. The 211-referral process had individuals seeking the affordable rate offers calling into the company's general call center. CETF has found that call center employees frequently try "upselling the services." This results in the household either not signing up because they cannot afford the price higher, or the household enrolling but then later not being able to pay their bill and getting disconnected.

Referring callers to ISPs was tested because it was less expensive than funding a specific call center as was done with SMUD. Cost effectiveness is an important consideration, and if effective this method could have achieved similar adoption numbers with different and less expensive methods. A specifically trained call center that understood the various ISP programs, enrollment processes and the needs of the low-income population resulted in a significantly higher adoption rate.

The three projects analyzed in this paper tested multiple outreach and call processing methodologies to determine their effectiveness at generating broadband adoptions. The most effective program achieved an adoption generation rate of 1.21%. We now ask, if that conversion rate is applied to the IOU's CARE customers, would it be sufficient to generate broadband adoption at a rate high enough to appreciably close the digital divide?

Table 17 shows the projected number of adoptions and the cost to achieve them if the SMUD program were expanded to target the all CARE customers of the three IOUs (CPUC, 2019c). To calculate this, we use an adoption conversion rate of 1.21% and a per adoption cost of $284.31. We find expanding the program would expect to yield 34,695 adoptions, which would close the digital divide by 1.48%. This excludes the CARE customers of SoCalGas, but as their territory is in large part contiguous with Southern California Edison and they share customers, it is not reasonable to assume the adoption rate would be 1.21%. But with 1.6 million enrolled CARE customers, it would likely yield some adoptions. Additionally, this excludes the Los Angeles Department of Water and Power (LADWP). LADWP does not report their low-income enrollment, but with a little over four million customers, it is slightly larger than SDG&E. Assuming similar low-income enrollment – as of 2011, they reported 270,000 customers enrolled – then we would expect an additional 3,500–4,000 adoptions.

Using the less expensive, but also less effective iFan adoption rates and cost per adoption, we would expect 10,896 adoptions at a total cost of $2,252,197 for just the electric IOUs. This would close the urban and suburban digital divide by 0.47%. If we also approximate the inclusion of SoCalGas and LADWP and use 1,500 as the educated estimate of the number of adoptions derived from efforts targeted at their customers, the urban and suburban digital divide would close by 0.53%.

Alternately, combining census data, CPUC broadband availability data and the adoption rate from the 2019 Broadband adoption survey, we find an estimated 2,341,398 households in urban and suburban areas which lack meaningful internet access despite access to infrastructure. The number of customers enrolled in the IOU CARE programs in Table 17 is greater than the estimated 2,341,398 urban and suburban customers without broadband. As the estimated number was extrapolated from the adoption survey data, the exact number could be different. Also, some number customers enrolled in the CARE program area already have broadband. If we take the SMUD rate and apply it to the calculated population estimate, we expect to generate 28,331 adoptions at a cost of $8,054,763. The difference between the CARE method and the calculated figure is the difference between closing the digital divide by 1.21% or 1.48%.

Effective civic participation is highly dependent upon internet access and digital literacy skills. As such, governments have a moral and ethical imperative to close the digital divide. Programs that yield an adoption rate of 1.21%–1.48% not suffice. As Hauge and Prieger and Manlove and Whitacre found with the BTOP projects, the data contained in this paper also does not support the expansion of these programs specifically or the continuation of these types of outreach efforts generally. In addition to being ineffective, continuing and expanding these efforts would give the illusion of action and delay the adoption of other policies that might prove more successful. This gives rise to the following key policy question: if the programs and investments that have been undertaken have not yielded results, what policies can governments implement to most effectively close the digital divide?

7. Policy recommendations

As the CBO-based outreach efforts that predominated the past decade have not succeeded, this section looks at what policies and programs governments could implement to close the digital divide.

Utility	CARE enrollees 4/19 (CPUC, 2019c)	Expected adoptions	Total cost
SDG&E	290,647	3,517	$999,870
PG&E	1,384,327	16,750	$4,762,294
So. Cal. Edison	1,192,387	14,428	$4,101,991
	Total	34,695	$9,864,155

Table 17. Projected adoptions from program expansion

The ISPs do not disclose data on enrollment numbers or outreach efforts for their existing affordable offers. The industry asserts it is competitive and to disclose the information would put them at a competitive disadvantage. An alternate explanation is the companies are not disclosing their enrollment numbers because it would point out how ineffective the programs are. Comparing the customer acquisition costs (CAC) from these projects and the monthly low-income revenue generated to the CAC and monthly subscription cost of the ISPs' standard offers, we find it highly likely that the ISPs will lose money on every adoption. The CAC for the projects discussed in this paper ranged from $206.70 to $699.29. If we take the lowest CAC in this study, $206.70, at the monthly low-income rate offered by Cox ($9.95) and AT&T ($10.00), it would take 20.6 months for the ISP to recoup just the cost of the acquisition. Using the more effective call center model used in the SMUD project, the time need to recoup the CAC stretches to 28.5 months. Those time periods also assume uninterrupted service and regular bill payment.

For comparison, in 2004 when the broadband adoption curve was the steepest, CAC averaged under $100/residential customer for standard commercial offerings (de Bernabé, 2004). More recently, a 2017 report on the wireless industry indicated companies reported their CAC to be in the $200–$400 range, and further stated it, "[. . .] compares quite favorably to the SAC [Subscriber Acquisition Costs] reported by cable, telco, and satellite providers for delivery of their video and broadband service" (Carmel Group, 2017).

As we saw in Table 2, the standard offers from the California ISPs are all around $50/month, with offers ranging from $30 to $100 depending on speed and other factors. Standard internet offers generally require a one- or two-year commitment. On a one-year commitment at the lowest priced offering and a CAC of $400, the time to recoup the CAC is just over 13 months. At the average offering price of $50/month, the recoup time is eight months.

The CAC to revenue differential and the time period to recovery between affordable offers and the standard offers is stark. Further, the affordable offerings have no contract requirement. Because of multiple factors tied to economics, low-income households are more likely to drop service or not pay their bills. Were a company to invest $206.70 to sign up the customer, they may only get revenue for a few months.

Further, because the ISPs do not report the enrollment numbers for their low-income programs, policymakers and researchers have no way of knowing what the natural rate of adoption is and therefore have no ability to compare the adoption rate from these projects to the company's own efforts. It does seem reasonable to conclude that with the digital divide not closing and with 1.21% being the best adoption rate achieved by the targeted programs analyzed in this paper, the natural adoption rate is unlikely to be higher than 1.21%. To achieve the 1.21% adoption rate took a significant effort at a significant cost. Given the economics, the ISPs would likely lose money for every customer they enroll.

To determine the true effectiveness of the current low-income offerings, policymakers should start by obtaining enrollment data and outreach efforts from the ISPs. Comparing that data to the data from the ARRA/BTOP programs and the pilot programs analyzed in this paper will allow policymakers and advocates to understand the effectiveness of existing offers and the types of efforts the ISPs use to drive enrollment.

Absent government intervention or the invention and deployment of new technologies, the competitive marketplace AQ: 13 has pushed deployment and adoption as far as it will go (Levine (2018). To approach 100% adoption and deployment will require changes in policy and/or new technologies. The data presented in this paper and the findings regarding the BTOP grants show that policymakers should create new digital inclusion policies and programs and not expand or repeat these efforts. Such new policies must account for the provision of an appropriate computing device. The current LifeLine program allows for a smartphone, but smartphone is only a supplement to a computing device (Levine, 2018). Governments should not treat it as an adequate replacement for a computing device. The functionality of a smartphone is not conducive to tasks such as typing and formatting a resume, filling out forms or job applications or typing term-papers, to name but a few (Smith, 2015). The policy recommendations here are all focused on the goal of ensuring low-income households have a reliable, high-speed broadband connection, an appropriate computing device and the skills necessary to use them. A government policy that does not recognize this will fail to achieve its goal.

Low-income programs used by other utilities provide excellent guidance for policymakers. The Lifeline program for telephony subsidizes monthly phone bills and can provide a free device, including a smartphone (FCC, 2016). Expanding Lifeline to broadband will overcome the affordability components of meaningful internet access, thereby addressing two of the three impediments – lack of broadband service and computing device – to obtaining it. Lack of computing skills is the other component of meaningful internet access. To ensure lack of digital literacy skills is not an impediment, programs must ask individuals about their need for training and incorporate referrals to digital literacy training into the program design.

The Energy Savings Assistance (ESA) and CARE programs in California also provide models for discounted pricing on services and equipment, as well as outreach and enrollment. The CARE program is similar to Lifeline but for electricity, whereas ESA provides a method for low-income households to obtain energy efficiency upgrades – insulation, dual pane windows, etc. – that would otherwise be unaffordable. The existing affordable broadband offers are either completely voluntary on the part of the companies or are mandated as part of a merger approval and will expire when the agreements end. The CARE and ESA programs are statutorily required programs, overseen by the CPUC (a regulatory arm of the government), operated by the electric utilities, have structure with enrollment targets and require outreach efforts and have reporting requirements. Currently, the FCC and others grapple with the issue of regulating the internet and broadband providers, but full regulation is not necessary to close the digital divide. Mandated policies and programs targeting low-income households should be implemented as they have been for electricity, telephony, natural gas, water and other necessary utilities.

Finally, as noted earlier in this paper, the 2019 Annual Broadband Adoption survey showed the digital divide in California went from approximately 70% for the past 6 years to 78% in 2019 (Berkeley Institute for Government Studies, UC Berkeley, 2019). The 2020 adoption survey will let us know if this is a trend or an anomaly in the data. However, an examination of the data in the 2019 Broadband Adoption Survey shows those gains came primarily from those households, which had students under the age of 18 residing in the house. Recent policy and programmatic changes in California have seen more school districts allowing students to take computers home with them. This directly addresses one of the key components of meaningful internet access (Levine, 2018) and one of the main impediments listed in the broadband adoption surveys (Berkeley Institute for Government Studies, UC Berkeley, 2017, 2019). Space does not permit a full examination here, but it can be reasonably inferred that these and other state and local efforts to increase the use of computers in schools may have played a significant role in that change. Given this, it would be useful to conduct a more rigorous examination of the state and local policies and programs that may have resulted in the increased adoptions.

8. Conclusions

Broadband did not enter the mainstream of daily life in the USA until the early to mid-2000s.

But, despite approximately 27% of the US population lacking meaningful internet access (Pew Research Center Internet and Technology, 2019), it is now an essential, completely integrated part of daily life in the developed world. Those who lack meaningful internet access suffer educational and economic harms. Finding a job without meaningful internet access is more difficult as many companies now require applicants to fill out an online application for employment, even for lower skill positions. Most of those applications are not mobile-optimized, meaning those without access or with access only via smartphone struggle to obtain the same economic outcomes as connected individuals. As government and business migrate information and services to digital platforms, the internet has become as indispensable to modern life as telephones and electricity.

In the USA, the ethical decision to help low-income households with utilities and quasi-utilities has already been made. There are programs to help with electricity, natural gas, water and telephony (including smartphones). There are programs to help with non-utility necessities such as food and health care. Collectively, the conversation – as evidenced by the discussions surrounding "Healthcare for All" – is about what level of assistance to provide and to whom. While broadband is not yet a utility, evidence clearly shows it is a necessity. For more than a decade, both the California and federal governments have put forward programs aimed at closing the digital divide by assisting rural and low-income households with broadband adoption. Implicit and explicit in those discussions has been the ethical responsibility to assist those without meaningful internet access. However, those adoption programs were substantially similar to each other, and the data shows they were mostly ineffective. While failure itself is not a breach of ethics, when confronted with evidence of that ineffectiveness, it would be an ethical failure for governments and advocates to continue to pursue and fund the same unsuccessful policies. The ethical debate has been settled, but the policy debate has not. In 2020, governments in the USA, and we would argue in all developed nations, have an ethical responsibility not to disenfranchise their constituents and therefore should create and implement new policies and programs to ensure everyone has sufficient access to the internet, computing technology and the vital benefits that access provides.

Notes

1. We infer that the adoption of broadband in a home means the household also has a device, and the skills necessary to use it. It would be illogical for a household to pay for a service they are unable to use.
2. Municipal utilities are autonomous entities, owned by the public and governed by a publicly elected board. They are subject to state law, but not CPUC regulatory law, and do not have to ask permission of the CPUC to expend funds.
3. An e-mail address was used as a surrogate for internet access. While not all who have an e-mail address have broadband at home, it is more likely that those without an e-mail address on file also lack meaningful internet access.
4. The customers were given their choice of provider. Some asked for information and phone numbers for both providers.
5. Utility customers enrolled in the CARE program are required to recertify their eligibility every two years. The utilities send "CARE Recertification" letters in advance to inform them of the requirement and process.

6. This number is slightly lower than the actual number. CETF pays the 844 number a monthly retainer to be the answering service for multiple input sources. It is not possible to apportion a *pro rata* share of the costs to this project, but the costs would be a few hundred dollars at most.
7. Adoptions were verified in the same manner as the 211 San Diego project, a call back to consenting clients, except for the iFan portion of the project with the adoption status verified by the CBO at the time of assistance.

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Corresponding author

Lloyd Levine can be contacted at: LloydLevine@Outlook.com