



Are Historically Black Colleges and Universities (HBCUs) in the United States a Single Institutional Group? Evidence from Educational Outcomes

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Historically Black Colleges and Universities (HBCUs) have been studied consistently as a single institutional group. However, at least ostensibly, HBCUs are relatively heterogeneous. Consequently, we evaluated the homogeneity of three educational outcomes that have been recognized as potentially distinguishing features of HBCUs (i.e., STEM major, GPA, and degree completion). Hierarchical linear and nonlinear modeling conducted on two large databases suggested greater variability within HBCUs than between HBCUs. This variability tended to be explained by HBCUs' public versus private status, advanced degrees offerings, and enrollment. We conclude that HBCUs' institutional characteristics are relevant, but that they may underscore differences within one institutional group.

Introduction

Historically Black Colleges and Universities (HBCUs)¹ have been considered to be a single institutional group in US higher education for generations. However, at least ostensibly, HBCUs are relatively heterogeneous. They are about equally as likely to be public or private institutions, and they follow no discernible classification pattern under generally accepted institutional classification methods (e.g., the Carnegie Classification system) (Coaxum 1999, 2001). Rigorous, quantitative attempts to classify HBCUs have amplified, rather than ameliorated questions about the homogeneity of HBCUs.

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¹HBCUs are defined in The US Higher Education Act of 1965 as accredited institutions generally established prior to 1964 with a principal mission of educating Black Americans.

For example, Coaxum's (1999) analysis suggested that the 86, 4-year HBCUs alone could be appropriately divided into 10 categories. Such findings call into question whether HBCUs are a single institutional group or a collection of many institutional groups.

Yet, the veracity of categorizing HBCUs as a single institutional group is quite relevant to US educational policy and to educational research. Recent data indicate that the Black-White achievement gap persists in US higher education: 33% of White Americans over 25 tend to complete at least a Bachelor's degree compared to only 20% of Black Americans over 25 (National Center for Educational Statistics [NCES], 2010). HBCUs, a tiny pool of roughly 100 institutions, are generally thought to ameliorate this achievement gap *collectively*. More specifically, these institutions award about one-fifth of all undergraduate degrees conferred to Black Americans (Provasnik & Shafer, 2004). Additionally, about 24% to 33% of Black doctoral recipients in the fields of science and engineering from 1986 to 2006 earned their undergraduate degrees from HBCUs (Burrelli & Rapoport, 2008).

But, it is not clearly understood whether the Black-White achievement gap in higher education is ameliorated by HBCUs *as a whole* or by *a subset* of HBCUs (i.e., do HBCUs function as a single institutional group?). Such research has never been conducted--given that empirical research on HBCUs is generally recognized to be in its incipency relative to other areas of higher education. Clarity on this issue has the potential to provide greater information about whether federal funding currently provided to almost all HBCUs might be channeled more properly to a subset of particularly effective institutions. Clarity on HBCUs' institutional grouping also offers potential insights for conducting research on these institutions' effectiveness (e. g., can researchers study educational strategies at *any* HBCU for insight about how to improve minority education in the United States, or should these researchers restrict their analysis to a specific subset of HBCUs?).

As a step toward answering the larger question of whether HBCUs are a single institutional group, we evaluated the homogeneity of three educational outcomes that have been recognized as potentially

distinguishing features of HBCUs. More specifically, prior analysis has suggested that HBCUs produce (1) a high percentage of African American, STEM majors (e.g., National Science Foundation, 2010), (2) a significant number of African American college graduates (e.g., Provasnik & Shafer, 2004), and (3) potentially, but not incontrovertibly higher GPAs among African American students (e.g., Allen, 1992). We posit that the degree of homogeneity in these educational outcomes provides some evidence about the underlying, unitary nature of HBCUs.

We also evaluated whether differences in basic institution characteristics explained any heterogeneity detected in educational outcomes. In particular, we examined whether variability in HBCUs' educational outcomes was explained by HBCUs' public versus private status, advanced-degree offering status, total student enrollment, and percentage of African Americans enrolled. This second set of analyses assessed whether differences in basic institutional characteristics should preclude categorizing HBCUs as a single institutional group.

Conceptual Framework

This section discusses the conceptual framework that underlies our study. More specifically, we posit that distinctive “inputs” at HBCUs may explain the distinctive educational outcomes that are generally theorized to occur there. Such inputs consist of unique pedagogical practices and warmer, but stricter ecological contexts² (Boone, 2003; Palmer & Gasman 2008; Taylor, McGowan, & Alston, 2008). Distinctive outcomes may include STEM major (Burrelli & Rapoport, 2008), degree attainment (Provasnik & Shafer, 2004), and GPA (Allen, 1992). We argue further that cohesion in these outcomes across HBCUs, if detected, provides evidence that HBCUs are a single institutional group, with such singularity representing much more than just a common historical connection.

²We define ecology as the relationship between students and their environment.

Inputs

Pedagogical practices. Extant research suggests that pedagogical practices at HBCUs differ from practices at other U.S. universities. These pedagogical practices, in turn, are generally posited to be a primary factor behind HBCUs' successes in educating African American students. The tone and quantity of interactions at all levels are a hallmark of these pedagogical practices. At the faculty level, such interactions include faculty-learning communities, where faculty members collaborate extensively about course development and delivery (Taylor, McGowan, & Alston, 2008). Similar student-learning communities also encourage student-to-student interactions (Freeman, Alston, & Winborne 2008). There is also evidence of extensive faculty-student interactions both within the classroom (Boone, 2003) and outside the classroom (Perna, et al., 2009). Structural modifications—such as reduced class sizes (Perna, et al., 2009)—and program modifications—such as service-based learning course designs (Murphy & Rasch, 2008)—also likely promote greater interaction at HBCUs.

Additional characteristics of pedagogical practices at HBCUs may bolster the effectiveness of these increased interactions. For example, teaching methods at HBCUs may be tailored to match students' learning styles (Gallien & Peterson, 2004). These learning styles are posited to be high context, meaning that students value the group over the individual as well as feelings and trust over logic. Additionally, these learning styles are also field-dependent, meaning that learners are holistic and tend to be less analytical and detailed oriented. Finally, some evidence indicates that there may be more writing assignments and scholarly content in instruction at HBCUs (Seifert, Drummond, & Pascarella, 2006).

Ecological contexts. The literature suggests that HBCUs' contextual ecologies tend to be warm, yet strict in a manner that promotes academic accomplishments. In terms of warmth, Palmer and Gasman (2008) reported that HBCUs offer students an abundance of social capital in the form of supportive relationships with faculty, other mentors, peers, and the campus community at large. Such relationships extend to campus leaders who champion the

advancement of social justice (Jean-Marie, 2006). These leaders often share a profound sense of the importance of students' futures. Hirt, Amelink, McFeeters, and Strayhorn (2008) classify these and similar behaviors as *othermothering*, a practice common in African American communities of caring for another person's child as one's own.

Coupled with such warmth is an air of strictness or conservatism. Evidence of this facet of HBCUs' ecologies includes strict dress codes, conservative expectations about acceptable sexual behavior/mores, and expectations for students to defer to faculty's viewpoints (Harper & Gasman, 2008). HBCUs' ecologies account for part of Outcalt and Skewes-Cox's (2002) findings that HBCU students had about twice the odds of being satisfied with college overall.

Outcomes

STEM major. African Americans are underrepresented consistently among STEM degree recipients in the U.S. (National Science Foundation [NSF], 2010). However, HBCUs' have made substantial contributions to the number of STEM degrees that African Americans have earned. In fact, HBCUs awarded 22% of bachelor's degrees, 17% of master's degrees, 12% of doctoral degrees earned by Black Americans in STEM in 2006 (NSF, 2010). In addition to awarding degrees in STEM, HBCUs serve as feeder institutions to doctoral programs in STEM at all institutions. Burrelli and Rapoport (2008) reported that 24% to 33% of African American doctoral recipients in science and engineering from 1986 to 2006 earned their undergraduate degrees from HBCUs.

Degree Attainment. The literature typically affirms that the number of degrees that African American students earn at HBCUs is practically significant. In fact, one of the most up-to-date, comprehensive studies concluded that as of 2001, HBCUs awarded more than one-fifth of all undergraduate degrees conferred to Black Americans (Provasnik & Shafer, 2004). Criticism, however, does abound about relatively high dropout rate at HBCUs, which may hover around 63% (Pope, 2009). HBCUs' proponents have retorted that such criticisms do not account adequately for the challenges of

educating HBCU students (Ashley, Gasman, Mason, Sias, & Wright 2009). They argue that these students have had less academic preparation and struggle with greater financial difficulties in completing post-secondary education—so that the odds of educational failure are automatically higher.

GPA. Research supports the conventional wisdom that African America students at HBCUs earn higher GPA's than their counterparts. In particular, Allen's (1992) seminal study concluded that African American students at HBCUs reported higher GPAs than African American students at Primarily White Institutions (PWIs). Subsequent research has corroborated this finding (Cokley 2000; Fries-Britt & Turner, 2002). However, these results are not necessarily definitive. More specifically, neither Cokley (2002) nor Wenglinsky (1996) detected significant differences in GPAs between African American students across institution type.

Method

Participants

Data for this study were derived from the following restricted datasets collected by the US National Center for Educational Statistics (NCES):

The National Postsecondary Student Aid Study (NPSAS:08), a nationally representative sample of all institutions and students enrolled in post-secondary education in 2008; or

The third wave (2008-2009) of the Beginning Postsecondary Students Longitudinal Study (BPS:04/09), a nationally representative sample of first-time post-secondary students in 2003-2004 who were re-surveyed in their third year (2005-2006), and sixth year (2008-2009).

NPSAS:08 provided an HBCU sample with 40 institutions and 1,660 students (range $n > 10^3$ to 100 students per institution; mean = 43 students per institution). The BPS:04/09 provided an HBCU sample

³This notation is necessary because NCES restricts disclosure of exact sample sizes and instead requires that they be rounded to the nearest ten's place.

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with 40 institutions and 300 students (range = $n > 10$ to 40 per institution; mean = 8 students per institution). NCES defined institutions as HBCUs based on institutions' legislative designations under the Higher Education Act of 1965. NCES also verified that institutions were HBCUs via the Integrated Postsecondary Education Data System (IPEDS).

Table 1 presents additional descriptive statistics about our data. Because our analysis is based on restricted datasets, NCES placed limitations on the types of descriptive data we were allowed to report. Additionally, NCES required that we round data reported about all unweighted samples to the nearest ten's place prior to disclosure.

Table 1. Descriptive Statistics for Weighted Institutional Samples: NPSAS:08 and BPS:04/09

Variable Type	Variable	NPSAS:08 HBCUs $n = 40$ Students $n = 1,660$	BPS:04/09 HBCUs $n = 40$ Students $n = 300$
Independent Variables	Public	83.9%	90.0%
	Private	16.1%	10.0%
	Master's or above	62.5%	41.0%
	Below master's	37.5%	59.0%
	No. students enrolled	5,975 (Mean) 770-11,560 (Range)	8,640 (Mean) 90-17,470 (Range)
	% African American students enrolled	71.80% (Mean) 11%-96% (Range)	78.46% (Mean) 2%-99% (Range)
Outcomes	STEM	18.3%	18.1%
	Mean GPA	2.798	2.124
	6-year degree completion = yes	n/a	32.2%

Note. NCES prohibits detailed disclosure related to restricted secondary datasets. For example, we were required to round data reported about all unweighted samples to the nearest ten's place prior to presentation.

Measures

The educational outcomes, or dependent variables, in this study were cumulative GPA (standardized to a 4-point scale), STEM major (1 =

yes, 0 = no), and 6-year degree completion (1 = yes, 0 = no). Institutional level predictors—or independent variables—were (1) the percentage of African Americans enrolled at each institution, (2) number of students enrolled, (3) whether the institution offered advanced degrees (i.e., at least a Master’s degree) (1 = offers advanced degrees, 0 = does not offer advanced degrees) and (4) whether the institution was public or private (1 = public, 0 = private).

Data Analysis

The primary mode of analysis for continuous educational outcomes (i.e., GPA) was hierarchical linear modeling (HLM) (Snijders & Bosker, 2012), where the fully unconditional model (i.e., One-Way Analysis of Variance [ANOVA]) was as follows:

Level 1 (Student): $\text{Outcome}_{ij} = \beta_{0j} + r_{ij}$, where $r_{ij} \sim N(0, \sigma^2)$; i = student; j = institution. (eq. 1)

Level 2 (Institution): $\beta_{0j} = \gamma_{00} + \mu_j$, where $\mu_j \sim N(0, \tau_{00})$; j = institution. (eq. 2)

The intraclass correlation coefficient for continuous outcomes was estimated as $\rho = \tau_{00}/(\tau_{00} + \sigma^2)$ (eq. 3). Non-continuous models were calculated via restricted maximum likelihood estimation.

Non-continuous outcomes (i.e., degree completion and STEM vs. non-STEM major) were evaluated based on hierarchical nonlinear modeling (Snijders & Bosker, 2012). More specifically, a Bernoulli sampling model with logit link function was evaluated for STEM major (yes = 1, no = 0) and degree completion within 6-years (yes = 1, no = 0). The intraclass coefficients for non-continuous outcomes was computed as $\rho = \tau_{00}/(\tau_{00} + \pi^2/3)$ (eq. 4), where π is an irrational number approximated as 3.14159. Non-continuous models were estimated via Laplace approximation.

Institutional predictors (i.e., public vs. private status, advanced degree offerings, number of students enrolled, and percentage of African Americans enrolled) were tested at level-2 of each model—first, individually, and then in all possible groups to determine whether predictors had significance as point-estimates or had relevance in explaining variability. Continuous predictors were

grand-mean centered at level 2. The number of students enrolled was also standardized. For continuous outcomes, if significant variability at level 2 did not remain, then the model was considered to have accounted for 100% of variability. If significant variability remained, the degree of additional variance explained by the estimated model was estimated (1) as the % change in τ_{00} and (2) as the $1 - (\tau_{00_new\ model} + \sigma^2_{new\ model}/n) / (\tau_{00_empty\ model} + \sigma^2_{empty\ model}/n)$. For non-continuous outcomes, the percentage of variability explained in the model with predictors was calculated as $\sigma_F / (\sigma_F + \tau_{00} + \pi^2/3)$, where σ_F is the variance of the fixed portion of the model estimated. All analysis was weighted.

Results

Interclass correlation coefficients (ICC) for the empty, NPSAS:08 models were .08 for GPA and STEM (Table 2). For BPS:04/09 models, these coefficients were .32,⁴ .04, and .18, for GPA, STEM, and degree completion, respectively. ICCs can be interpreted as follows: 8% of the variability in GPA was accounted for by the particular HBCU that NPSAS:08 students attended. Each ICC indicated that variability between HBCUs was smaller than variability within HBCUs, a criterion for classification in many disciplines (Graves, 2005).

Public versus private status and advanced degrees offerings were significant point-estimates that explained all the variability between institutions for two BPS:04/09 outcomes (i.e., GPA and 6-year degree completion) (Table 2). Enrollment at a public (an advanced degree offering) HBCU was associated with 1.04-point (.67 lower (higher) GPA, all else constant. Being enrolled at a public (an advanced degree offering) HBCU was associated with 77% lower

⁴This finding was robust for two other specifications: GPA restricted to credits earned solely at HBCUs; GPA restricted to students who had attended only one HBCU. ICCs for the same educational outcomes would not necessarily be expected to be analogous across datasets due to cross-sectional and longitudinal differences in data collection. In particular, discrepancies between ICCs for GPA may imply that, at any particular point in time, variability between institutions for GPA was low, but it increased when the same student was followed over time.

odds (92% higher odds) of degree completion. Enrollment was also necessary to explain the variability in STEM major for BPS:04/09; no predictors were significant point-estimates.

Less variability between institutions was explained for the NPSAS:08 sample (i.e., 38%–43% by GPA; 47% by STEM)—so that 5% (4%) of variability between institutions remained unexplained for GPA (STEM). Offering an advanced degree was the only relevant variable for GPA (coefficient = $-.28$), whereas, the same BPS:04/09 predictors explained variability in STEM with each being significant point-estimates (i.e., $OR_{\text{public}} = .53$, $OR_{\text{advanced_degree}} = 1.82$, and $OR_{\text{enrollment}} = .79$) Percentage of African American enrollment did not explain variability or serve as a significant point-estimate for the educational outcomes studied in either dataset.

Discussion, Conclusions, and Implications

Variability in educational outcomes between HBCUs was less than variability within HBCUs. Public versus private institution status, advanced degree offerings, and enrollment explained either all or a considerable portion of variability between institutions—although differences in explanatory power were detected across educational outcomes as well among observations of the same outcome from cross-sectional and longitudinal perspectives.

Consequently, heterogeneity in HBCUs' basic institution characteristics would not appear to preclude HBCUs from being classified as a single institutional group. Instead, HBCUs' institutional characteristics appear to represent significant distinctions within the same institutional group. Furthermore, variability in the percentage of African Americans attending HBCUs had no implications for the educational outcomes tested, suggesting that congruent with the extant literature (e.g., Brown, 2002), something intrinsic to HBCUs makes them what they are, apart from race.

Table 2. *Estimates of Fixed Coefficients, Random Coefficients, and Variability Explained Between HBCUs for NPSAS:08 and BPS:04/09*

Variable	GPA		STEM		Degree Completion
	(NPSAS)	(BPS)	(NPSAS)	(BPS)	(BPS)
Intercept, γ_{00}	2.976	2.697	-0.975	-1.306	0.255
Odds ratio	n/a	n/a	0.377	0.271	1.291
SE	0.073	0.142	0.173	0.381	0.233
<i>p</i> -value	>0.000	>0.000	>0.000	0.002	0.283
Public, γ_{01}	n/a	-1.038	-0.633	-0.456	-1.459
Odds ratio	n/a	n/a	0.531	0.634	0.233
SE	n/a	0.317	0.198	0.448	0.301
<i>p</i> -value	n/a	0.003	0.003	0.317	0.000
Advanced, γ_{02}	-0.279	0.674	0.599	0.528	0.653
Odds ratio	n/a	n/a	1.820	1.700	1.922
SE	0.083	0.293	0.228	0.400	0.301
<i>p</i> -value	0.002	0.028	0.013	0.197	0.037
Enrollment, γ_{03}	n/a	n/a	-0.230	0.132	n/a
Odds ratio	n/a	n/a	0.794	1.141	n/a
SE	n/a	n/a	0.113	0.360	n/a
<i>p</i> -value	n/a	n/a	0.050	0.717	n/a
σ^2	0.513	1.011	n/a	n/a	n/a
τ_{00}	0.027	0.259	0.161	>.000	>.000
Intraclass correlation coefficient	0.083	0.315	0.084	0.041	0.179
Additional variability accounted for at level 2	38%-43%	~100%	47%	~100%	~100%

Note. Public = 1 if institution was public and 0 otherwise; advanced = 1 if institution was a master's or research & doctoral institution and 0 otherwise; and enrollment = number of students enrolled. Enrollment was standardized and grand-mean centered. Robust standard errors reported.

These findings suggest that future researchers should consider public versus private status, enrollment, and advanced degree offerings when sampling HBCUs. These researchers also should not assume that institutional characteristics have the same impact for cross-sectional and longitudinal designs. Further research may endeavor to discover why. Finally, researchers should replicate this study for a larger sample of HBCUs, given that fewer than 40% of HBCUs were available for study.

In terms of broader implications, this study provides support for popular consensus among policymakers in terms of the appropriateness of considering HBCUs as a single institutional group. Indeed, HBCUs as a whole, rather than just a subset of HBCUs, appear to be driving college completion rates among African Americans. These institutions also seem to work in concert to promote STEM education among African American students. Consequently, policymakers appear to have a sound case for awarding federal funding to all HBCUs, rather than to a subset of high performing HBCUs. Likewise, policymakers should encourage and fund educational research that pursues a better understanding not only about how HBCUs accomplish their educational successes, but also about how to bolster these successes. Such research and research funding are particularly important given the scant amount of educational research on HBCUs, relative to research on other aspects of higher education.

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