

**CONNECTED CITIES AND INCLUSIVE GROWTH (CCIG)
Policy Brief # 2
July 2017**

Mapping digital exclusion in Los Angeles County

The Internet is the lifeblood of social inclusion in the 21st century. It is a gateway to better education, to job opportunities, to health resources, and to civic engagement, among many other potential benefits of being online. These benefits, however, remain unevenly distributed. Despite decades of efforts to close the digital divide, large disparities in Internet access persist between populations defined by income, education, race and place of residency.

This policy brief maps the social and geographical contours of digital exclusion in Los Angeles County. The focus is on home broadband, which refers to the adoption of residential Internet services, regardless of access technology or devices used. Mobile broadband is also included, though treated as a separate category of interest. Following the 2016 FCC Broadband Progress Report, the analysis assumes that fixed and wireless broadband are imperfect substitutes, and that “both services provide necessary components of advanced telecommunications capability”.¹

The data is sourced from the 2015 American Community Survey (ACS), which is the latest available that allows for geographical disaggregation at the level of communities within Los Angeles County.² The ACS samples about 35,000 households in Los Angeles County per year.³ By identifying key trends and geographical patterns in Internet adoption, this document seeks to contribute new evidence that informs ongoing debates about digital inequalities in Los Angeles County.

1. The urban geography of home broadband

Despite limited competition, broadband services are available to the large majority (99.5%) of Los Angeles County residents.⁴ This suggests that geographical disparities in home broadband are largely driven by demographics and other demand-related factors. Income inequality is key among them, as illustrated in Figure 1. The figure reveals a strong association between wealth and broadband adoption across communities in Los Angeles County.

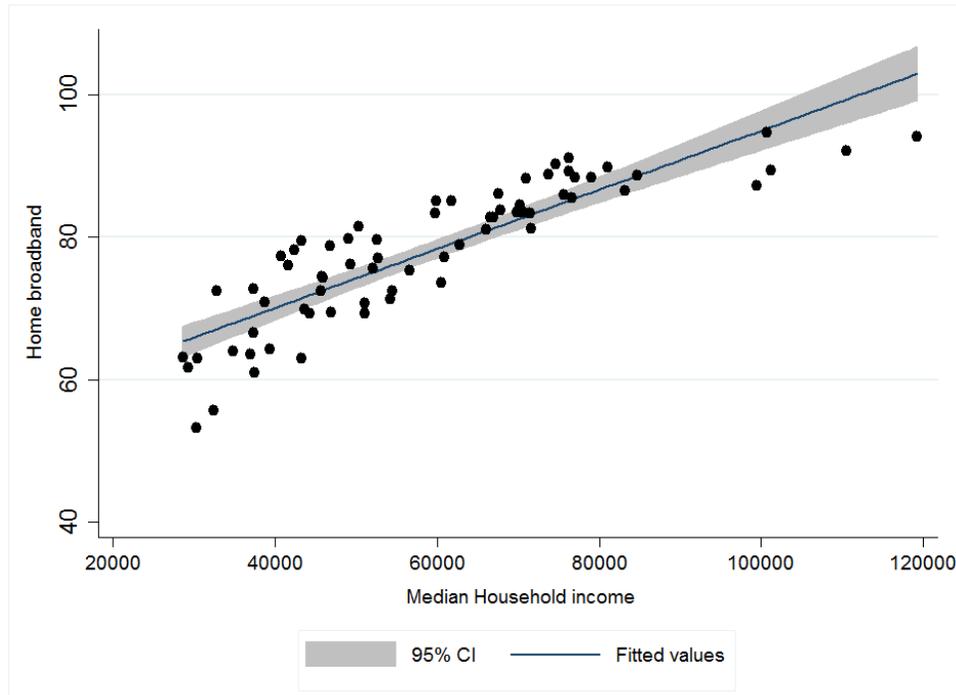
¹ FCC (2016), *Broadband Progress Report*. GN Docket No. 15-191, pp. 7 (released January 29, 2016).

² Communities are approximated by PUMAs, which are geographical areas defined by the Census Bureau with at least 100,000 residents. Los Angeles County is divided into 69 PUMAs.

³ See <https://www.census.gov/programs-surveys/acs/>.

⁴ See CCIG Policy Brief #1 (available at <http://arnicus.org/research/connected-cities>).

Figure 1: Home Broadband and Median Household Income by PUMA (2015)

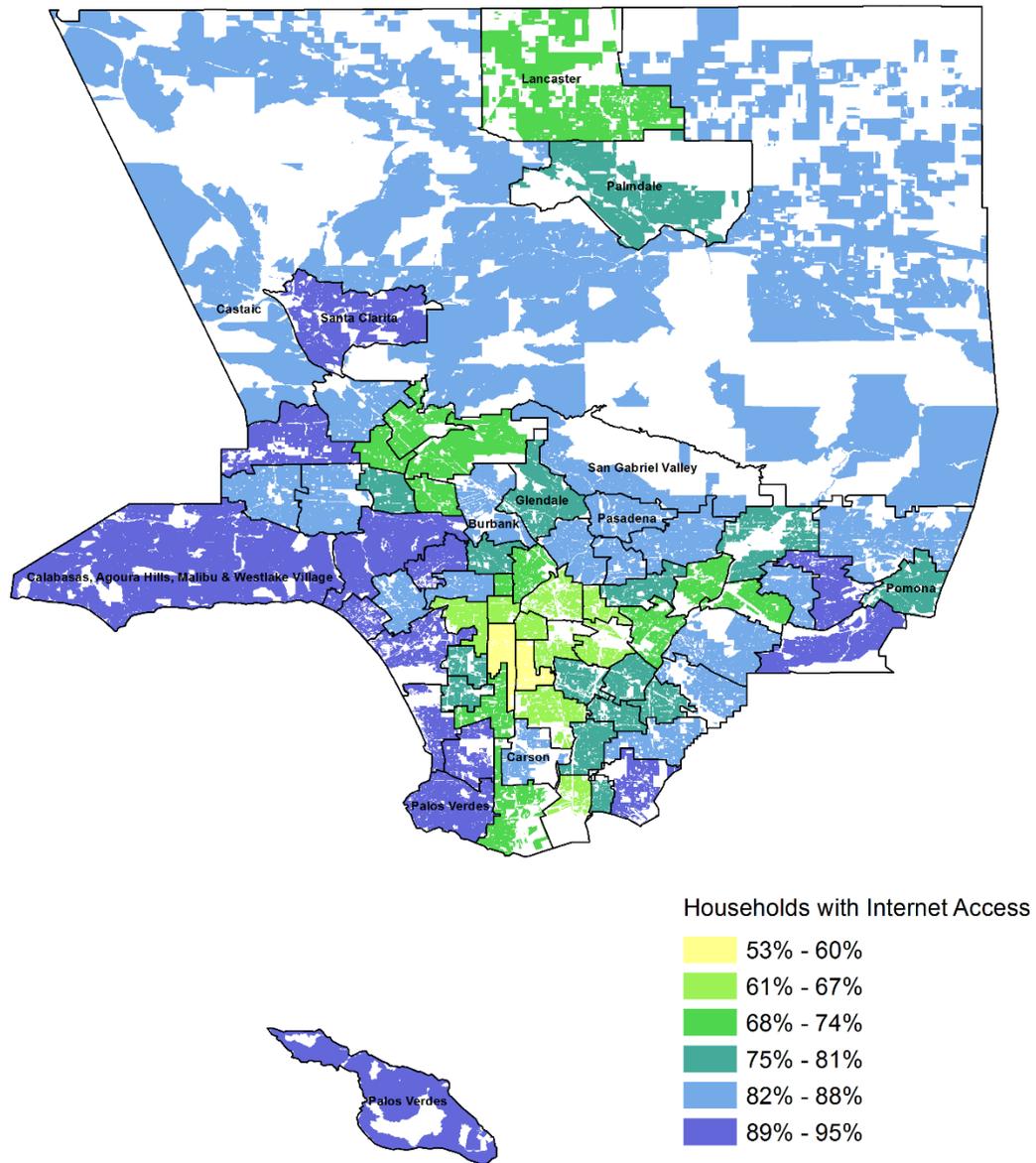


Source: American Community Survey.

Figure 2 maps the rate of home broadband adoption across Los Angeles County. As shown, adoption levels of 89% or above are common in West Los Angeles and coastal communities, as well as in some areas of the San Fernando Valley. This contrasts with East and in particular South Los Angeles, where only about half of the residents report having broadband service at home.

It is not surprising to find that the least connected communities are located in South Los Angeles, which comprises an area characterized by high poverty (64% of families qualify for free or reduced school lunch programs), limited human capital (46% of heads of household lack a high-school degree) and high concentration of people with disabilities (18% of heads of household report at least one disability). Lack of Internet access is both a result and a contributing factor to the poverty cycle that limits opportunities for social mobility in these communities.

Figure 2: Home Broadband Adoption Rates by PUMA (2015)⁵

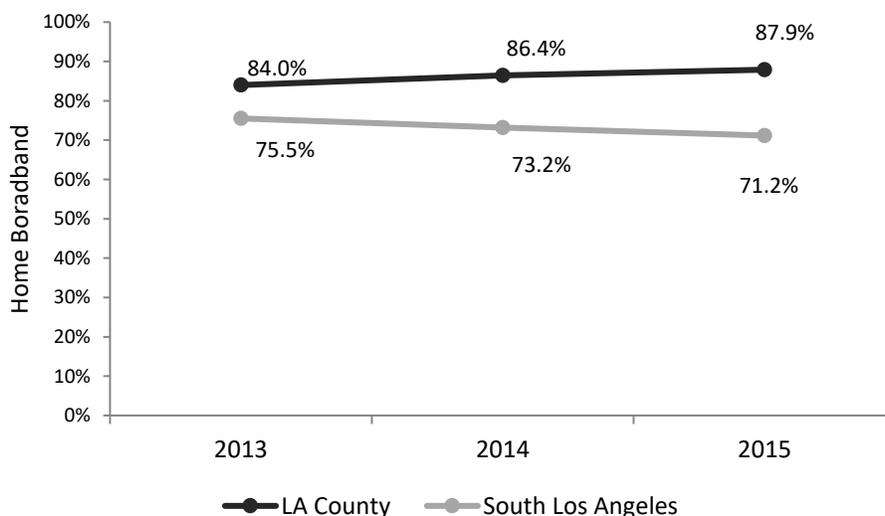


⁵ Census blocks with no population have been clipped out from the map.

Increasing human capital is key to promoting social mobility, and in particular for mitigating the intergenerational transmission of poverty. Ongoing efforts to improve K-12 education in South Los Angeles are nonetheless confronted with a growing *homework gap*, which refers to the disadvantages faced by low-income students without Internet access at home.

Countywide, the share of children in school age that live in connected households has increased from 84% in 2013 to 88% in 2015. By contrast, in South Los Angeles this share has fallen from 76% in 2013 to 71% in 2015 (Figure 3). Further, children in South Los Angeles are twice as likely to live in a household where mobile broadband is the only available gateway to the Internet. This puts these children at a significant disadvantage, distancing them from the growing universe of online educational resources and tools available to other students.

Figure 3: Home Broadband Adoption Rates in Households with Children in School Age



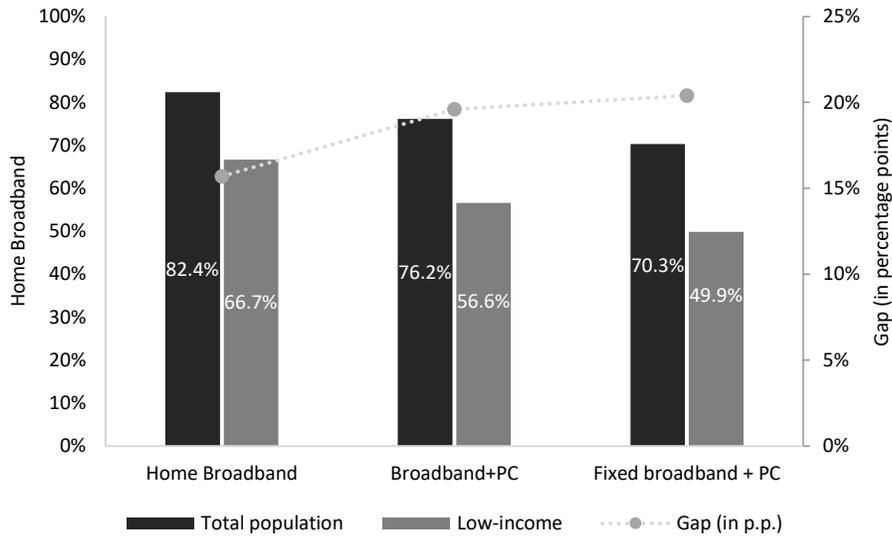
Source: American Community Survey.

2. A digital underclass? Fixed vs. mobile-only access

Overall, home broadband in Los Angeles County has increased from 79.8% in 2013 to 82.4% in 2015. This is a very modest increase which suggests that, save for a major reduction in prices, adoption is likely to plateau short of universal access. Further, the poor continue to fall significantly behind. As shown in Figure 4, a third of low-income households do not have home broadband, about double the rate in the general population (17.6%). When considering the availability of fixed broadband in combination with PC ownership, the share of connected low-income households falls below 50%.⁶

⁶ Low-income is defined following the California Department of Education's eligibility to receive free or reduced-price school meals which corresponds to 185% of the federal poverty guidelines.

Figure 4: Home Broadband Modality by Income Status (2015)

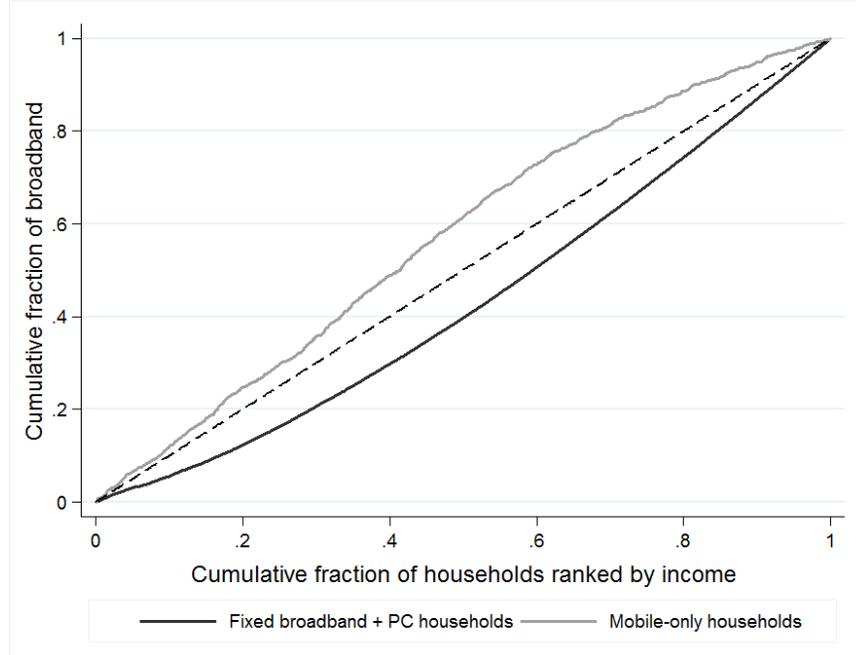


Source: American Community Survey.

There is also evidence that home broadband is increasingly polarized between higher-income households with PCs and fixed broadband connections and lower-income households where smartphone-based broadband is the only access alternative available. This polarization is apparent in Figure 4 (secondary axis), which reveals that the income gap increases in line with the quality of connectivity.

Another illustration of this polarization is found in Figure 5, which represents concentration curves for fixed broadband+PC and mobile-only access (on the y axis) based on a rank order of households by income (x axis). In other words, the curve indicates the extent to which the distribution of broadband among households deviates from the theoretical case of a distribution that perfectly matches that of household incomes.

Figure 5: Concentration Curve for Fixed and Mobile-only Access



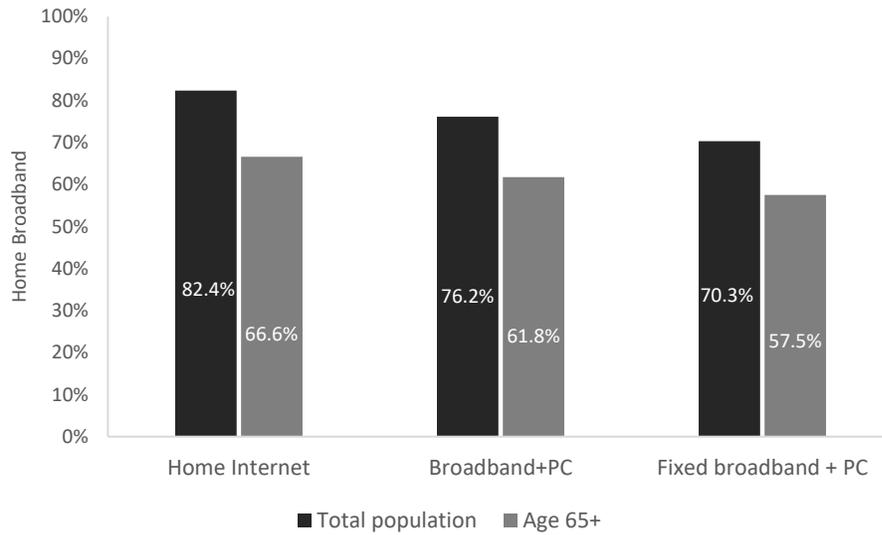
Source: American Community Survey.

As shown, mobile-only households skew poor. By contrast, there is a higher concentration of fixed broadband+PC access at higher incomes. The area between the two curves represents the gap between the full connectivity offered by fixed access and the more limited functionalities available through smartphone-based broadband. As households further diverge into different access modalities, the magnitude of this gap is likely to become an important benchmark for tracking future patterns in digital inequality.

3. *Connecting the disadvantaged*

A critical challenge for closing the digital divide relates to populations which, for different reasons, face higher barriers to Internet access. Among them are senior citizens (age 65+), who typically have lower ICT-related skills. Seniors can greatly benefit from the affordances of broadband, including remote health care and online learning tools. However, as shown in Figure 6, home broadband among seniors lags significantly with respect to the general population.

Figure 6: Home broadband and PC ownership by senior status



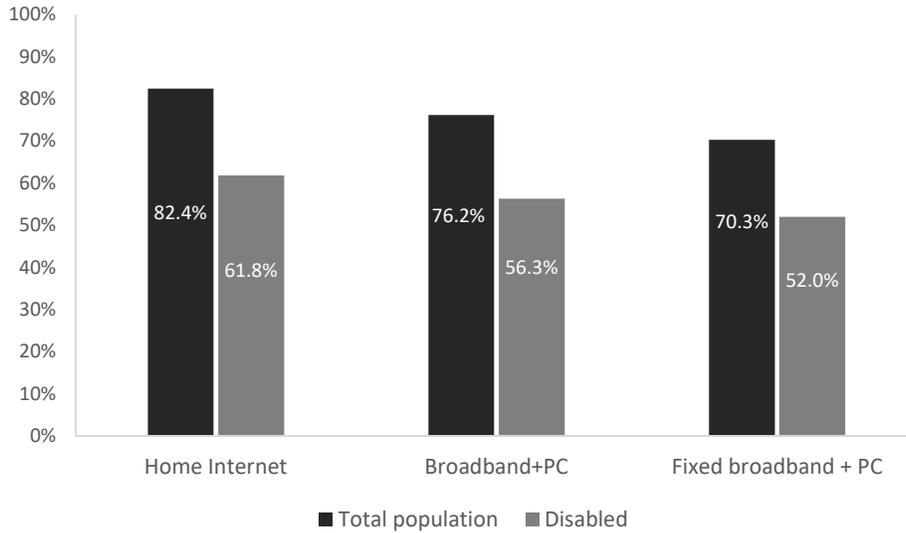
Source: American Community Survey.

Because senior status is associated with other factors that affect Internet access (notably income), a multivariate probability model is needed to isolate the effect of age. This model is presented in the Technical Appendix. The results indicate that, after controlling for income and several other demographic characteristics, age remains a strong predictor of home broadband. More specifically, for every additional year of age the odds of having home broadband drop by about 3%. This indicates the need to address motivational and skills-based barriers to access among this population.

Another group at high risk of digital exclusion is people with disabilities. Home broadband could greatly benefit the disabled, facilitating the delivery of services and enabling economic and social inclusion for those with limited mobility. Further, there is a growing array of devices and interfaces specifically designed to facilitate access for people with different sensory disabilities. However, low adoption rates remain an obstacle to the realization of these benefits, as illustrated in Figure 7.

Disability status also affects several other variables (such as income) that are strongly associated with home broadband. However, results from the probability model show that, after controlling for income and other demographic factors, people with disability remain about 13% less likely to have home broadband. This gap further reinforces the disadvantages associated with disabilities, aggravating social exclusion in this population.

Figure 7: Home Broadband and PC Ownership by Disability Status



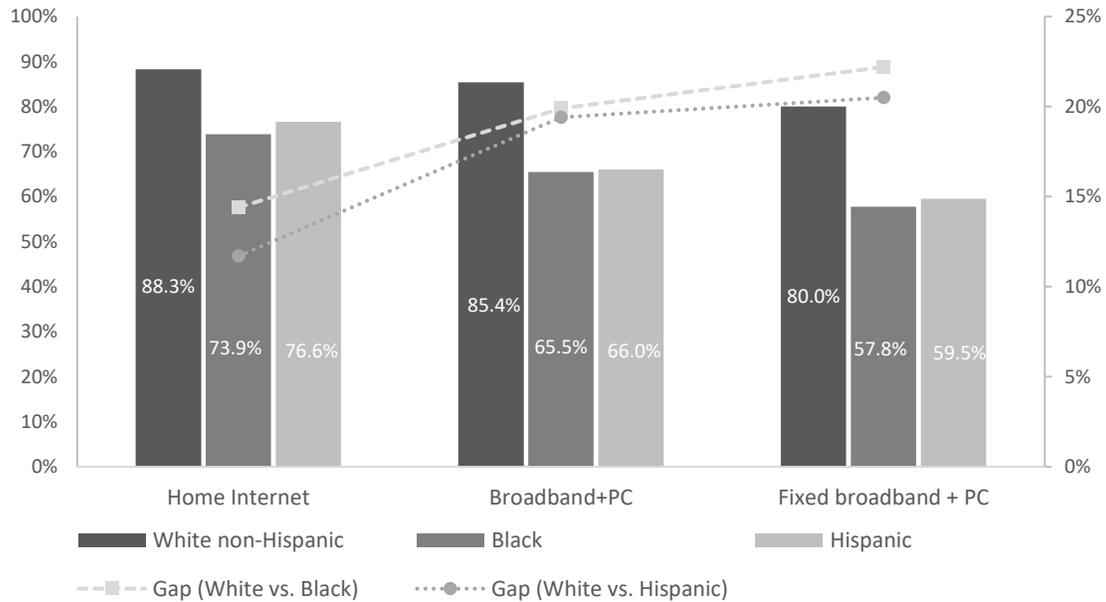
Source: American Community Survey.

4. Racial disparities in home broadband

Race continues to be an important determinant of opportunities for Internet access, as it is for many other resources. As shown in Figure 8, home broadband adoption among African-American and Hispanics trails significantly behind that of non-Hispanic whites. Further, the racial divide is aggravated when considering higher-quality alternatives associated with fixed broadband service and PC ownership. This reflects a significantly higher incidence of mobile-only households among racial minorities (7.2% vs. 3.5% among non-Hispanic Whites). For example, while the home broadband gap between non-Hispanic Whites and African-American households is about 15 percentage points, it widens to about 22 percentage points for higher-quality access modalities associated with fixed broadband and PC ownership.

The probability models in the Technical Annex confirm that, after controlling for income, education and other demographic factors, race continues to be a very significant explanatory factor of connectivity gaps. Other things equal, when the head of household is Hispanic the odds of having home broadband drop by about 37%. Likewise, in the case of an African-American head of household the odds drop by 31%.

Figure 8: Home Broadband and PC ownership by Head of Household Race



Source: American Community Survey.

5. Conclusion

The evidence presented in this document indicates that the social and economic dividends associated with the Internet are not extending to those most in need. In South Los Angeles, only about half of the residents report having a broadband connection at home, and there are indications that the homework gap for K-12 students is growing. Seniors and people with disabilities continue to face higher barriers to access, and the racial gap in connectivity remains large even after accounting for differences in income and other demographics. Further, the findings suggest the emergence of a mobile-only digital underclass with more limited digital capabilities.

A concerted public-private effort is needed to address these challenges. So far, policy initiatives have focused on the promotion of private infrastructure investments in advanced broadband services. While such investments are visibly necessary to increase competition in residential services, there has been relatively less attention to initiatives promoting adoption. This involves digital literacy training and outreach programs to promote the uptake of services targeted at specific populations, including those with disabilities, seniors and low-income residents.

The California Assembly Bill 1665, known as the Internet For All Now Act, is a promising step in the right direction.⁷ The bill would prolong ongoing efforts to ensure the availability of broadband in rural and remote communities throughout California, but more importantly would authorize funds specifically aimed at promoting adoption among disadvantaged populations in urban areas. This exemplifies the type of policy intervention required to ensure that all Angelenos share the opportunities for social and economic progress associated with Internet access.

⁷ See <http://www.internetforallnow.org/>.

Technical Appendix

The data used in the study is sourced from the American Community Survey (ACS) which samples about 35,000 households in Los Angeles County. Since 2013, the ACS includes two questions about Internet access. The first question relates to the availability of Internet access in the household (regardless of access technology or device), and the second inquires about specific access technology (fixed, mobile, dial-up, etc.).

The model estimates the effect of different demographic factors on the probability that a household has home broadband (regardless of access technology). A logit, population-weighted model is fit to the data, using several demographic covariates (listed below) as well as a fixed term for geographical location (at the PUMA level). This term significantly reduces concerns about unobserved differences between communities (including broadband supply factors) that may affect the results. The characteristics of the head of household are used for demographic factors that cannot be represented at the household level, such as gender, age and education.

Probability of Home Broadband (logit estimation with PUMA fixed term)

	Odds Ratio	SE	z	P>z	95% C.I.	
<i>Income (log)</i>	1.420627	0.0355	14.05	0	1.352724	1.491938
<i>Education (omitted category: less than HS)</i>						
<i>HS graduate</i>	1.462846	0.081693	6.81	0	1.311182	1.632053
<i>Some college</i>	2.623655	0.158585	15.96	0	2.33054	2.953636
<i>Graduate (B.A./B.S.)</i>	4.303958	0.331473	18.95	0	3.700939	5.005231
<i>Post-graduate</i>	5.078649	0.524925	15.72	0	4.147331	6.219102
<i>Age</i>	0.970015	0.001579	-18.7	0	0.966925	0.973116
<i>Hispanic (1=yes)</i>	0.627785	0.034424	-8.49	0	0.563814	0.699014
<i>Black (1=yes)</i>	0.689904	0.053078	-4.82	0	0.593336	0.802189
<i>Children in K-12 (1=yes)</i>	1.134239	0.074346	1.92	0.055	0.997495	1.28973
<i>Non-English HH (1=yes)</i>	0.880464	0.046596	-2.41	0.016	0.793714	0.976695
<i>Disability (1=yes)</i>	0.866264	0.044721	-2.78	0.005	0.782902	0.958503
<i>Male head of HH (1=yes)</i>	1.001006	0.040674	0.02	0.98	0.924378	1.083987
<i>Employed (1=yes)</i>	1.428275	0.07197	7.07	0	1.293958	1.576536
<i>Number of HH members</i>	1.314551	0.030014	11.98	0	1.257021	1.374713
<i>HH tenure (omitted category: owned with mortgage)</i>						
<i>Owned no mortgage</i>	0.689769	0.045124	-5.68	0	0.606763	0.78413
<i>Rent</i>	0.367174	0.020793	-17.69	0	0.328601	0.410275
<i>Occupied</i>	0.37575	0.055659	-6.61	0	0.281069	0.502325
<i>constant</i>	0.335594	0.111643	-3.28	0.001	0.17484	0.644149

Number of observations =34,989

Pseudo R2 = 0.2578

Wald chi2 = 4111.90

Prob > chi2 = 0.0000

Log pseudolikelihood = -1109212.2

This document is part of the Connected Cities and Inclusive Growth (CCIG) project, a collaboration between the USC Annenberg Research Network for International Communication (ARNIC) and the USC Price Spatial Analysis Lab (SLAB). More information about the project can be found at arnicusc.org/research/connected-cities.

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About ARNIC

The Annenberg Research Network on International Communication (ARNIC) studies the emergence of new communication infrastructures, examines the attendant transformation of government policies and communication patterns, and analyzes the social and economic consequences. The project is multi-disciplinary – including communication, sociology, economics, and political science approaches – and follows an international comparative perspective spanning North America, Latin America, Asia, Africa, the Middle East, the Pacific, Western and Eastern Europe.

About SLAB

SLAB, the Spatial Analysis Lab at USC Price, aims to advance the visualization of the social sciences for public service through research, public engagement, and teaching. Our research experiments with developing alternative cartographies and exploring their potential roles in society, endeavoring to create knowledge and narratives that support an increasingly inclusive city. Aligned with Price's commitment to social justice and equity, the various activities of SLAB focus on bringing creativity and a humanistic attention to marginalized peoples and places.

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