Measuring Students' Access to Broadband at Historically Black Colleges and Universities (HBCUs)

Proposal for AEFP 2024

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2023-10-12

Background

The economic, educational and social opportunities broadband access brings to communities are indisputable (Tomer et al. 2020). However, a significant portion of the U.S. population still lacks stable access to broadband internet in their home. In the higher education context, broadband serves a vital role in sustaining the academic and social mechanisms of a college/university. Simply put, reliable broadband connections are nonnegotiable necessities for supporting the work of students, staff and faculty at HEIs across the country.

The principal question then becomes, what does broadband access look like in the U.S. and how should it be measured? In Skinner (2019), multiple data sources were utilized to develop informed measures of broadband at open-access institutions across the United States. These different sources measure broadband access uniquely, through counts of individuals with broadband in the home, upload/download speeds, etc. Averaging and weighting these points (by distance/population) resulted in a more comprehensive measure of broadband access for each HEI featured in the analytic sample. This measure served as the independent variable in the multiple Bayesian regression models defined to estimate the relationship between broadband access and students taking online courses at public, open-access institutions.

We hope to expand on the work done in Skinner (2019) by gauging broadband access (via similar population/distance-weighted processes) across a specific subset of institutions in the U.S.: HBCUs. Recent spotlight on the inaccessibility of broadband at HBCUs across the country warrants deeper empirical investigation. The McKinsey Institute for Black Economic Mobility sounds the alarm on this issue clearly; in their 2021 report, researchers found that 82% of HBCUs are located in broadband deserts (Bevins et al. 2021). Broadband deserts, as defined by Mathews and Ali (2023), "lack readily available and affordable access to high-performance broadband, with residents unable to experience digital inclusion, digital equity and, ultimately, digital dignity" (p.730). The dire broadband needs at HBCUs has even prompted a comprehensive federal response with the creation of the Office of Minority Broadband Initiatives under the National Telecommunications and Information Administration (NTIA) (Federal Register 2021). Programs under this newly created office will specifically address issues of broadband access in "vulnerable communities", naming HBCUs as important stakeholders in accomplishing this goal.

This focus on historically underserved and underfunded institutions will shed light on large-scale inequities in access to broadband for the most vulnerable student populations in the country. Previous research highlights broadband disparities geographically (LaRose et al. 2007; West and Karsten 2016; Vogels 2021), but recent scholarship by Skinner, Levy, and Burtch (2023) has challenged this narrow view of broadband access by underscoring inequities across racial/ethnic & socioeconomic subpopulations, connecting this heterogeneity to historical redlining practices determined by 20th century federal housing policy. Our project supports the broader movement towards exploring nuance in the broadband landscape, examining access through the intersections of geography, institution type and student demographics.

Research Questions

1. Does broadband access vary across surrounding populations at MSIs?
2. Does the urban/rural broadband access divide exacerbate inequities across MSIs?

Data

This paper will draw from three unique sources of data: the Integrated Postsecondary Education Data System (IPEDS), ACS and the FCC.

From IPEDS, we will be pulling unit identification numbers and locations for institutions (via coordinates of latitude/longitude), filtering institutions by HBCU status. ACS summary files will be pulled to identify counts of individuals with broadband access in the home at the block group level. FCC data contribute the final pieces to the dataset, providing details of unique Internet Service Providers (ISPs) and maximum/minimum download speeds at the block group level.

These multiple data sources will be utilized to eventually calculate population- and distance-based weights via matrices. Combining these weights will allow us to assign a more informative measure of broadband access at HBCUs across the United States. These measures will provide a descriptive picture of access to broadband at HBCUs, with the ability to disaggregate measures by geography, race/ethnicity, etc.

Methods

The institution-level data from IPEDS will be pulled first, as that contains the most basic information to properly locate each HBCU available as reported by the National Center for Education Statistics (NCES).

Next, we will pull block group-level information from ACS summary files to identify block group centroids and counts of broadband access in the home. The centroids, along with the coordinate information from the institutions, will be used to construct an $N \times K$ distance matrix (N representing the institutions, K representing each block group). This matrix contains values that calculate the distance d between each institution i and all the block group centroids c in the U.S., d_{ic}.

To ensure that download speed information from block groups nearest the institution is valued more in the final measure calculation, inverse distances will be created using the following equation:

$$id_{ic} = \frac{1}{(d_{ic})^r}$$

where id_{ic} represents inverse distance and r represents a decay function to prevent skewing of averages due to differences in population densities.

Distance weights will then be calculated by dividing each inverse distance by the sum of the distances for each institution:

$$idw_{ic} = \frac{id_{ic}}{\sum_{c=1}^{C} id_{ic}}$$

Since this weighted broadband measure will be assigned to each institution (and not at the student level), population weights will need to be calculated to account for institutional averages that might be pulled to more densely populated areas:

$$pw_c = \frac{pop_c}{\sum_{c=1}^{C} pop_c}$$

where pw_c is the population weight for each school and pop_c is the population measure for each block group.

The two weights achieved through these calculations will be consolidated to form one concrete, weighted average measure of broadband for each HBCU in our analytic sample:

$$w_{sc} = idw_{ic} \times pw_c$$

$$weightedbroadband_i = \sum_{c=1}^{C} \frac{w_{sc} \cdot broadband_c}{\sum_{c=1}^{C} w_{ic}}$$

The broadband measure $broadband_c$ represents average broadband speeds (upload/download) and available ISPs for the block group.

Forthcoming Findings

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