Disconnected from Higher Education

How Geography and Internet Speed Limit Access to Higher Education

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Approximately 3 million American adults lack access to higher education based on where they live. These people live more than 25 miles from a broad-access public university and do not have access to the high-speed internet connection needed for online education.

Previous work on education deserts has identified areas where access to physical universities is limited (Hillman and Weichman 2016). Our study is the first to examine access to online education. Although online education is not a perfect substitute for learning in a physical classroom, increasing access to online coursework is a common response to the issue of education deserts. Previous studies of online education have found that the least-prepared students perform worse in online courses than in face-to-face courses (Alpert, Couch, and Harmon 2016; Bettinger and Loeb 2017). For the most part, students in hybrid courses that include both face-to-face and online coursework perform about the same as students in face-to-face courses (Alpert, Couch, and Harmon 2016; Bowen et al. 2014). One study found that students taking the same course in a hybrid format instead of the traditional face-to-face format had a small negative impact on student performance (Joyce et al. 2014). Additionally, a recent study on Georgia Tech's online master of science degree in computer science found that online education expands access to higher education rather than only acting as a substitute for face-to-face courses (Goodman, Melkers, and Pallais 2016).

Our work examines how many students (who are physically isolated from higher education) have the opportunity to access online education and how many are still isolated. Using data from the Integrated Postsecondary Education Data System (IPEDS) and the Federal Communications Commission (FCC), we identify three types of education deserts: physical education desert only, online education desert only, and both a physical and online education desert.

After looking at where these deserts are physically located, we used data from the American Community Survey and the US Census to determine who lives in these deserts. Although some students

move to enroll in college, the further prospective students live from a college or university, the less likely they are to enroll (Goodman, Hurwitz, and Smith 2015; Kennedy and Long 2015). Additionally, prospective students who have work and family commitments may be less likely to move to attend college. People living in an education desert are among those with the least access to higher education.

Defining Education Deserts

In line with an existing definition of physical education deserts, we define physical deserts as either having no colleges or universities within 25 miles or having access to a single community college as the only broad-access public institution within 25 miles (Hillman and Weichman 2016). The second half of this definition is an important distinction because community colleges and other broad-access public institutions serve their local communities, more so than private institutions or selective public universities. Using the FCC's benchmark for measuring broadband internet access, we define online education deserts as areas where internet speeds are below 25 megabits per second (Mbps) for downloads and 3 Mbps for uploads (FCC 2016a).

Who Is More Likely to Live in a Complete Education Desert?

Our estimates of the number of adults living in physical education deserts are similar to estimates in previous work, even though we employ a different analytic strategy. We find that 17.6 percent of adults live in a physical education desert. Although many people who live in these deserts have sufficient broadband service to access online education, 1.3 percent of adults (3.1 million) have access to neither physical nor online education (a complete education desert, table 1).

TABLE 1

Types of Education Deserts and Share of Adults Living in Each Type

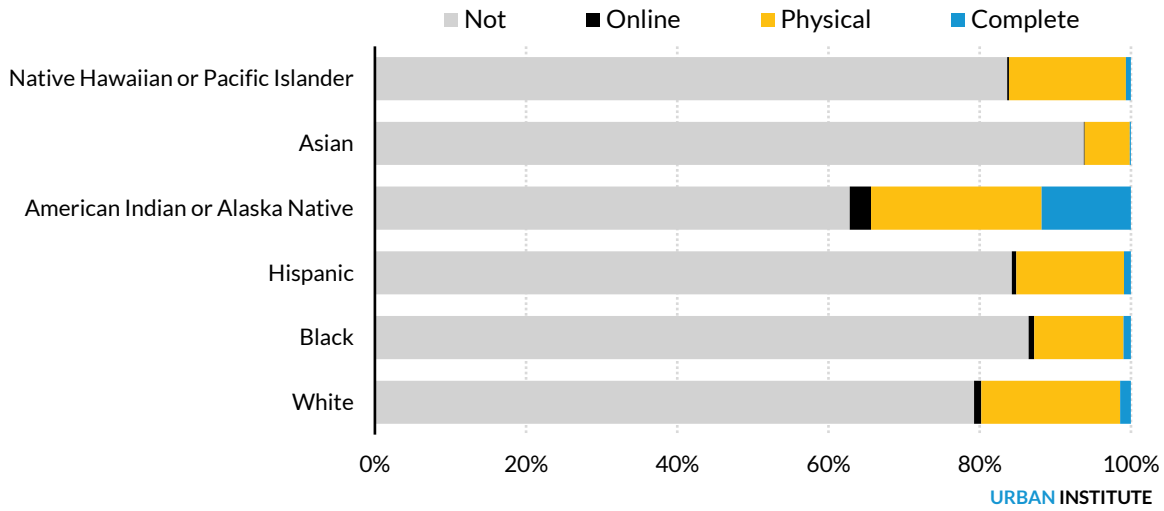
	Online education desert	Not an online education desert
Physical education desert	Complete education desert: 1.3%	Physical education desert: 16.3%
Not a physical education desert	Online education desert: 0.8%	Not an education desert: 81.6%

Source: Urban Institute analysis of American Community Survey, Census Bureau, Integrated Postsecondary Education Data System, and Federal Communications Commission data.

Previous work on physical education deserts found that although people living in physical education deserts are primarily white, a disproportionately large number of Native Americans live in physical education deserts. The same holds true for people living in complete education deserts. Only 1.3 percent of the US population lives in a complete education desert, but 11.8 percent of American Indians and Alaska Natives live in education deserts (figure 1).

FIGURE 1

Share of Adults Living in Each Type of Education Desert, by Race or Ethnicity



Source: Urban Institute analysis of American Community Survey, Census Bureau, Integrated Postsecondary Education Data System, and Federal Communications Commission data.
Note: People who identified themselves as non-Hispanic white are included in the "White" category, and all people who identified themselves as Hispanic are included in the "Hispanic" category.

Older Americans are more likely to live in complete education deserts than the average American. Because 82 percent of people living in education deserts are in rural areas, these age demographics may be because of migration trends in rural counties. According to the US Department of Agriculture, the older age of the population in rural counties is likely a function of younger adults leaving and older retirees moving into the area.[1]

Communities in complete education deserts have lower median family incomes than communities that are not in complete education deserts. The median family incomes, weighted by population, for families not living in an education desert and those living in a complete education desert are approximately $56,500 and $41,000, respectively.

Communities without access to higher education have lower levels of educational attainment than those with access to online and physical higher education. People living in a complete education desert and those not in an education desert have similar levels of high school or GED completion, but these two communities are less similar with respect to college enrollment. The educational attainment gap in high school completion is only 6 percentage points, the gap in college enrollment is 16 percentage points, and the gap in college completion is 18 percentage points. About 45 percent of the people in a complete education desert enrolled in college, compared with 61 percent of those not living in an education desert.

Conclusion

For most disadvantaged students, the problem is not necessarily enrolling in college, but completing college (Sawhill 2013). But for prospective students who have work or family commitments and live in education deserts, enrollment might be the primary problem. Most research focuses on improving college enrollment to increase access, but our study adds to the growing body of research that shows that researchers should also focus on the geography of college access (Hillman and Weichman 2016; Kennedy and Long 2015; López Turley 2009).

Further, we believe our estimate represents a lower bound for the prevalence of online education deserts. First, although we find that 2.2 percent of adults lack access to 25 Mbps download and 3 Mbps upload service, a recent FCC report, using data at the census block level instead of the block group level, found that 10 percent of Americans lack this access (FCC 2016b). If we assume that the proportion of online deserts that are also physical deserts (two out of three) remains the same, the true share of Americans living in complete education deserts may be closer to 6 or 7 percent.

Second, the FCC report notes that the maximum advertised speed is not necessarily the speed available to all consumers in a given area and that actual speeds vary by provider (FCC 2016b). This suggests that the estimate in our study is a lower bound of the number of Americans who lack broadband access through an internet provider. Third, research on physical education deserts suggests that estimates of the number of adults living in a physical education desert are conservative (Hillman and Weichman 2016). Thus, the number of people living in education deserts may be higher than we have estimated here.

Our findings suggest potential remedies. To expand physical access in education deserts, some have suggested that selective private or selective public institutions operating in deserts could form partnerships with local community colleges, which are better designed to serve their communities than selective institutions (Hillman and Weichman 2016). Through these partnerships, local community colleges could find ways to expand degree options beyond associate degrees by improving the transfer and articulation process to the nearby selective four-year school. To expand online access in education deserts, the federal government could decrease the cost of broadband deployment.[2] In addition, the FCC recently inquired about benchmarking mobile broadband access and including both mobile and fixed broadband access in their analyses (FCC 2017). Although these two are not substitutes, we need to learn more about the differences between these services when it comes to caps on downloads and costs. Mobile broadband deployment may be more beneficial for minorities and adults, but these benefits might not translate into online education access (Prieger 2015).[3]

Increasing access to broadband is an important part of increasing access to online education, but this solves only part of the access issue. Prospective students still need access to the appropriate hardware and software for their online programs. Currently, institutions are allowed to include the costs of purchasing or renting a personal computer in their aid allowances for books, supplies, transportation, and miscellaneous personal expenses (Federal Student Aid Handbook 2015).

This study demonstrates what many Native Americans, rural Americans, and other Americans living in education deserts already know: the internet has not untethered all of us from our geographic locations. As long as broadband access depends on geography, place still plays an important role in access to higher education.

Data

Our study uses data from five sources (table 2). Many of the variables are straightforward, but a couple require additional definition.

TABLE 2

Data Sources and Relevant Variables

Source	Years	Data
American Community Survey (via IPUMS)[a]	2011–15	At the census block group level: ▪ Educational attainment for the population ages 25 and older ▪ Median household income in the past 12 months (in 2015 inflation-adjusted dollars)
Integrated Postsecondary Data System[b]	2001–14	Higher education institutions: ▪ Longitude and latitude ▪ Number of admissions and applicants ▪ Number of two- and four-year degrees awarded ▪ Institutional control (public, nonprofit, or private) ▪ Institutional status, which indicates whether the school was consolidated with another school for reporting, among other indicators of status
Federal Communications Commission[c]	2016	For each provider at the census block level: ▪ Maximum advertised upload and download speeds offered to consumers and residents in the census block
Missouri Census Data Center[d]	2010	At the census block group level: ▪ Longitude and latitude of centroids ▪ Population as the weight
US Census (via IPUMS)[a]	2010	At the census block group level: ▪ Total population ▪ Urban and rural ▪ Race ▪ Hispanic or Latino origin by race ▪ Age

Note: IPUMS = Integrated Public Use Microdata Series.

[a] For information about IPUMS, see the website for the National Historical Geographic Information System at https://www.nhgis.org/.

[b] "Use the Data," National Center for Education Statistics, Institute of Education Sciences, Integrated Postsecondary Data System, accessed January 18, 2018, https://nces.ed.gov/ipeds/Home/UseTheData.

[c] See "Explanation of Broadband Deployment Data," Federal Communications Commission, last updated November 20, 2017, https://www.fcc.gov/general/explanation-broadband-deployment-data.

[d] See "MABLE/Geocorr 14: Geographic Correspondence Engine," Missouri Census Data Center, last updated December 20, 2017, http://mcdc.missouri.edu/websas/geocorr14.html.

First, the maximum advertised upload and download speeds are based on what individual providers offer in a census block. These values come from the Form 477 that providers file with the FCC twice a year. Additionally, centroids are the center of the block group area, weighted by population, which we downloaded from the Missouri Census Data Center.

Methodology

First, we collapsed all the FCC data from providers at the census block level to the census block group level, taking the highest of the maximum advertised upload and download speeds for consumers. Because educational attainment and other American Community Survey variables are not available at the census block level, we aggregated data to the census block group level. With these data now at the block group level, we merged them with other block group–level population data from the Integrated Public Use Microdata Series and the Missouri Census Data Center's centroids.

In the IPEDS data for 2014, we determined which institutions are both public and "broad access," based on the institutional control variable and the number of applicants and admissions. Broad access is defined as admitting at least 75 percent of applicants. Two-year public universities are those that offer an associate degree as the highest degree or the institution's highest degree awarded was a bachelor's degree or higher, but less than 50 percent of the degrees awarded were below a bachelor's degree. IPEDS also provides the longitude and latitude of the institution's location in this year.

Most of the IPEDS data we used are from 2014, but we also identified 331 institutions that were consolidated for reporting reasons between 2001 and 2013. Using the same variables as we did for the 2014 data, we used the 2001 data to determine which institutions were broad-access public institutions and two-year, broad-access public institutions. IPEDS did not provide the longitude and latitude of the institutions in this year, so we geocoded the addresses using the Google Maps geocoding application programming interface.

Using the longitude and latitude of the centroids (Missouri Census Data Center) and institutions (IPEDS), we linked each census block group to the nearest institutions. This allowed us to identify which census block groups are physical education deserts. If there was no institution within 25 miles of the block group's centroid, we identified the block group as a physical education desert. It was also identified as a physical education desert if there was only one two-year, broad-access public institution within 25 miles and no other broad-access public institutions.

Using the maximum advertised speeds, we defined online education deserts as those not meeting the FCC's definition of broadband—that is, where the maximum download speed was less than 25 Mbps or the maximum upload speed was less than 3 Mbps (FCC 2016a). With these definitions of physical and online education deserts defined, we identified which block groups met both definitions or just one.

We used the American Community Survey and US Census data to sum the number of people living in each education desert by age, gender, race, ethnicity, urban or rural designation, educational

attainment, and unemployment. To determine the median household income of each type of education desert, we weighted the median income by the total population of each block group.

TABLE 3

Summary Statistics, by Type of Education Desert

	Total population	Type of Education Deserts			
		Not	Online	Physical	Complete
Adult population	234,564,064	191,264,608	1,983,101	38,179,524	3,136,839
Percentage of demographic group living in each type					
Total population	308,745,536	81.6%	0.8%	16.3%	1.3%
Rural	59,492,268	57.8%	3.5%	33.1%	5.6%
Race or ethnicity					
White	196,817,552	79.3%	0.9%	18.4%	1.4%
Black	38,929,320	86.5%	0.7%	11.8%	1.0%
Hispanic	50,477,592	84.2%	0.6%	14.2%	0.9%
American Indian or Alaska Native	2,932,248	62.8%	2.8%	22.6%	11.8%
Asian	14,674,252	93.8%	0.1%	6.0%	0.2%
Native Hawaiian or Pacific Islander	540,013	83.6%	0.2%	15.5%	0.7%
Other	28,116,441	85.2%	0.7%	13.2%	1.0%
Age					
18–24	30,672,088	82.2%	0.8%	15.9%	1.1%
25–34	41,063,948	83.4%	0.8%	14.7%	1.1%
35–44	41,070,608	83.1%	0.8%	14.9%	1.2%
45–54	45,006,716	81.6%	0.9%	16.1%	1.4%
55–64	36,482,728	80.2%	0.9%	17.3%	1.5%
65 or older	40,267,984	78.7%	0.9%	18.9%	1.6%
Percentage of population within each type					
Education					
Completed sixth grade	206,010,528	97.4%	97.2%	97.6%	97.2%
Completed ninth grade	199,287,136	94.4%	92.5%	94.1%	92.8%
Completed high school or GED	183,159,040	87.1%	80.7%	85.3%	81.3%
Attended college	124,463,952	60.5%	43.1%	53.3%	44.4%
Graduated from college	79,954,512	39.8%	22.2%	30.6%	21.8%

Source: Urban Institute analysis of American Community Survey, Census Bureau, Integrated Postsecondary Education Data System, and Federal Communications Commission data.
Note: People who identified themselves as non-Hispanic white are included in the "White" category, and all people who identified themselves as Hispanic are included in the "Hispanic" category.

Notes

1. "Recent Population Change," US Department of Agriculture, accessed January 5, 2018, https://www.ers.usda.gov/topics/rural-economy-population/population-migration/recent-population-change/.
2. Alisha Green, "Lawmakers Push 'Dig-Once' and Other Bipartisan Policies to Expand High-Speed Internet," *Roll Call*, October 30, 2015, http://www.rollcall.com/news/lawmakers_push_dig_once_and_other_bipartisan_policies_to_expand_high_speed-244530-1.html.

3. Andrew Perrin, "Digital Gap between Rural and Nonrural America Persists," *Fact Tank*, May 19, 2017, http://www.pewresearch.org/fact-tank/2017/05/19/digital-gap-between-rural-and-nonrural-america-persists/.

References

Alpert, William T., Kenneth A. Couch, and Oskar R. Harmon. 2016. "A Randomized Assessment of Online Learning." *American Economic Review* 106 (5): 378–82.

Bettinger, Eric, and Susanna Loeb. 2017. "Promises and Pitfalls of Online Education." Washington, DC: Brookings Institution.

Bowen, William G., Matthew M. Chingos, Kelly A. Lack, and Thomas I. Nygren. 2014. "Interactive Learning Online at Public Universities: Evidence from a Six-Campus Randomized Trial." *Journal of Policy Analysis and Management* 33 (1): 94–111.

FCC (Federal Communications Commission). 2016a. *2016 Broadband Progress Report*. Washington, DC: FCC.

———. 2016b. *2016 Measuring Broadband America: Fixed Broadband Report*. Washington, DC: FCC.

———. 2017. "Thirteenth Section 706 Report Notice of Inquiry." Washington, DC: FCC.

Federal Student Aid Handbook. 2015. *Federal Student Aid Handbook*. Washington, DC: Federal Student Aid.

Goodman, Joshua, Michael Hurwitz, and Jonathan Smith. 2015. *College Access, Initial College Choice, and Degree Completion*. Working Paper 20996. Cambridge, MA: National Bureau of Economic Research.

Goodman, Joshua, Julia Melkers, and Amanda Pallais. 2016. *Can Online Delivery Increase Access to Education?* Working Paper 22754. Cambridge, MA: National Bureau of Economic Research.

Hillman, Nicholas, and Taylor Weichman. 2016. *Education Deserts: The Continued Significance of "Place" in the Twenty-First Century*. Washington, DC: American Council on Education.

Joyce, Theodore J., Sean Crockett, David A. Jaeger, Onur Altindag, and Stephen D. O'Connell. 2014. *Does Classroom Time Matter? A Randomized Field Experiment of Hybrid and Traditional Lecture Formats in Economics*. Working Paper 20006. Cambridge, MA: National Bureau of Economic Research.

Kennedy, Alec, and Mark Long. 2015. *Optimal Spatial Distribution of Colleges*. Paper presented at the Association for Public Policy Analysis and Management fall conference, Miami, FL, November 12–14.

López Turley, Ruth N. 2009. "College Proximity: Mapping Access to Opportunity." *Sociology of Education* 82 (2): 126–46.

Prieger, James E. 2015. "The Broadband Digital Divide and the Benefits of Mobile Broadband for Minorities." *Journal of Economic Inequality* 13 (3): 373–400.

Sawhill, Isabel. 2013. "Higher Education and the Opportunity Gap." Washington, DC: Brookings Institution.

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