CONNECTED CITIES AND INCLUSIVE GROWTH (CCIG)
Policy Brief # 6
April 2020

The Distance Learning Gap in California

This policy brief examines the availability of distance learning resources for K-12 households in California. The report expands on a previous report that was limited to Los Angeles County (CCIG Policy Brief #5). The analysis seeks to identify demographic and spatial patterns in the availability of two key resources for distance learning: a desktop or laptop computer and an Internet connection. The data comes from the American Community Survey (ACS) 5-year estimates for 2018, the latest year available.

The previous report assumed that mobile broadband services, for a variety of reasons, fall short of meeting the needs of K-12 students for distance learning. This assumption is relaxed in the current report due to the limited availability of high-speed residential Internet (e.g., DSL or cable) in many rural California communities.[1] This report therefore examines the availability of distance learning resources using two different metrics:

1) The share of households with a PC (desktop or laptop) and fixed (wireline) Internet service;

2) The share of households with a PC (desktop or laptop) and Internet service (regardless of type of service).

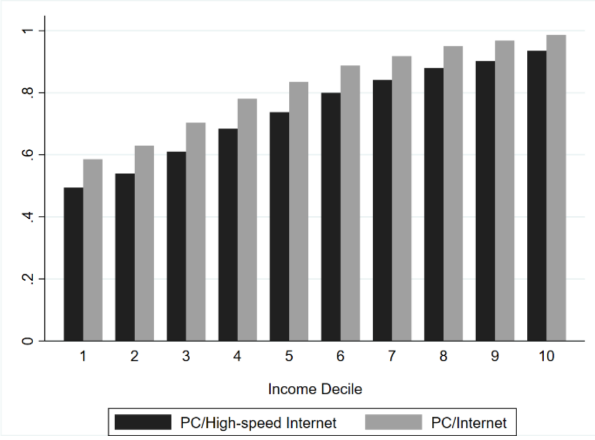
One in four K-12 households in California are without distance learning resources, but one in two low-income households are ill-equipped for online learning.

Overall, one in four K-12 households in California do not have a desktop or laptop computer and a high-speed Internet connection. This represents about 870,000 families whose child or children are likely to fall behind in educational attainment during the COVID-19 crisis. If households with mobile broadband service are also included, the share of K-12 households lacking resources for distance learning falls to 17%, which represents about 610,000 families.

As expected, there is a strong association between wealth and distance learning resources at home. Only about half of the families in the bottom 20% of the income distribution have a desktop or laptop computer and subscribe to high-speed internet. This compares to over 90% of families in the top income quintile (Figure 1). In absolute terms, the gap is similar when using the metric that includes households with mobile broadband service: while the share of families prepared for distance learning in the bottom income quintile rises to about 60%, the same share climbs to 97% among the top income quintile.

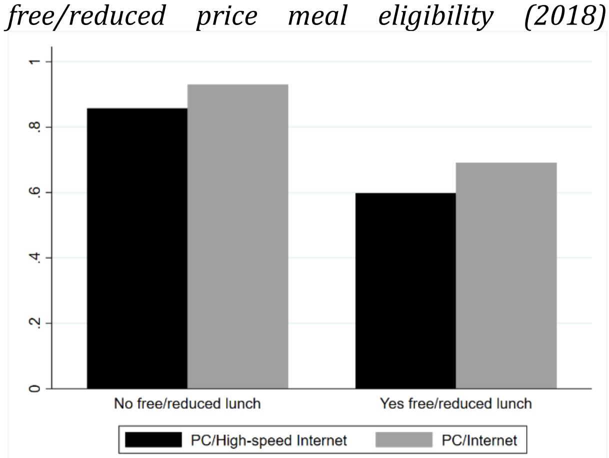
[1] See CPUC Annual DIVCA Report (2019). The definition of rural areas is based on the USDA-ERS classification for PUMAs.

Figure 1: Internet and PC availability by income decile (2018)



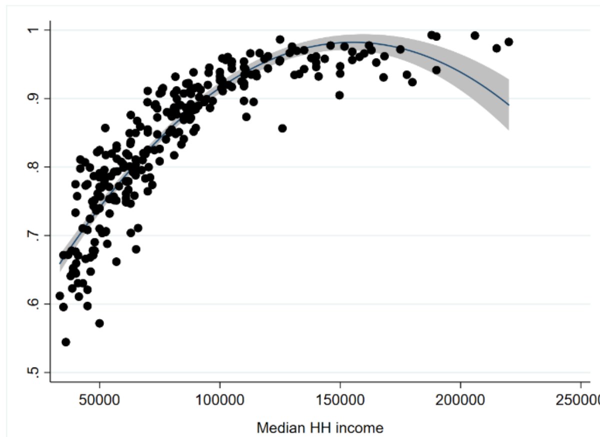
Another indication of the disparities in distance learning opportunities is presented in Figure 2. The analysis uses eligibility for free or reduced-price meals as a proxy for students who are socioeconomically disadvantaged. As shown, students who are eligible for these benefits are significantly less likely to have access to distance learning resources at home. Interestingly, while the gap is larger for high-speed internet and PC availability (about 26 p.p.), it is only slightly smaller when families with mobile broadband are included (about 24 p.p.)

Figure 2: Internet and PC availability by free/reduced price meal eligibility (2018)



A similar pattern is apparent at the broader community level. Figure 3 plots the availability of an internet-enabled computer (regardless of connection type) and median household income by PUMA, the smallest geographical unit for which data is available.[2] As expected, the availability of distance learning resources is significantly higher in more affluent communities. At the same time, there are large differences between less affluent communities which suggest that local conditions and initiatives are also important to determine readiness for online learning.

Figure 3: PC/Internet availability (any type) and median income by PUMA (2018)



The figures below map the availability of distance learning resources among K-12 households based on the two metrics used in this study. Households in coastal metro areas are generally better equipped than those in the rural communities of the Central Valley, Southeast and Northern California. However, large concentrations of under-resourced households exist within metro areas. As an example, the availability of an internet-enabled PC at home for students in South LA is only slightly above that for students in Tulare County, which has the lowest availability rate in the state.

[2] PUMAs are geographical areas defined by the Census Bureau with at least 100,000 residents. California is divided into 265 PUMAs.

Figure 4: Availability of PC/Internet (any type) among K-12 households (%) by PUMA

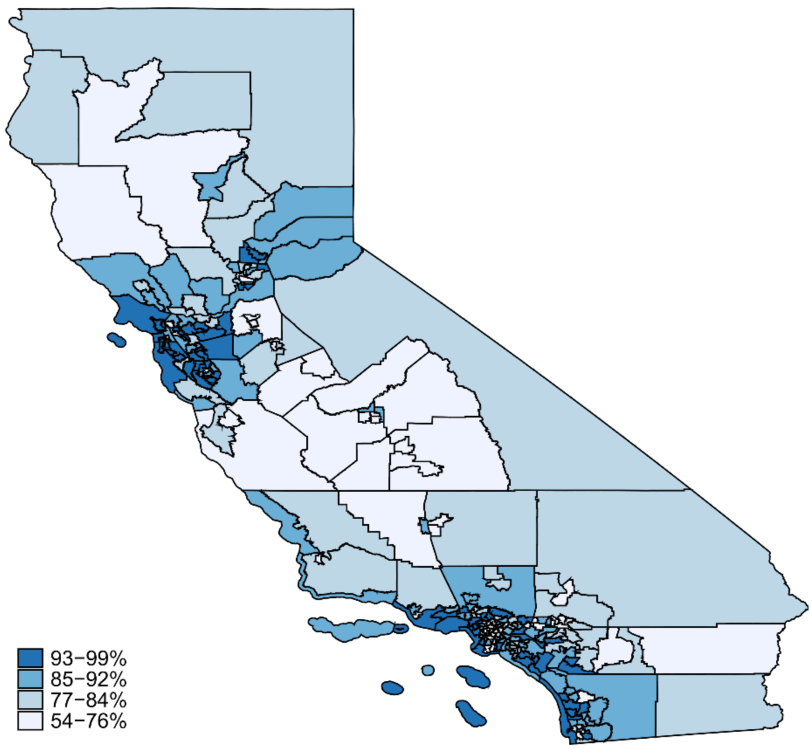
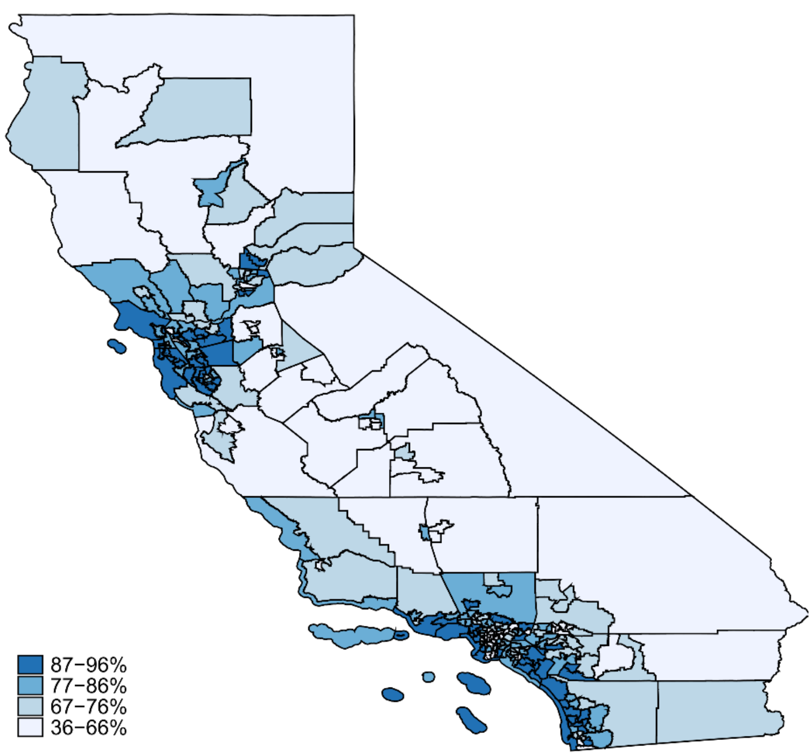


Figure 5: Availability of PC/high-speed Internet among K-12 households (%) by PUMA



Regardless of income, rural and minority K-12 households are less likely to have distance learning resources

While a key determinant, income is hardly the only factor affecting household preparedness for distance learning. Large disparities also exist along the urban-rural divide. Even though less than 2% of California's households are rural, these families are disproportionately under-resourced for online learning. The share of rural households with high-speed internet and a PC stands at 62%, significantly below the share for urban families (75%). If families with mobile broadband are also included, the share of rural households with distance learning resources climbs to 80%, only slightly behind the share for urban families (83%).

The rural disadvantage results from a number of factors, including lower household incomes (about 30% on average in our dataset). In order to account for income-related factors, a multivariate model is used to predict the availability of distance learning resources among K-12 households based on location (urban/rural) while controlling for family income. Geographical location by PUMA is also included in the models to control for place-based factors impacting resource availability.

Table 1: Distance learning resources in K-12 households (logit regression coefficients)

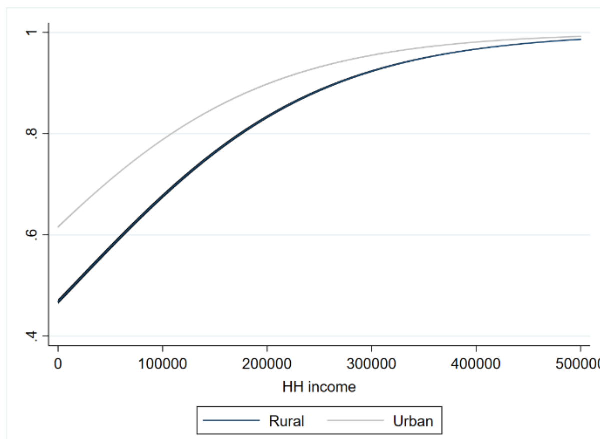
	PC/high-speed internet	PC/internet (any type)
HH income	8.95e-06***	1.78e-05***
	(3.87e-08)	(5.36e-08)
Urban (=1)	1.018***	0.573***
	(0.0474)	(0.0661)
Location control	yes	yes
Constant	0.221***	0.901***
	(0.0292)	(0.0399)
Observations	3,549,189	3,684,709

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results show that, regardless of income, K-12 households in rural areas are significantly less likely to be equipped for distance learning. Interpreting the results in odds ratios, the chances that an urban household has a PC and high-speed Internet are almost twice as large as those for a rural household. When the indicator includes wireless broadband, the relative odds for urban households are still about 75% higher. These results reflect the fact that rural students, regardless of income, are more likely to attend under-resourced schools where technology initiatives are less likely to be adopted.

Figure 6 offers a visualization of these results by plotting the predicted odds of urban and rural households having the resources for distance learning at different levels of family income. As shown, the differences are particularly large at lower income levels. As annual household income rises above 300K, the differences become significantly smaller.

Figure 6: Predicted probability of PC/high-speed Internet by location (urban-rural)



The results also show that Black and Hispanic students are at greater risk of falling behind due to lack of distance learning resources at home. Again, a multivariate model is used to disentangle the effect of income from that of race factors. As in the previous model, geographical location by PUMA is also included in the model to control for place-based factors impacting household resource availability (Table 2).

Table 2: Distance learning resources in K-12 households (logit regression coefficients)

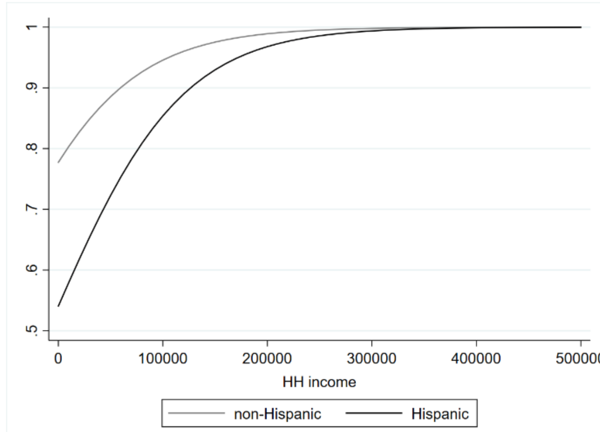
	PC/high-speed internet	PC/internet (any type)
HH income	7.91e-06***	1.66e-05***
	(2.97e-08)	(4.22e-08)
Hispanic (=1)	-0.670***	-0.910***
	(0.00247)	(0.00302)
Black (=1)	-0.342***	-0.543***
	(0.00399)	(0.00452)
Location control	yes	yes
Constant	1.659***	2.201***
	(0.0320)	(0.0489)
Observations	5,971,420	6,206,427

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Interpreting results in odds ratios, the chances that a Hispanic student lives in a household with a PC and high-speed internet are only about half relative to those for a non-Hispanic student, regardless of income and location. Similarly, the chances for a Black student are about 70% relative to those of non-Black students. These differences suggest that, regardless of family income, Black and Hispanic students are more likely to attend schools with fewer technology resources, and to live in areas with fewer connectivity options.

A visualization of these results is found in Figure 7, which plots the probability of a Hispanic student having a PC and high-speed internet at home at different levels of income. As shown, the differences are large for annual incomes below 150K, where about 85% of K-12 Hispanic households are concentrated. For example, at the 55K income level (the median income for Hispanic K-12 households), the probability that a Hispanic student has an Internet-enabled PC at home stands at 63%, significantly below the 80% for a non-Hispanic student with similar family income. As shown, at higher levels of income the differences in distance learning resources become significantly smaller.

Figure 7: Probability of PC/high-speed internet for Hispanic/non-Hispanic students by HH income



Distance learning threatens the role of schools as engines of social mobility

Previous studies have shown that prolonged school closures, from those caused by the polio epidemic in 1916 to the Ebola outbreak in 2014, tend to have a disproportionately large negative impact on students from families already struggling with poverty or other forms of resource deprivation. Today, as California schools remain closed for the foreseeable future, distance learning tools have the potential to mitigate these negative impacts and prevent at-risk students from falling further behind.

At the same time, as documented throughout this report, the opportunities afforded by online learning are not equally available to all. Students who are less affluent, live in rural areas, and those from Black or Hispanic households are less likely to have access to an internet-enabled PC that is readily available for school activities. This not only violates their constitutional right to education but also threatens the slow but steady narrowing of student achievement gaps in recent years. State and local leaders have already taken important steps to correct these disparities, but much more will be needed to address the needs of California families struggling to transition to distance learning.

About the project

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.

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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