

Barriers and Facilitators to Obtaining External Funding at Historically Black Colleges and Universities (HBCUs)

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Abstract

Historically Black Colleges and Universities (HBCUs) were established to further the education of Black Americans and have a long history of service to minority, first-generation, and low-income students. HBCUs are also struggling financially, due to federal and state underinvestment, small endowments, low alumni giving, and decreasing enrollment. Financial constraints not only have a direct impact on physical facilities and resources, but also on human resources. Faculty at HBCUs are tasked with heavy teaching loads and, in research-focused institutions, high research expectations, especially in science, technology, engineering, and mathematics (STEM) fields. However, HBCUs can provide only limited support for these research endeavors; thus, faculty at these institutions need to pursue external grants and contracts to support their research. In the present study, we surveyed faculty at five research-focused HBCUs to determine the major difficulties they encounter when applying for external funding (barriers) and the things their institution could do to facilitate this process (facilitators). Time constraints and difficulties with internal functioning and policies emerged as the most relevant barriers, whereas providing training and mentoring and improving internal functioning and policies emerged as the most relevant facilitators. The PATHS program is proposed as a model of faculty support anchored around mentoring and institutional awareness, and which could be adapted to different institutions to increase their faculty's success in attaining external funding.

The education of Black Americans was prohibited in many states prior to the Civil War. On February 25, 1837, a Quaker philanthropist by the name of Richard Humphreys founded the African Institute (later renamed the Institute for Colored Youth), a high school that began offering advanced degrees and became the first institution of higher education for Black Americans. The Institute came to be known as Cheyney University of Pennsylvania in 1983. Through the work of philanthropists and free Blacks, several other institutions of higher education for Black Americans were founded from the mid-19th through the

20th century to provide Black individuals with educational opportunities otherwise not available to them. Many of these institutions are known today as Historically Black Colleges and Universities (HBCUs). According to Title III of the Higher Education Act of 1965, an HBCU is “any historically black college or university that was established prior to 1964, whose principal mission was, and is, the education of Black Americans, and that is accredited by a nationally recognized accrediting agency or association determined by the Secretary [of Education] to be a reliable authority as to the quality of training offered or is, according to such an agency or association, making reasonable progress toward accreditation.”

In 2020, there were 101 HBCUs across the United States and territories, 52 of which are public institutions (18 designated as land-grant universities) and 49 of which are private, non-profit institutions (National Center for Education Statistics [NCES], n.d.). The designation of “HBCU” does not mean that these institutions are homogeneous. HBCUs vary in degree offerings (ranging from 2-year associates degree to doctoral and professional degrees), enrollment (ranging from approx. 2,000 [Claffin University] to approx. 13,500 [North Carolina A&T] students), admissions requirements (ranging from open admission to extremely competitive admission), and research activity (ranging from purely instructional to research-intensive). But despite these differences, HBCUs continue to have a student- (Fontaine, 2012) and community-centered (Gasman, 2013) orientation. HBCUs serve a more diverse student population than ever (up to 24% non-Black students in 2020, NCES, n.d.), but they continue to serve a large proportion of minority, first-generation, and low-income students (Gasman & Commodore, 2014).

Historical underfunding and continued financial struggles of HBCUs

The history of HBCUs is plagued with financial inequities that persist to the present day (see Harris, 2021, for an insightful history of HBCUs). Most (if not all) HBCUs have struggled and continue to struggle financially. Recent increases in funding allocated to HBCUs (e.g., Presidential Executive Order of 2017; Congress HBCU PARTNERS bill,

2021) and the increase in private philanthropy that followed the murder of George Floyd (e.g., Mackenzie Scott's \$560 million donation to 17 HBCUs in 2021) have done little to alleviate their financial woes. According to the American Council of Education, HBCUs rely on local, state, and federal funding to a greater extent (54% of overall revenue) than non-HBCUs (38% of overall revenue; Williams & Davis, 2019). Unfortunately, serving marginalized and traditionally underrepresented groups (URGs) has led to these institutions being seen as “less important” than their traditionally white-serving institution (TWI) counterparts, resulting in marked state underinvestment. A recent investigative report revealed that between 1987 and 2020, land-grant HBCUs have been underfunded by a staggering \$12.8 billion, adjusted by inflation (Adams & Tucker, 2022). The highest discrepancy was observed in the state of North Carolina, in which North Carolina State University appropriated \$16,400 per student, while North Carolina A&T University (its HBCU counterpart) appropriated \$8,200 per student. Similarly, the State of Tennessee failed to deliver over \$500 million in land-grant funding to the only HBCU in the State (Tennessee State University), but not to its TWI counterpart (The University of Tennessee; Weissman, 2021); the actual underfunding may be three times that amount since 1987 (earliest year for which data are available; Adams & Tucker, 2022). HBCUs have also been among the institutions experiencing the greatest federal funding cuts per full-time equivalency (FTE) student over the past two decades, with these cuts being up to 42% for private HBCUs (Williams & Davis, 2019). More recently, the COVID-19 pandemic has affected all institutions of higher education, but small and typically underfunded institutions have experienced the greatest financial challenges (American Association of Colleges & Universities [AAC&U], 2021).

The financial gap between institutional needs and state investment cannot be filled with endowments, which are 70% lower for HBCU than non-HBCU institutions. In July 2022, the highest HBCU endowment was held by Howard University (\$839 million), but this endowment was just about 1.5% of Harvard's \$53.2 billion. Alumni donations are also low for HBCUs (on average, 10% of HBCU alumni give back to their *alma mater*; Gas-

man & Bowman, 2012), possibly a reflection of overall lower wealth for Black Americans than any other racial group. This also means that tuition increases would be unmanageable by the population typically served by HBCUs (Gasman, 2013; Gasman, & Commodore, 2014).

Financial concerns not only affect HBCUs structurally; they also play a heavy burden on their human resources. Although 81% of faculty at US institutions of higher education taught an average of three or less courses per semester in Fall 2003 (NCES, n.d.), tenure-track HBCU faculty teach an average of four classes per semester (Gasman, 2013), and they do so for less compensation than their non-HBCU counterparts. In the 2018–2019 academic year, HBCU faculty salaries were \$18,000–\$24,000 lower than the national average for all professorial ranks at comparable institutions (Clery, 2021). HBCU faculty also spend a disproportionate amount of time in out-of-classroom teaching-related activities, such as student mentoring, mostly due to the preparatory gap that characterizes the student population typically served by HBCUs, and compression of the faculty body has led to increased expectations on their existing faculty.

Research-intensive HBCUs face unique challenges

Even of the largest HBCUs are considered 'Doctoral Universities, higher research activity,' according to the Carnegie Classification of Institutions of Higher Education (2018; this classification matches what is commonly known as R2 institutions). Even in these institutions, teaching loads and expectations are high, but faculty's progression to tenure is usually dependent not only on teaching excellence, but also research productivity, an expectation that is accentuated in STEM fields. This expectation of research productivity does not necessarily come alongside plentiful institutional resources. Despite most STEM departments being strongly research-oriented and supportive of their faculty's research endeavors, start-up packages are low (or nonexistent) at HBCUs. Consequently, HBCU faculty must rely on other sources of funding for their research, support of graduate students, publication costs, and professional travel. These "other sources" are usually federally- or foundation-sponsored research awards (i.e., grants). Thus, at HBCUs in which STEM faculty research productivity is an expectation, their capacity to secure external funds has also come to be expected. Escobar et al. (2021) reviewed the tenure and promotion criteria of five HBCUs in the Southeast, all of which have large graduate STEM programs (at the MS and/or PhD levels). According to this review, the smaller institutions emphasized teaching excellence (including advisement, curricular contributions, and mentoring) over research productivity in their tenure and promotion criteria, but all institutions had research expectations with measurables such as research publications. Even though only the larger institutions' criteria mentioned obtaining external funding

as a measurable of research productivity, 89% of participants in Escobar et al.'s study stated that external funding was expected in order to obtain tenure at their institution, regardless of the size of the institution. Thus, obtaining external funding may not be specified in tenure and promotion guidelines, but it is an "informal" review standard at all of these institutions.

External funding is not only valuable to the faculty who submit proposals and receive awards. Research awards can be used to fund infrastructure, purchase permanent equipment, support graduate and undergraduate students, and, in special cases, facility improvements or construction. There are federal programs that designate funding to HBCUs, such as the National Science Foundation's (NSF) HBCU-Undergraduate Program (HBCU-UP). HBCU-UP supports activities that strengthen undergraduate education and research in STEM at HBCUs through Targeted Infusion Projects (TIP), Broadening Participation Research (BPR), Research Initiation Awards (RIA), Implementation Projects (IMP), Achieving Competitive Excellence IMP (ACE), Broadening Participation Research Centers (BPRC), Early-Concept Grants for Exploratory Research (EAGER), Rapid Response Research (RAPID), conference, and planning grants (NSF-20559). In response to Executive Order 13779 (February, 2017), the National Institutes of Health (NIH) launched the Path to Excellence and Innovation (PEI) program to facilitate engagement between HBCUs and the NIH. Despite these opportunities created specifically for HBCUs, not all eligible faculty submit proposals for federal funding, raising the question of why many faculty decide not to do so or why they are not successful (Toldson, 2017). Parallel to this question is the question of what can their institutions, whose overall revenue relies heavily on external funds, do to encourage and support faculty proposals. The focus of the study described here was to assess HBCU faculty to determine the barriers they perceive/encounter to submit proposals for external funding, as well as the actions their institution could take to facilitate this process.

Methods

Participants

Participants were STEM faculty at five HBCUs in the Southeastern United States. According to the Carnegie Classification of Institutions of Higher Education (2018) three of these institutions can be classified as 'Doctoral Universities, higher research activity,' and two as 'Masters colleges and universities, larger programs.' A total of 497 faculty received an email invitation to participate in a survey. The survey was administered in two consecutive semesters, and the measures presented here were part of a larger research project investigating faculty experiences at HBCUs. Participants were free to decline answering any survey questions they did not wish to answer, and participants surveyed in different semesters may have received

different sets of questionnaires as part of the overall survey. Survey return rate was 20% ($n = 48$ for Survey 1, $n = 48$ for Survey 2), with 89% of respondents providing at least one response ($n = 88$). There were 55 men and 33 women in this final sample; 40 participants were tenured faculty and 48 participants were untenured faculty.

All procedures were carried out with approval of the Oakland University Institutional Review Board (IRB) and were conducted in accordance with the guidelines of the 1964 Helsinki declaration and its later amendments. After consenting to participate in the study, participants completed an online survey, and their participation was incentivized via monetary compensation (i.e., electronic gift cards).

Measures

Participants were asked to describe the three main reasons why it is difficult for them to submit grant proposals (barriers), as well as what their institution could do to facilitate this process (facilitators). The specific prompts were, "In order of most to least important, list 1–3 things that increase the difficulties you experience in applying for and obtaining external funding," and "In order of most to least important, list 1–3 things your institution could do in order to facilitate their tenure-track faculty's success in obtaining external funding." Participants were free to enter 1–3 words or sentences for each of the questions.

The survey also collected basic demographic information, including gender, identification with an underrepresented group (URG), and tenure status (untenured vs. tenured).

Data coding and analyses

Each term/statement was reviewed by two independent coders, who assigned a label to the barrier or facilitator provided by each participant. All coding discrepancies were discussed by the two coders and a consensus was reached. The emerging labels were then coded again to align them to more comprehensive categories. A frequency score (equal to the number of times a label had appeared in the analysis) was assigned to each label. Each label was then coded by its relative relevance, with the first term entered by the participant receiving a value of 0.50, the second term receiving a value of 0.33, and the third term receiving a value of 0.17. If a participant provided more than one term aligning to the same category, the highest relevance score was given to the term. Frequency scores were then weighed by their relative relevance by multiplying the two scores ($\text{weighted frequency} = \text{frequency} \times \text{relative relevance}$), and each weighted frequency was then converted into a percentage score by contrasting it against the sum of all weighted frequency scores for that given analysis. For example, the *percentage score* for Barrier A was calculated by dividing the weighted frequency for Barrier A into the sum of the weighted frequencies for all barriers. Percentage scores will be referred

Label	Type of items classified into label	Frequency	Relative relevance	Category
Low success rate for grant applications	Nationwide competition, success rates	13	0.06	External factors
Few opportunities for content area	Subject/topic of research, available funding mechanisms	8	0.03	
Inadequate facilities and resources	Laboratory space/equipment, library resources	30	0.10	Facilities and resources
Poor institutional support	Support from department/college/university	23	0.09	Internal functioning/policies
Issues with functioning of OSP	Timeliness, submission, efficiency, interaction, number of personnel	17	0.06	
Unfair internal policies/poor institutional climate	Internal competition, perceptions of fairness/discrimination, climate	17	0.07	
Lack of institutional recognition/incentives	Recognition of/incentives for funded researchers, cost-recovery funds	1	0.00	
Limited support for/availability of graduate students	Support of graduate programs, recruitment and support of students	13	0.04	Internal funding
Lack of start-up/seed funds/preliminary data	Availability of start-up and matching funds, support for pilot research	10	0.04	
Time constraints	Availability of time to devote to writing grant proposals	49	0.24	Time
High teaching load	Teaching, advisement, and mentoring activities	22	0.11	
High service load	Departmental, college, and university service	3	0.01	
Lack of training/mentoring	Information, training, and feedback on grant opportunities, mentoring	28	0.10	Training and mentoring
Lack of collaborators/networking opportunities	Collaborations within and outside the institution	12	0.04	

The Sample term/statement column presents a representative example of the items that were placed under that label. The Frequency column presents the number of instances in which a term/statement assigned to a given label was produced. The Relative relevance column reflects the relevance of the barrier, based on the order in which it was produced. Each label was aligned to one of five emerging categories, presented in the Category column.

Table 1. Emerging labels for barriers to obtain external funding.

to as “importance” for the purposes of discussion.

Percentage (importance) scores were compared using the chi-squared (χ^2) statistic. All comparisons were conducted in a pairwise manner (degrees of freedom = 1). To correct for multiple comparisons in exploratory analyses, a Bonferroni adjustment of p values was implemented by dividing the significance value ($p = .05$) by the number of comparisons conducted in any given analysis. Adjusted p values are provided with each analysis.

Results

Eighty-six participants provided at least one barrier and 88 participants provided at least one facilitator. In total, participants provided 246 barriers and 243 facilitators as responses to the respective prompts.

The terms provided by participating faculty were analyzed and assigned one label based on the content of the term provided. Fifteen labels emerged from the list of barriers, and 12 labels emerged from the list of facilitators. The relative relevance of each label was estimated by assigning each term a score based on whether it was entered first, second, or third on the list, and then contrasted

to the total relevance score as described above. Tables 1 and 2 present the labels, the sort of terms/statements that went into each label, and the frequency and relative relevance score for each label for barriers and facilitators, respectively.

The emerging labels were then aligned to categories, and six categories emerged from this analysis (listed in alphabetical, rather than relevance, order): External factors (e.g., success with grant proposals), facilities and resources (e.g., lab space), internal functioning and policies (e.g., functioning of the Office of Sponsored Programs), internal funding (e.g., start-up funds), time (e.g., teaching loads), and training and mentoring (e.g., knowledge of the funding application process). The same categories emerged when barriers (see Table 1) and facilitators (see Table 2) were considered, with exception of External factors, likely because faculty recognized that these factors are not dependent of their institution.

Barrier and facilitator categories were compared to each other to determine which were more important as barriers and facilitators. The values of the χ^2 statistics, as well as the adjusted probability values for these compari-

sons are presented in Table 3. Time and internal functioning and policies ranked as significantly more important barriers than all other categories (training and mentoring, facilities and resources, internal funding, and external factors), which did not differ from each other. Despite being the most important barrier, easing time constraints was not the most important facilitator, and it was only more important than improving facilities and resources. Time and internal functioning and policies were also ranked as the most important facilitators, along with training and mentoring (external factors were removed from the analyses; the frequency for this category was zero), and these three categories were ranked as more important than improving facilities and resources. Improving internal functioning and policies and providing training and mentoring were ranked as more important facilitators than providing internal funding (easing time constraints was only marginally more important than providing internal funding).

Notably, the importance of a category as a barrier was not necessarily equivalent to its importance as a facilitator (the adjusted significance value for these comparisons was $p < .01$). Offering training and mentoring oppor-

Label	Sample term/statement	Frequency	Relative Relevance	Category
Improve facilities and resources	Research/laboratory spaces, access to e-resources, upgrade infrastructure	13	0.05	Facilities and resources
Improve OSP functioning	Number of personnel, efficiency of procedures, communication and services	26	0.09	Internal functioning/policies
Provide institutional recognition/incentives	Recognition and incentives for researchers/research activities	15	0.04	
Increase institutional support	Support from department/college/university	11	0.04	
Revise internal policies/improve climate	Fairness of internal reviews, welcome atmosphere, simplify procedures	9	0.04	
Provide start-up/seed/matching funds	Availability of start-up and matching funds, support for pilot research	23	0.11	Internal funding
Provide support for graduate students	Support of graduate programs, recruitment and support of students	6	0.02	
Reduce teaching load	Teaching, advisement, and mentoring activities, teaching buyouts, release time	61	0.32	Time
Reduce service load	Departmental, college, and university service	5	0.02	
Provide grant writing training/support	Workshops/training, information on opportunities, proposal review	48	0.17	Training/mentoring
Encourage/support collaboration	Encourage cooperation, foster collaborative research	15	0.04	
Provide faculty mentoring	Guidance by senior faculty, structured mentoring programs	11	0.05	

The Sample term/statement column presents a representative example of the items that were placed under that label. The Frequency column presents the number of instances in which a term/statement assigned to a given label was produced. The Relative relevance column reflects the relevance of the facilitator, based on the order in which it was produced. Each label was aligned to one of five emerging categories, presented in the Category column.

Table 2. Emerging labels for facilitators to obtain external funding.

tunities was significantly more important as a facilitator than lack of training and mentoring was a barrier, $\chi^2(1) = 14.12, p < .001$, whereas time was more important as a barrier than a facilitator, $\chi^2(1) = 7.35, p < .01$. The remaining categories were ranked to be equally important as barriers than as facilitators (see Figure 1A).

Analysis of men vs. women faculty

The responses provided by women and men faculty were analyzed separately, as it was anticipated that some

categories, such as time constraints, would impact women in a different manner than they impact men due to, for example, conflicting family responsibilities. As was the case when the full sample was analyzed, time constraints and internal functioning and policies were ranked as the two most important barriers by both women and men faculty (see Table 3 and Figure 1B), with both of these barriers being more important than all other factors for both women and men faculty.

Despite the fact that time constraints were the most

important barrier for women and men faculty, it was not ranked to be as important as a facilitator. The top facilitators were improving internal functioning and policies and providing training and mentoring, which were ranked as more important than all other facilitators. For men, there was a large numerical difference between internal functioning and policies and providing training and mentoring, with the former being more important than the latter, but this difference did not reach the adjusted probability level of significance. For women, these two factors were

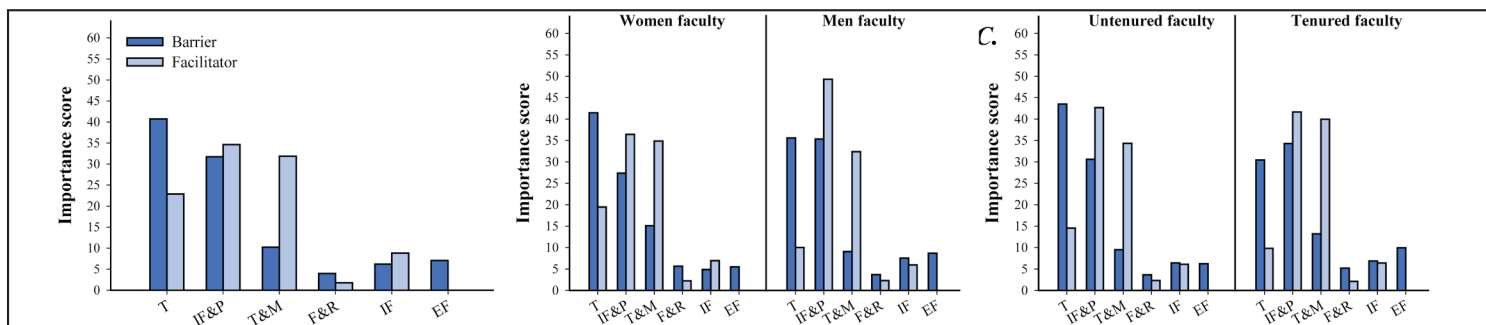


Figure 1. Panel A. Importance scores for the overall sample. Panel B. Importance scores for women and men faculty. Panel C. Importance scores for tenured and untenured faculty. T = Time; IF&P = Internal functioning and policies; T&M = Training and mentoring; F&R = Facilities and resources; IF = Internal funding; EF = External factors. Asterisks represent statistically significant differences between barriers and facilitators (adjusted significance value = $p < .01$); ** = $p < .01$; *** = $p < .005$; **** = $p < .001$. See text for details.

		Internal functioning and policies		Training and mentoring		Facilities and resources		Internal funding		External factors	
		Bar.	Fac.	Bar.	Fac.	Bar.	Fac.	Bar.	Fac.	Bar.	Fac.
Time	All	1.7	3.4	24.5*	2.0	38.9*	20.7*	33.1*	7.4 ⁺	31.1*	---
	F	4.4	7.1	17.1*	6.0	35.6*	15.4*	37.6*	6.9	36.0*	---
	M	0.0	37.0*	20.3*	15.0*	32.2*	5.2	23.2*	1.1	21.0*	---
	UT	3.6	19.4*	29.7*	10.6*	44.1*	9.7*	36.7*	3.8	37.1*	---
	T	0.3	26.5*	8.7 ⁺	24.3*	21.8*	5.3	18.4*	0.8	13.1*	---
Internal functioning and policies	All			14.0	0.2	26.3	36.3*	21.2*	19.6*	19.4*	---
	F			4.5	0.1	17.1*	37.5*	18.7*	25.6*	17.4*	---
	M			20.0*	5.9	31.9*	57.8	23.0*	47.0	20.7*	---
	UT			13.9*	1.5	25.6*	46.7*	19.4*	36.3*	19.7*	---
	T			12.2*	0.1	26.7*	45.7*	23.0*	34.0*	17.2*	---
Training and mentoring	All					3.0	32.5*	1.1	16.4*	0.6	---
	F					4.8	35.3*	5.8	23.6*	5.0	---
	M					2.4	31.6*	0.1	22.6*	0.0	---
	UT					2.8	34.2*	0.6	24.7*	0.7	---
	T					3.8	43.1*	2.2	31.6*	0.5	---
Facilities and resources	All							0.5	5.0	0.9	---
	F							0.1	2.5	0.0	---
	M							1.4	1.7	2.1	---
	UT							0.8	1.8	0.7	---
	T							0.2	2.3	1.6	---
Internal funding	All									0.1	---
	F									0.0	---
	M									0.1	---
	UT									0.0	---
	T									0.6	---

Each cell presents the value of the χ^2 statistic, for category comparisons. Significance levels were adjusted using the Bonferroni correction based on the number of comparisons conducted with each subsample. For barriers, the adjusted significance value was $p < .003$, and for facilitators it was $p < .005$. * = significant based on adjusted p value; + = marginally significant ($.005 < p < .007$ for barriers; $.003 < p < .005$ for facilitators). All = Full sample; F = Female faculty; M = Male faculty; UT = Untenured faculty; T = Tenured faculty. External factors did not emerge as a facilitator category, and thus comparisons were not possible (---).

Table 3. Chi squared values of category comparisons.

numerically and statistically equivalent (see Figure 1B). For both women and men faculty, time was more important as a barrier than a facilitator ($\chi^2s[1] = 18.56$ and $11.38, p < .001$ and $.005$, respectively), and training and mentoring was more important as a facilitator than a barrier for ($\chi^2s[1] = 16.59$ and $10.41, p < .001$ and $.005$, respectively). When women and men faculty were

compared against each other, there were no differences in how important they ranked the barriers and facilitators that emerged from the analyses.

Analysis of tenured vs. untenured faculty

It seems reasonable to assume that untenured faculty should feel more pressure to obtain external funding

(which, as mentioned below may be an “informal” review criterion for tenure decisions) than tenured faculty. Thus, the data for tenured and untenured faculty were analyzed separately to determine whether the barriers and facilitators emerging from these two samples were different. The overall pattern of data for both tenured and untenured faculty mirrored that for the overall sample: both ranked

time and internal functioning policies as more important barriers than all other factors, and training and mentoring as more important than all other facilitators, except for internal functioning and policies (see Figure 1C). Both tenured and untenured faculty ranked time to be more important as a barrier than as a facilitator ($\chi^2[1] = 13.26$ and 20.38 , respectively, $ps < .001$) and training and mentoring to be more important as a facilitator than as a barrier ($\chi^2[1] = 18.34$ and 18.00 , respectively, $ps < .001$).

Discussion

Obtaining external funding has become an expectation for professorial career progression at most institutions of higher education that count research as a criterion for tenure and promotion. Despite their community service orientation, HBCUs are not an exception. Indeed, pursuing and obtaining external funding is not only vital to the development of HBCU faculty careers, but also for the survival of their institutions. Analyses of funding to HBCU from federal sources suggests that this need for federal funding is far from met. Toldson (2016) analyzed the revenue from grants and contracts obtained by HBCUs, using TWIs as a reference. This analysis found that, in 2014, the total amount of grant revenue for all 4-year HBCUs combined (\$1.2 billion from federal, state, local, and foundation sources) was less than that for John Hopkins University alone (\$1.6 billion). Toldson argued that this creates a “caste system” in higher education, in which students and faculty at better-funded institutions have access to state-of-the-art facilities and resources than students and faculty at less-well-funded institutions. The consequences of this caste system are clear: Better-funded institutions have more resources to support faculty and their research, which in turn leads to more external funding.

In the present study, we identified six barriers for HBCU faculty to submit proposals for external funding: Lack of time, issues with internal functioning and policies, insufficient training and mentoring, insufficient facilities and resources, insufficient internal funding, and other external factors. Five of these six barriers could in some way be addressed by their institution, which was highlighted by the fact that they also emerged as facilitators: Increase available time to devote to writing grant proposals, improve internal functioning and policies, increase the availability of training and mentoring, improve facilities and resources, and provide seed and/or matching funding. Not surprisingly, time constraints emerged as the most important barrier to prepare and submit grant proposals; as mentioned above and elsewhere (see e.g., Escobar et al., 2021), HBCU faculty are burdened with many responsibilities and tight schedules that make finding the time to write grant proposals difficult. However, the surveyed faculty did not view easing time constraints as the top facilitator to seek external funding; rather, improving

internal functioning and policies and providing training and mentoring emerged as the top facilitators. This was somewhat surprising, as we anticipated that time, which emerged as the top barrier, would also be the top facilitator.

The emergence of time constraints as the top barrier for women was not surprising. Despite a move toward more egalitarian division of family responsibilities, women faculty are more likely than men faculty to have a working spouse and be the primary caretaker for children at home (e.g., French et al., 2020), an issue exacerbated by the COVID-19 pandemic. Women faculty are also more likely than men faculty to be burdened with “departmental housekeeping”, small but time-consuming, service and advisement responsibilities (e.g., O’Meara et al., 2017a, b). Thus, it was not surprising that time constraints were ranked as women faculty’s top barrier (this category included teaching, mentoring/advising, and service activities). Notably, men faculty also ranked time constraints as a top barrier, although for men faculty the importance of time as a barrier was numerically and statistically identical to the importance of internal functioning and policies as a barrier (for women faculty the difference between these two factors was sizeable, although it did not reach statistical significance with the adjusted p values). Despite it not being the top barrier, the availability of training and mentoring emerged as the top facilitator for both men and women faculty. This category included items such as assistance with finding funding opportunities, training on grant writing, proposal review, and structured faculty mentoring programs.

The emergence of internal functioning and policies as one of the top barriers and facilitators suggests that HBCU faculty view structural properties of their institutions related to governance, culture, and climate (rather than physical facilities) as a hurdle they need to conquer in order to progress in their academic careers. The type of barriers coded under this category include perceived unfairness in internal reviews (e.g., internal competitions for funding mechanisms that limit the number of proposals from a given institution), experiences of interference from administrators, perceived discrimination, difficulties with the Office of Sponsored Programs (OSP), lack of recognition for research accomplishments, and overall perceived lack of support for research initiatives. The facilitators coded under this category were in direct alignment with the barriers, including fairness of internal reviews, increase the number of personnel and improve the policies and functioning of the OSP, increase recognition of research accomplishments, and provide support at all levels (department, college, and institution).

Tenured and untenured faculty had an almost identical pattern of barrier and facilitators, suggesting that HBCU faculty do not stop pursuing research funding after they achieve tenure and promotion. Indeed, some studies show that HBCU faculty research productivity tends

to increase as they progress through the academic ranks, which may be due to either experience or reduced teaching loads (Betsey, 2007). As was the case with the overall sample, improving internal functioning and procedures and providing training and mentoring emerged as the top facilitators, suggesting that even tenured faculty could benefit from interventions aimed at providing information and support with efforts to attain external funding.

Notably, no faculty group (men, women, tenure, or untenured faculty) ranked physical facilities or start-up funding as their top barrier or facilitator. This suggests that, even if faculty are aware of the many issues that affect HBCUs (e.g., lack of state-of-the-art facilities and resources), they consider that improving climate and providing proper training and mentoring would significantly increase their chances of obtaining external funds.

Training and mentoring as an essential component of proposal success

The process of writing a grant proposal is complex, and even “good” writers may find that the “proposal language” is foreign to them. Grant proposals tend to use simple, straightforward language that emphasizes key aspects and distills details to facilitate reading and understanding by reviewers who are knowledgeable in the area, but likely not experts, on the topic. Page limits constraint verbosity, which is often encouraged in research articles, and section requirements warrant focus and organization that differs from other academic writing endeavors. Grant proposals could be (and are frequently) rejected due to the presentation style; either because they focus too much on what has been done and too little on what will be done, or because they miss the target of the requirements of the solicitation. This can be highly frustrating because it is difficult to determine whether the rejection is due to conceptual or stylistic concerns. Writing grant proposals is also a time-consuming endeavor, which requires that priorities are re-evaluated, takes time from other responsibilities, and can take a heavy toll on family life (Herbert et al., 2014). Not surprisingly, women faculty in this study viewed availability of time as the major barrier and one of the main facilitators for their successful writing of grant proposals. However, HBCU faculty may struggle allocating sufficient time to research due to conflicting activities (Escobar et al., 2021).

Porter (2006) suggested that proposal writing could be encouraged and facilitated by (1) instituting workshops that describe the grant application and scoring process, (2) giving examples of successful grant applications, (3) using the services of a grant specialist to edit the proposal, (4) using a “red team” of experienced colleagues for review, and (5) creating summaries of writing tips for grant proposals. Note that all of these activities fall under the umbrella of “training and mentoring,” which was identified by participants in this study as a primary facilitator of writing grant proposals.

It is not all on the faculty or the HBCU: Implicit biases impact the chances of HBCU faculty receiving external funding

A large proportion of HBCU faculty are individuals from URGs, and providing support for these faculty must start with an awareness that there are funding disparities that impact URG PIs and which, consequently, disproportionately affect HBCU faculty. Applicants who self-identify as White are 1.7-fold times more likely to receive funding from the NIH than applicants who self-identify as Black, even when proposals have received similar scores (Ginther et al., 2011). Low funding rates for Black PIs appear to be independent of the institution from which the PI graduated, field of study, type of institution from which the proposal originated, or prior success of the applicant (Ginther et al., 2011; Hoppe et al., 2019), although they may be related to their publication history as described in their biographical sketch (Ginther et al., 2018). Small institutions are also at a disadvantage when it comes to obtaining external funding (Murray et al., 2016), possibly because their facilities and resources may be viewed by reviewers as insufficient to complete the project.

Black applicants also need to resubmit proposals more times than White applicants to increase their chances of success. Ginther et al. (2011, Table S6) reported that in 2000–2006, NIH made a total of 23,381 awards out of 83,188 applications (28.1% success rate). Out of the submitted proposals, 69.9% were submitted by White PIs (72.8% of awards) and 1.4% were submitted by Black PIs (0.8% of awards). The probability that a Black PI would resubmit a proposal (of the proposals submitted in the 2000–2006 period, 68.1, 22.4, and 9.6% were first, second, and third submissions, respectively) was equivalent to that of a White PI resubmitting a proposal (62.3, 26.7, and 11.0% were first, second, and third submissions, respectively). Thus, the problem is not that Black applicants fail to resubmit their applications (Taffe & Gilpin, 2021), the problem is whether they submit proposals in the first place. Success rates for proposal resubmissions increases steadily, narrowing the gap between White and Black researchers. In Ginther et al.'s analysis, success rate for White and Black researchers were 22.1 vs. 9.5% for first submission, 38.7 vs. 25.3% for second submission, and 47.4 vs 41.8% for third submission. This suggests that encouraging submission and continuing support to facilitate revision and resubmission of proposals is important to increase the rate of success of Black applicants in obtaining external funding.

A recent analysis suggested that funding by the NSF also favor White over Black applicants. Chen et al. (2022) calculated the overall funding rate of proposals to the NSF between 1996 and 2019 (range: 22–34%) and compared it to the relative funding rate of applicants disaggregated by race. Overall, White applicants' likelihood of obtaining an award was higher than the overall rate (+8.5%), whereas it was lower than the overall rate for all non-

White groups analyzed (Asian [−21.2%], Black/African American [−8.1%], and Native Hawaiian/Pacific Islander [−11.3%]). Black applicants submit fewer proposals (929 or 3% of submissions in 2019) than White applicants (20,400 or 66% of submissions in 2019). These disparities were observed with varying proportions for research- and non-research-based proposals, and across directorates. Reviewer scores also showed disparities based on the race of the applicant. In 2015, White applicants received a median score of 3.24 (where 1 = poor and 5 = excellent), whereas Black applicants' median score was 2.98.

Note that, since the publication of Ginther et al.'s (2011) report, most funding agencies have taken steps to reduce bias in the review process, which have had varied degrees of success (see Lauer and Roychowdhury, 2021; Taffe & Gilpin, 2021, for a discussion of continued inequities in NIH funding). Funding decisions are ultimately made by the agency, and agencies seem to take into consideration factors other than reviewers' scores when determining whether to fund highly-scored proposals (Chen et al., 2022, Figure 5B). But there is still plenty of ground to cover. Even though federal agencies like NIH make awards “to institutions, not people” (Lauer, 2018), there is also inequality regarding the type of institutions that receive funding, with 2% of NIH-funded institutions receiving 53% of NIH awards (e.g., Wahls, 2019). Number of grant applications, success rates, and award sizes skew funding toward large institutions, creating a vicious cycle: Institutions that receive funding tend to have better research facilities and attract more students and, in some states (e.g., North Carolina), state funding dollars are aligned with the strength of the institution as a “research university” (Adams & Tucker, 2022). Wahls (2019) argued that discrepancies among institutions in research funding are an example of the “Matthew effect” (the richer get richer), but this may not be the most beneficial strategy for science. Smaller laboratories (typically at smaller institutions) tend to be more innovative (larger laboratories tend to develop the ideas that the laboratory is already researching), and the skewed distribution of funding may overshadow the rich diversity of ideas and innovation from small and diverse research teams.

Change is in the horizon

As mentioned above, in 2022, 11 HBCUs were classified as “R2” institutions. In the 2021–22 fiscal year, some HBCUs acquired record funding, including \$122 million for Howard University, \$97.3 million for North Carolina A&T University, and \$74 million for Morgan State University. Howard's funding exceeded its goal of attaining \$100 million in research funding by 2024, and continues a trend of increasing funding (the institution obtained \$66 million in research funding in 2020, and \$91.3 million in 2021). This trend suggests that an HBCU could possibly be designated as an “R1” institution in the foreseeable future; indeed, this goal is part of Howard University's new strategic plan

(Weissman, 2022). The American Council of Education (ACE) is exploring whether to include a new classification of institutions of higher education based on whether they contribute to social mobility and racial equity, which aligns with the mission of most HBCUs (Lederman, 2022). However, this should not undermine the role that research at HBCUs has had through history, and obtaining external funding is a necessary part of supporting this innovation.

The PATHs Program

The PATHs program (Qazi & Escobar, 2019), funded by the NSF's Alliances for Graduate Education and the Professoriate (AGEP) program is an innovative approach to provide faculty with the support and resources they need to further their careers through obtaining external funding. PATHs' interventions have aligned with the facilitators that emerged in this study. Structured mentoring, proposal-writing informational sessions, and one-on-one proposal development mentoring fill the need for *training and mentoring*. PATHs Fellows (URG pre-tenured faculty in STEM fields) are connected not only to external mentors, but also to a Red Team that provides focused mentoring on proposal development, submission, and resubmission. A structured mentoring program has connected participating faculty with experienced faculty, who provide valuable information, guidance, and feedback on successful strategies to obtain external funds. Mentoring in the PATHs program goes beyond developing the idea for a proposal; the program provides information and guidance on funding opportunities, individualized mentoring on the pre-award process (e.g., developing specific aims, creating a budget), and support through the post-award process (e.g., the function of the OSP on managing the budget).

The PATHs program has also focused on building awareness of the importance of supporting faculty through the grant proposal and management cycle. Informational sessions with institutional leaders have led to increased awareness of both the external and internal factors that impede successful attainment of external funds by their faculty. Some of these awareness efforts have been instrumental to reduction of heavy teaching loads by newly-hired faculty, which can facilitate faculty success by addressing *time constraints, internal functioning and policies*, and lack of *internal funding*. These informational sessions have also highlighted the accomplishments of pre-tenure faculty, increasing *recognition* of their efforts from institutional leadership. We believe this recognition is essential to improving institutional climate and an important motivator of their faculty's efforts to pursue external funding opportunities. Comprehensive models such as PATHs can create systemic and sustainable structures to support HBCU faculty success with procuring external funds.

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