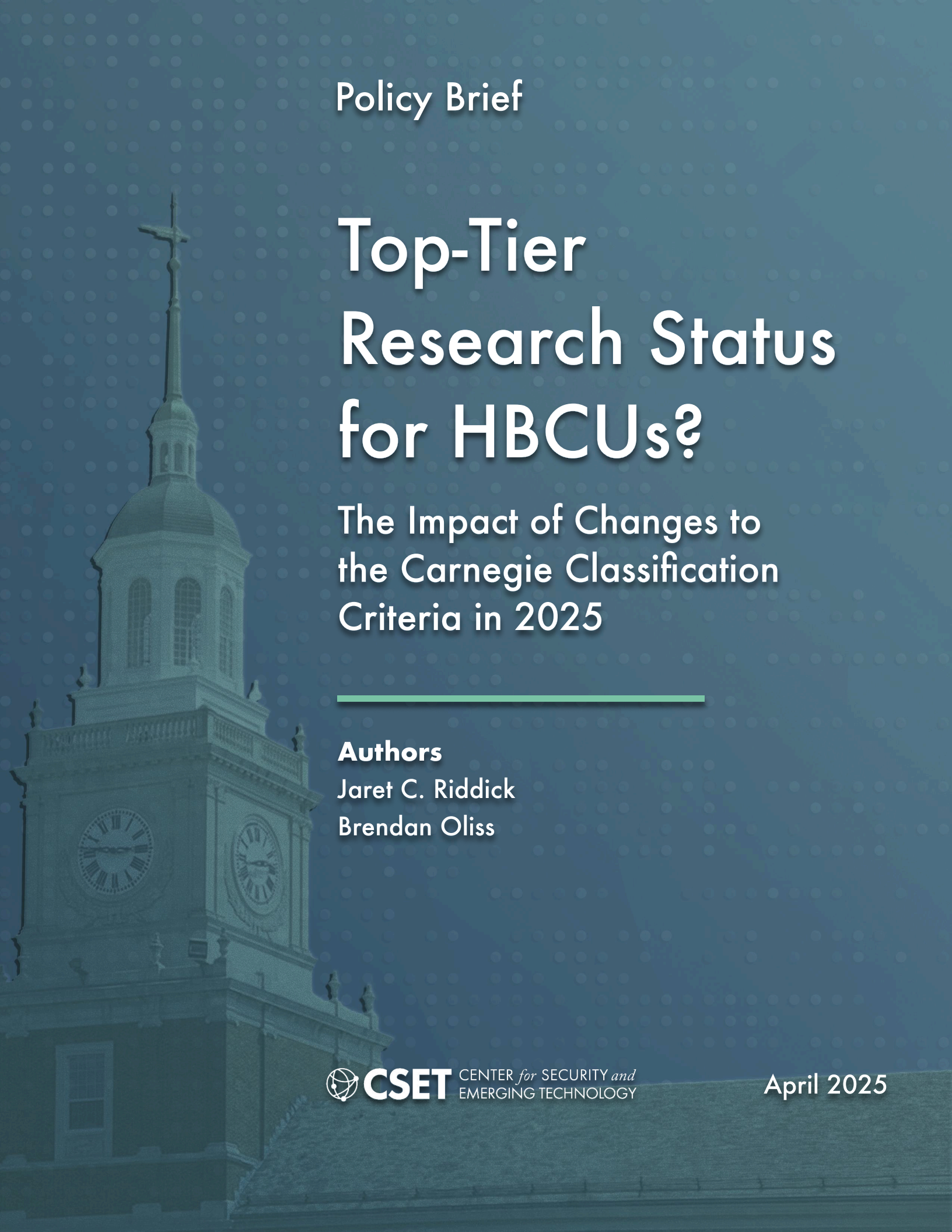

Policy Brief

Top-Tier Research Status for HBCUs?

The Impact of Changes to the Carnegie Classification Criteria in 2025

Authors
Jaret C. Riddick
Brendan Oliss

CSET CENTER *for* SECURITY *and* EMERGING TECHNOLOGY

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Executive Summary

Since 2015, the Carnegie Classification of Institutions of Higher Education has used a set of calculations based on a host of criteria—such as research expenditures, number of faculty, doctoral degrees conferred, and number of PhD research staff—to determine its highly coveted R1 ("very high research activity") top-tier research classification. Starting in 2025, CCIHE will drastically simplify the criteria. The new threshold for achieving R1 will simply be spending $50 million on research and development (R&D) and awarding 70 doctoral degrees in any research field—all within a year.

Congress has long recognized the strategic importance of increasing the defense research capacity of minority-serving institutions, and it recently enacted a law with the goal of encouraging the highest performers among these institutions, including eligible historically Black colleges and universities, to achieve R1 status. Section 223 of the 2023 National Defense Authorization Act authorizes the Department of Defense (DOD) to use a portion of the billions of dollars it spends annually on higher education R&D to expand the defense research capacity at the nation's minority-serving institutions and encourage them to strive for R1 status.[1] Although the changes to the CCIHE criteria slated for 2025 intend to uplift a range of R&D efforts across the country's diverse higher education landscape, the implications for the nation's HBCUs are unclear.

This policy brief addresses the question of how the original goals for HBCU progress supported by Section 223 translate to the new criteria for achieving R1 status adopted in 2025. The Section 223 law relies on the 2015 classification criteria to develop "measurable" progress toward top-tier research status.[2] This raises concern about the impact of the new 2025 criteria on the key goal of Section 223: to expand defense research capacity by encouraging eligible HBCUs and other minority-serving institutions to achieve R1 status. Here, we analyze data on research expenditures and PhD conferrals for R1 and R2 universities, according to the 2015 CCIHE criteria, and we analyze a snapshot of the 11 R2 HBCUs from 2021, in the context of the newly simplified 2025 criteria.

Several key recommendations emerge from the analysis presented here:

1. **Revisit Section 223.** Congress, the DOD, and HBCU leadership together should revisit the goals and objectives of Section 223 to develop strategies for investment, programming, and sustainment based on the CCIHE classification criteria being adopted in 2025.

2. **Increase the proportion of science, technology, engineering, and mathematics research PhDs.** For the key objectives of both achieving and sustaining R1 status, strategies for eligible R2 HBCUs should focus on increasing the proportion of STEM research PhD degrees to greater than 33 percent, with 45 percent as a goal.

3. **Increase the proportion of institutional expenditures.** To address the gap between R2 HBCUs and highly successful R1 institutions, R2 HBCUs focused on top-tier research status should increase the proportion of institutional funding of R&D, largely driven by endowment income, to levels of 30 percent or greater.

4. **Close the funding gaps.** To achieve goals of Section 223, for those institutions closest to 70 research PhD conferrals per year, near-term infusions of state and local R&D funding can provide a bridge to developing long-term strategies to grow the proportion of institutional funding.

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Introduction

The Carnegie Classification of Institutions of Higher Education has drastically simplified the criteria that determine its highly coveted R1 ("very high research activity") top-tier research classification. Since 2015, CCIHE analysts have used a set of calculations based upon criteria such as research expenditures, doctoral degrees conferred in science and engineering, and number of PhD research staff. Starting in 2025 the threshold for achieving R1 will be simply spending $50 million on research and development (R&D) and awarding 70 PhDs in any research field—including arts and humanities—within a year.[3]

Since 2022, the D.C.-based nonprofit American Council on Education (ACE) has led the management of the CCIHE.[4] The classification labels designate institutions at the forefront of innovative R&D. An institution's classification often influences decisions concerning cutting-edge research projects, grants, and collaborations with leading experts.[5] As such, pursuing the R1 and R2 ("very high" and "high" research activity) classifications is a key priority for research institutions. According to the *Chronicle of Higher Education*, ACE is making this change to the CCIHE in an attempt to better reflect the breadth of R&D in higher education.[6] The old criteria often rewarded institutions with comprehensive R&D programs, and more specialized institutions were often overlooked.[7] Although the change is intended to uplift a range of R&D efforts across the country's diverse higher education landscape, questions remain about the implications for the nation's historically Black colleges and universities (HBCUs).

Recognizing the strategic importance of increasing the defense research capacity of minority-serving institutions, Congress recently enacted a law with the goal of lifting these institutions, including HBCUs, to R1 status. The law, Section 223 of the 2023 National Defense Authorization Act (NDAA), authorizes Department of Defense (DOD) programs supportive of R1 status for these institutions based on the 2015 CCIHE classification criteria.[8] This raises concerns about the impact of the proposed 2025 criteria on the key goal of Section 223: to expand defense research capacity by encouraging eligible HBCUs and other minority-serving institutions to achieve R1 status.

Implementation of Section 223 allows the DOD to take full advantage of HBCUs as fundamental to preserving national competitiveness and innovation. As testament to the importance of these institutions, the bipartisan HBCU Research, Innovation, Security, and Excellence Act, introduced in 2022, pointed out that while HBCUs represent only 3 percent of U.S. colleges and universities, they graduate 25 percent of Black students with bachelor's degrees in science, technology, engineering, and

mathematics (STEM).[9] Also, according to the RISE Act, HBCUs are the institution of origin for almost 30 percent of Black graduates of science and engineering PhD programs.

A recent *Defense One* op-ed made the point that, in order to compete globally, the United States must access untapped talent among underrepresented populations.[10] The great power competition between the United States, Russia, and China is shaping up to be a race for technological dominance. According to a recent CSET analysis of leading producers of STEM graduates around the world, China and India lead the United States, with Russia not far behind.[11] Talent among populations typically underrepresented in the advancement of technology is key to closing this gap and maintaining U.S. competitiveness. HBCUs represent a proven pipeline to this talent, and Section 223 gives the DOD a new lifeline to increased defense research capacity in this continually evolving strategic competition.

How do original goals for HBCU progress supported by Section 223 translate to the new criteria for achieving R1 status starting in 2025? In order to maintain progress on these goals, Congress, the DOD, and HBCU leadership must connect strategies, plans, and programs from the 2015 criteria to the 2025 criteria. Do the same priorities apply, or is course correction needed?

Here, we analyze historical data for research expenditures and PhD conferrals for universities classified as R1 and R2 according to the 2015 CCIHE criteria. More importantly, we plot R2 HBCUs according to their yearly R&D expenditures and PhD conferrals, and compare them to the new 2025 criteria. The data is taken from the Higher Education Research and Development (HERD) survey—conducted by the National Center for Science and Engineering Statistics, part of the National Science Foundation (NSF)—and the Integrated Postsecondary Education System (IPEDS), run by the U.S. Department of Education's National Center of Education Statistics (NCES).[12] Since the latest update to the list of R1 institutions was performed in 2021, data from that year will be the focus of this study. Historical data from years 2015 and 2018 will also be used.

In 2021 there were 11 R2 HBCUs:

1. Clark Atlanta University; Atlanta, GA
2. Florida A&M University (FAMU); Tallahassee, FL
3. Howard University; Washington, D.C.
4. Jackson State University; Jackson, MS
5. Morgan State University; Baltimore, MD

6. North Carolina A&T State University (NC A&T SU); Greensboro, NC
7. Prairie View A&M University (PVAMU); Prairie View, TX
8. Southern University and A&M College; Baton Rouge, LA
9. Tennessee State University; Nashville, TN
10. Texas Southern University; Houston, TX
11. University of Maryland Eastern Shore (UMES); Princess Anne, MD

Background on the Carnegie Classifications and Their Importance

The CCIHE, often referred to simply as the Carnegie classification, was established in 1970 by the Carnegie Foundation for the Advancement of Teaching as a way to classify American colleges and universities according to their research capabilities and production.[13] Since the first published classifications appeared in 1973, the Research I, or R1, designation has signaled the very top tier of research institutions, followed by Research II, or R2.[14] For the 1973 and 1976 versions of the CCIHE, the top 50 PhD-granting universities (ordered by federal grants) were designated as R1, while R2 signified the top 100 by federal grants. To qualify for consideration, universities had to award 50 or more PhDs in a calendar year.

The classification criteria have evolved over time. In 1987, hard limits on funding were used to designate the R1 and R2 categories.[15] For universities awarding 50 or more PhDs, R1 status required $33.5 million or more in federal grants, and R2 required between $12.5 million and $33.5 million. In 1994, the required amounts were raised to above $40 million for R1 status and between $12.5 million and $40 million for R2 status.[16] In 2000, Carnegie made an attempt to quell the inference that the research classification was a ranking system by realigning the research categories.[17] Between 2000 and 2005, the classification recognized "Research-Extensive" as those institutions that awarded 50-plus PhDs across 15 or more disciplines, and "Research-Intensive" as those institutions that awarded 10 PhDs across three or more disciplines, or at least 20 PhDs overall. Additional changes were made between 2005 and 2010, moving away from using the R1 and R2 labels.[18]

In 2015, a dramatic shift was proposed for determining the classification. The category "R2: Doctoral Universities—high research activity" was redefined as those universities that "conferred at least 20 research/scholarship doctorates in 2016–17 and reported at least $5 million in total research expenditures."[19] "R1: Doctoral Universities—very high research activity" status was then determined using a principal component analysis, which took into account multiple indicators of research activity.[20] The PCA approach, applied for the first time in 2018, yielded two "research indices," one for the aggregate level of research activity and another for per capita research activity.[21] Institutions that

scored highly on both indices were classified as R1. The approach broadened the R1 classification without watering down the standard by applying analytical rigor that enabled a broader set of key research indicators to be weighed.

In 2021, the list of R1 institutions updated by applying the PCA calculations to data from the 2020-21 academic year. At the time of this update, the number of R1 institutions stood at 146, more than double the 1994 number.[22] While much of the discussion at that time focused on the fact that no HBCU had R1 status, it is worth noting that Howard University, an HBCU in Washington, D.C., held R1 status from 1987 until shifts in CCIHE criteria in 2005. As of the latest update announced in 2025, Howard University became the only HBCU among the 187 R1 institutions. In addition, the number of R2 HBCUs rose from 11 to 13 of the 139 R2 institutions in this 2025 update.[23]

The two primary data sources for the CCIHE are the NSF HERD survey, which captures yearly higher education expenditures reported by institutions, and the NCES IPEDS, which captures yearly institution data on program completions, graduation rates, faculty, and more.[24] Table 1 presents data for schools with the highest combined scores on the research indices from the PCA approach described above, using 2021 data from HERD and IPEDS.

Note that here and throughout this brief, "R&D expenditures" include spending from federal, state, local, and institutional funds. HERD defines institutional funds as endowment income, general-purpose state or local government appropriations, general-purpose awards, and gifts.[25] The "total R&D expenditures" reported in Table 1 also include expenditures from other private sources, which can include businesses and nonprofits. We found that in 2021, for the average R1 institution, less than 15 percent of R&D spending was from private sources and the average among R2 HBCUs was close to 5 percent. Therefore, data for other private sources will not be reported here but is available in the 2021 HERD survey.

Table 1. 2021 R&D Expenditures and PhD Conferrals for High Performing R1 Institutions

Institution	Total R&D Expenditure Rank	Total R&D Expenditures	Federal Funds	State and Local Funds	Institutional Funds	Total Research PhDs	% Research PhDs in STEM
U. Michigan, Ann Arbor	3	$1.64B	$891M	$2.07M	$582M	793	66%
U. Pennsylvania	4	$1.63B	$792M	$20.7M	$512M	555	44%
U. Wisconsin, Madison	8	$1.38B	$647M	$136M	$413M	696	51%
Stanford U.	9	$1.27B	$811M	$17.8M	$136M	817	71%
Harvard U.	10	$1.25B	$617M	$5.14M	$384M	656	49%

Sources: Table builder, HERD Survey, National Center for Science and Engineering Statistics, accessed July 1, 2024, https://ncses.nsf.gov/surveys/higher-education-research-development/2022; "Custom Data Files," IPEDS, National Center for Education Statistics, accessed July 1, 2024, https://nces.ed.gov/ipeds/datacenter/InstitutionByName.aspx?sid=e63aa0ec-8ce9-4250-8103-6f4085d39e6a&rtid=5.

Table 1 shows that the CCIHE is not an outright ranking system. The school with the highest R&D expenditures for 2021, Johns Hopkins University at nearly $3.2 billion, is notably not at the top of the list here. Rather, schools that achieve the highest scores in both aggregate and per capita research indices are considered the top performers. Criteria beyond R&D expenditures and number of research doctorates awarded yearly weigh heavily on these results. The top R1 schools all exhibit the following characteristics: total R&D expenditures of more than $1 billion, STEM PhD production above 44 percent of graduated PhDs, significantly more R&D spending from the institution than from state and local funding, and the proportion of R&D expenditures from institutional funding at roughly 30 percent, with few exceptions (additional data presented in the Appendix). We use the Department of Homeland Security (DHS) definition of STEM, which includes mathematics and statistics, engineering, biological and biomedical sciences, and physical sciences.[26]

Table 2 shows the same 2021 R&D expenditure and PhD conferral data but for "newly minted" institutions that achieved R1 status in 2018, using the 2015 criteria. These schools have research index scores just above the threshold between R2 and R1 status. The comparison with Table 1 highlights the broad range of schools with R1 status, all considered top-tier research institutions. The R&D expenditures in Table 2

range from around the 2025 criteria, $50 million, up to $225 million, far shy of the $1 billion level of Table 1. The STEM PhD production among the newly minted R1 institutions in Table 2 ranges from 34 percent up to 62 percent, and, R&D expenditures from institutional funding significantly outpace those from state and local funding. Data shared in the Appendix, shows the proportion of institutional funding ranging from 30 percent up to 62 percent. Significant spending above the 30 percent threshold reflects increased spending on infrastructure, faculty and researchers required for newly minted institutions to move into top-tier research status.

Table 2. 2021 R&D Expenditures and PhD Conferrals for Institutions Newly Achieving R1 Status in 2018

Institution	Total R&D Expenditure Rank	Total R&D Expenditures	Federal Funds	State and Local Funds	Institutional Funds	Total Research PhDs	% Research PhDs in STEM
Tufts U.	110	$225M	$167M	$3.24M	$15.4M	115	61%
North Dakota State U.	141	$164M	$42.8M	$43.8M	$69.1M	126	44%
U. Maryland, Baltimore County	171	$84.4M	$59.9M	$7.22M	$12.4M	89	40%
Kent State U.	205	$50.4M	$32.5M	$9.22M	$31.4M	134	34%
Ohio U., Athens	206	$49.8M	$19.2M	$0.883M	$24.7M	128	39%
Baylor U.	207	$48.8M	$11.2M	$1.89M	$26.7M	131	37%

Sources: Table builder, HERD Survey, National Center for Science and Engineering Statistics, accessed July 1, 2024, https://ncses.nsf.gov/surveys/higher-education-research-development/2022; "Custom Data Files," IPEDS, National Center for Education Statistics, accessed July 1, 2024, https://nces.ed.gov/ipeds/datacenter/InstitutionByName.aspx?sid=e63aa0ec-8ce9-4250-8103-6f4085d39e6a&rtid=5.

HBCUs, Congress, DOD, and Section 223

Beginning with the 1987 NDAA, and revisiting efforts in the 2010, 2016, and 2020 versions, Congress has long sought to strengthen engagement between the DOD and the nation's HBCUs. Today, those efforts are encapsulated by Section 223. Existing programs of the Office of the Secretary of Defense, often in coordination with the military services, are in a strong position to provide robust reporting to Congress in response to that law.[27]

Congress has embraced a move beyond symbolic gestures toward measurable outcomes by empowering the DOD through Section 223 to harness the growing defense research capacity of HBCUs. The law was inspired, in part, by a congressionally mandated study conducted by the National Academies of Sciences, Engineering, and Medicine (NASEM), released in 2022.[28] Among a host of findings, the NASEM study concluded that DOD "programs, practices, and investments" are not sufficient for the research funding and infrastructure support needed to capture the capacity of HBCUs and other minority-serving institutions. The recommendations of the report called for a strategic approach, beyond simply allocating more funds, focused on strengthening capacity and incentivizing partnerships. As the NASEM study put it, "It is time to move from well-intentioned statements to actionable outcomes."

An entire section of the study's recommendations is dedicated to "improving data collection and evaluation," concluding that the DOD lacks sufficient quantitative evaluations to appropriately assess the advancement of HBCU research capacity. Quantifying the conditions that produce success will allow the intent of Congress, embodied in Section 223, to be fulfilled. Metrics associated with measurable outcomes at these institutions are critical for guiding DOD investment in talent to sustain U.S. superiority in emerging technologies.

The 2015 CCIHE classification criteria acknowledge the wide range of quality among U.S. colleges and universities, large and small. Section 223 requires that the DOD use the CCIHE criteria, referred to as "very high research activity status indicators," to develop "measurable milestones" to track and assess the progress of HBCUs toward R1 status.[29] These milestones will be used by the DOD, in concert with HBCU leadership, to support strategies for eligible R2 HBCUs to achieve R1 status. Further, these metrics can be used to develop future plans and projections to ensure that these institutions will sustain very high research activity after the ten-year program authorized by Section 223 sunsets. Now that the CCIHE criteria has changed for 2025, will metrics based on the current array of criteria (that is, R&D expenditures, number of faculty, research staff, and STEM PhD conferrals) remain effective? Or, should the two

CCIHE criteria adopted in 2025 (R&D expenditures and research PhDs awarded) serve as the sole metrics to evaluate the objectives of Section 223?

Why Is This a Goal Worth Achieving?

The program authorized by Section 223 comes at a time when the United States is lagging China in STEM higher education. A 2021 analysis from CSET concludes that China overtook the United States in STEM doctoral degrees conferred in 2007, and that by 2025 China could graduate more than 77,000 STEM PhDs compared to 40,000 from U.S. institutions.[30] This same assessment reports that, in 2019, China produced roughly 1.9 million STEM bachelor's graduates, while the United States produced just under 450,000. Finally, a 2023 CSET analysis shows China and India leading the United States in overall production of STEM graduates by wide margins.[31] An all-hands-on-deck approach is needed to close the gap. HBCUs, which excel at producing STEM talent from historically underrepresented demographic groups, need to be fully embraced as a key component of that strategy.

Rather than relying solely on closing the numerical gap, the United States must also invest in instilling the highest quality among institutions that serve as sources for its STEM talent. The "very high research activity status" designation, invoked as a goal in Section 223, is the gold standard applied to U.S. research universities by the Carnegie classification. Progress toward R1 for HBCUs will multiply the return on investment of precious DOD R&D funding. With an emphasis on faculty publishing and PhD programs, R1 universities attract the most distinguished professors and stand at the forefront of research and innovation.[32] Many also offer outstanding opportunities for undergraduate students, such as undergraduate research, access to teaching from distinguished experts, and better preparation for graduate-level studies and research.

Section 223 provides a pathway for DOD to expand traditional pipelines by growing the quantity of HBCU STEM graduates. Supporting and strengthening eligible institutions is critical for today's great power competition, in which maintaining U.S. superiority in emerging technologies is paramount. HBCUs are an integral part of this mission and fundamental to preserving national competitiveness and innovation. These institutions bring historically underrepresented demographic groups into the STEM talent pipeline and continue to be a key strategic asset.

The Carnegie Change

In 2025, Carnegie changed its classification in order to better recognize the broad diversity of approaches to R&D.[33] In a November 2023 article in the *Chronicle of Higher Education*, ACE acknowledges that university leaders making decisions on academics, budgets, and infrastructure are often heavily influenced by pursuit of the R1 classification.[34] ACE's hope is that simplification of the "murky 10-factor formula" method will provide stability in developing programs, strategies, and road maps for leaders pursuing top-tier research status.[35] The new CCIHE classification will consider (1) total expenditures on R&D and (2) total number of research PhDs. Effective in 2025, institutions that yearly spend over $5 million on R&D and confer more than 20 research PhDs will be R2, and institutions that yearly spend more than $50 million on R&D and confer more than 70 research PhDs will be considered R1.

The analysis presented here is intended to provide insight into how the 2025 changes proposed for 2025 will impact the goals of the current Section 223 law.

Impact on HBCUs

The 2023 article in the *Chronicle* pointed out that if the changes coming in 2025 had been enacted at the time, Howard University would achieve R1 status (which Howard indeed did in 2025).[36] Presumably, the writers reached this conclusion by examining publicly available data from NSF HERD and NCES IPEDS. The obvious question is: Of the remaining 10 R2 HBCUs, who is next?

The next sections of this report will consider the data used to determine R1 status (HERD and IPEDS)—focusing on 2021, the year of the latest update to the list of R1 institutions by CCIHE—to examine the status of the 11 R2 HBCUs under the existing criteria established in 2015. Then, using data from 2021, 2018, and 2015, this report will determine the prospective status of these same institutions based upon the changes announced for 2025. Besides Howard University, which R2 HBCUs might emerge as R1 institutions over time? What does available data indicate about the implications of the changes coming in 2025?

HBCUs in the Research Ecosystem

Although the new classifications are simple and may be easier for institutions to strive for, they may also have drawbacks, particularly for historically underfunded HBCUs and non-STEM institutions. Historically underfunded and non-STEM schools tend to attract less research funding.[37] Therefore, the 2025 classification criteria—which solely consider R&D expenditures and research doctorate conferrals—may have significant repercussions for HBCUs, particularly the country's eligible R2 HBCUs seeking to attain R1 designation. Therefore, Section 223 may need to be revisited to ensure that the goal of expanding defense research capacity for HBCUs can be met in the changing environment.

Recall that shifts in CCIHE criteria in 2005 saw Howard University lose the R1 distinction it had held since 1987.[38] While Howard will fare much better under the 2025 changes, what will be the other effects? Overall, how will these shifts impact progress toward the objectives of Section 223? What about not only achieving R1 status but maintaining it over time? Below, we examine data that characterizes the position of HBCUs within the scope of U.S. R2 research institutions. The data shows that current R2 HBCUs tend to have relatively low R&D expenditures yet continue to produce competitive levels of research PhD talent. Examining HBCU funding profiles and research PhD production can help to define the challenges and opportunities for R2 HBCUs presented by the 2025 classification criteria.

Underfunding and Overperformance

A 2024 report from the White House Council Economic Advisers (CEA) states: "Standard economic theory (and common sense) dictates that when particular sectors are highly productive, one should invest more heavily in these sectors. However, this has not been the case with HBCUs—which historically have been relatively underfunded."[39] Of the nearly $90 billion in U.S. higher education R&D spending reported in the 2021 HERD survey, roughly $49 billion was funded by the federal government, and HBCUs received about $550 million of that federal funding.[40] Our analysis of the 2021 HERD data indicates that while HBCUs made up 7.4 percent of the institutions that received federal R&D funding, they received only 1.1 percent of that funding—about a penny of every dollar. Recent estimates from the federal government suggest years of underfunding by states of HBCU land grant institutions, with the funding shortfall from states at nearly $13 billion over the course of 30 years.[41] Six of the 11 R2 HBCUs are land grant institutions that are subject of this recently acknowledged underfunding: FAMU, NC A&T SU, PVAMU, Southern University and A&M College, Tennessee State University, and UMES.[42]

As depicted in Table 3, R2 HBCUs tend to produce talent (in the form of research PhDs) with far fewer R&D expenditures compared to the average for non-HBCU R2 institutions. In all categories of expenditure, the average HBCU R2 trails behind the average non-HBCU R2. Further, their expenditures are supported by nearly 25 percent less in federal R&D funding and about 40 percent less in state and local R&D funding, and they expend about 60 percent less institutional funding on R&D than other R2 institutions. Despite an overall expenditure rate of slightly over 50 percent of the average across non-HBCU R2 institutions, the average HBCU R2 conferred PhDs at 75 percent the rate of the average non-HBCU R2 institution, demonstrating a relatively high return on funds spent. However, education efficiency is not among the criteria for the CCIHE: the 2025 classifications consider only the amount of money spent on R&D expenditures, not the efficiency of PhD production. As such, historically underfunded institutions may struggle to reach R1 and R2 status, even if they are disproportionately effective in PhD production.

Table 3. Comparison between R2 HBCUs and All Other R2 Institutions, 2021

R&D Expenditures, by Source of Funding	Average R2 HBCU	Average R2
Total	$21.1M	$41.9M
From federal funding	$16.5M	$22.2M
From state and local funding	$1.66M	$2.77M
From institutional funds	$4.31M	$12.3M
Total expenditures per PhD	$462K	$639K
Research PhDs Conferred	R2 HBCU	R2 Overall
Median number of PhDs conferred	42	56

Sources: HERD; IPEDS.

Even with the persistent underfunding at federal and state levels, Table 3 indicates that the largest gap in average R&D expenditures between R2 HBCUs and R2 non-HBCU schools is in institutional funding. The HERD survey defines institutional funds as the following: endowment income, general-purpose state or local government

appropriations, general-purpose awards, and gifts.[43] Endowment income accounts for the bulk of reporting for institutional funds in the HERD survey. The CEA report provides data indicating that HBCUs have much smaller endowments than non-HBCUs.[44] Ultimately, this leaves HBCUs more reliant on limited government funding to grow research capacity.

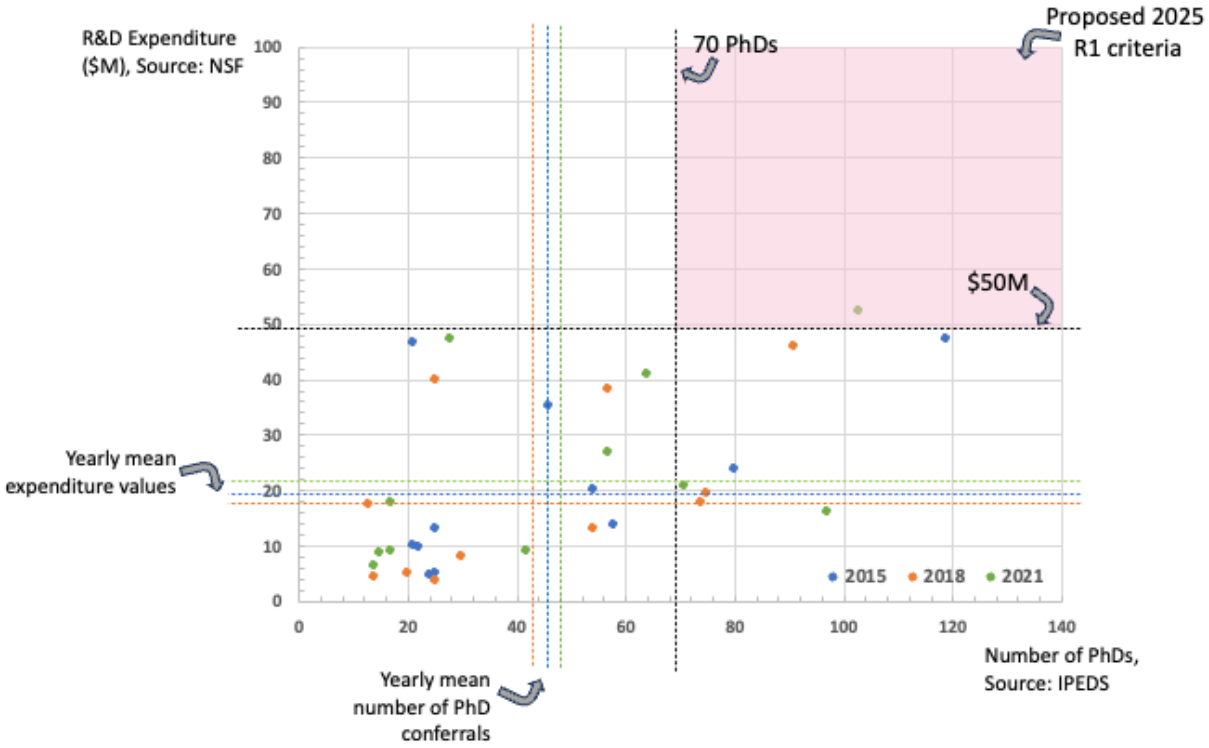
The data in Table 3 shows a clear contrast that can be attributed to HBCUs' relatively small endowments.[45] R2 HBCUs spend, on average, about one-third the amount of institutional funds on R&D compared to non-HBCU R2 institutions. Despite this gap in R&D expenditures, HBCUs consistently produce disproportionately high volumes of talent. Howard University, for example, produced nearly the same number of research doctorates as Tufts University in 2021, despite Tufts spending about $225 million on R&D compared to Howard's $52 million.[46]

The overperformance by HBCUs in the production of PhD talent makes them promising institutions for R&D funding, including both public and private investment. According to our analysis, collectively, R2 HBCUs account for about 6.5 percent of the research doctorates coming from R2 institutions while making up only about 4 percent of the U.S. R&D expenditures in a given year. However, the analysis in the following sections will demonstrate that the very efficiency that makes HBCUs a boon for R&D investment may hinder their efforts to reach R1 classification under the 2025 rules. For example, the proportion of STEM PhDs in 2021 was 61 percent for Tufts and 24 percent for Howard, suggesting that the higher proportion of STEM research PhDs conferred is associated with higher R&D expenditures. The following sections offer evidence that the apparent efficiency of producing more research PhDs with less R&D expenditure, associated with a lower proportion of STEM PhDs, may very well hinder progress to top-tier research status for HBCUs.

Pathways to R1 for R2 HBCU Institutions

The objective of Section 223 to help eligible HBCUs reach top-tier research status is rooted in the desire to improve the defense research capacity of the HBCU enterprise, which represents a critical asset to national security.[47] HBCUs are capable of producing quality STEM talent from underrepresented populations to help close the gap with China and other global power competitors. Considering the research ecosystem for U.S. colleges and universities discussed above, evidence indicates that R1 institutions share common characteristics: strong federal, as well as state and local, R&D support; a minimum level of institutional funding; and a minimum percentage of STEM research PhDs awarded in a given year. This evidence points to a common profile among those schools that are most successful at achieving and maintaining top-tier research status. To better appreciate the conditions and requirements for R2 HBCUs to meet the R1 threshold established for 2025, the following sections examine data specific to each of the HBCU institutions that held R2 status as of 2021, with a particular focus on key parameters for yearly STEM PhD production and investment of institutional funds.

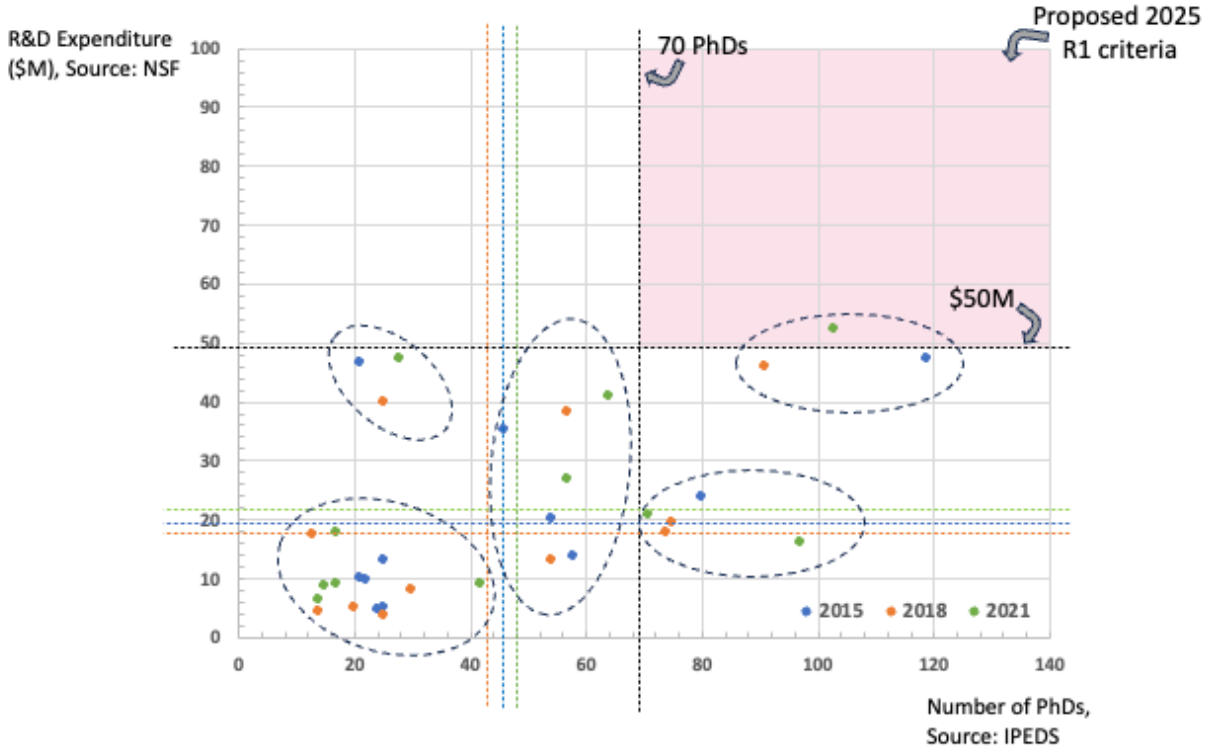
Figure 1. R2 HBCU R&D Expenditures and PhD Conferrals for 2015, 2018, and 2021



Sources: HERD; IPEDS.

Figure 1 presents 2015, 2018, and 2021 R&D expenditures and PhD conferrals for the 11 R2 HBCUs considered here. The shaded area in the top right quadrant is bounded by the 2025 R1 criteria: at least $50 million in R&D expenditures and 70 PhDs awarded yearly. The dotted lines depict the mean yearly R&D expenditures along with the mean number of PhDs awarded yearly across all 11 R2 HBCUs, color coded by year. In Figure 2, dotted ellipses encircling clusters of data points have been added to support the analysis in the next sections.

Figure 2. R2 HBCU R&D Expenditures and PhD Conferrals for 2015, 2018, and 2021, with Clusters

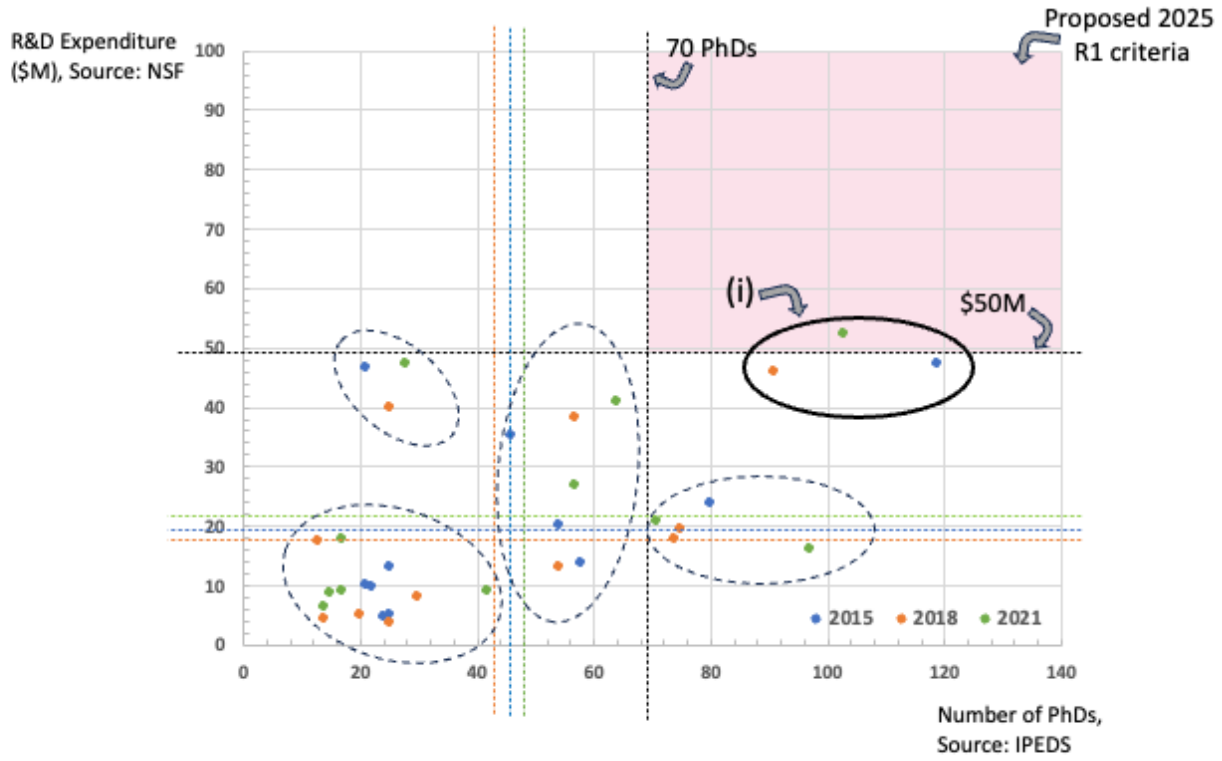


Sources: HERD; IPEDS.
Note: the dotted ellipses label clusters of points.

Of the 33 total data points, only one falls within the shaded area representing 2025 R1 status. This point belongs to Howard University, based on 2021 R&D expenditures and PhD conferrals (see Table A3 in the Appendix). It is part of a small cluster, labeled (i) in the solid-line ellipse in Figure 3. This cluster also includes Howard University data points for 2015 and 2018 R&D expenditures and PhD conferrals. This was announced officially in 2025, confirming the *Chronicle*'s prediction that: "If the list were redone today, Howard University…would make it."[48]

The composition of Howard's 2021 research PhD production and R&D expenditures offers interesting insight (see Table A3). For example, the percentage of R&D expenditures from institutional funds is 23 percent for 2021, comparable to top R1 institutions. On the other hand, the percentage of STEM degrees among the PhDs is 24 percent, considerably lower than top R1s (see Table 1).

Figure 3. Howard University's R&D Expenditures and PhD Conferrals for 2015, 2018, and 2021, Compared to Other R2 HBCUs

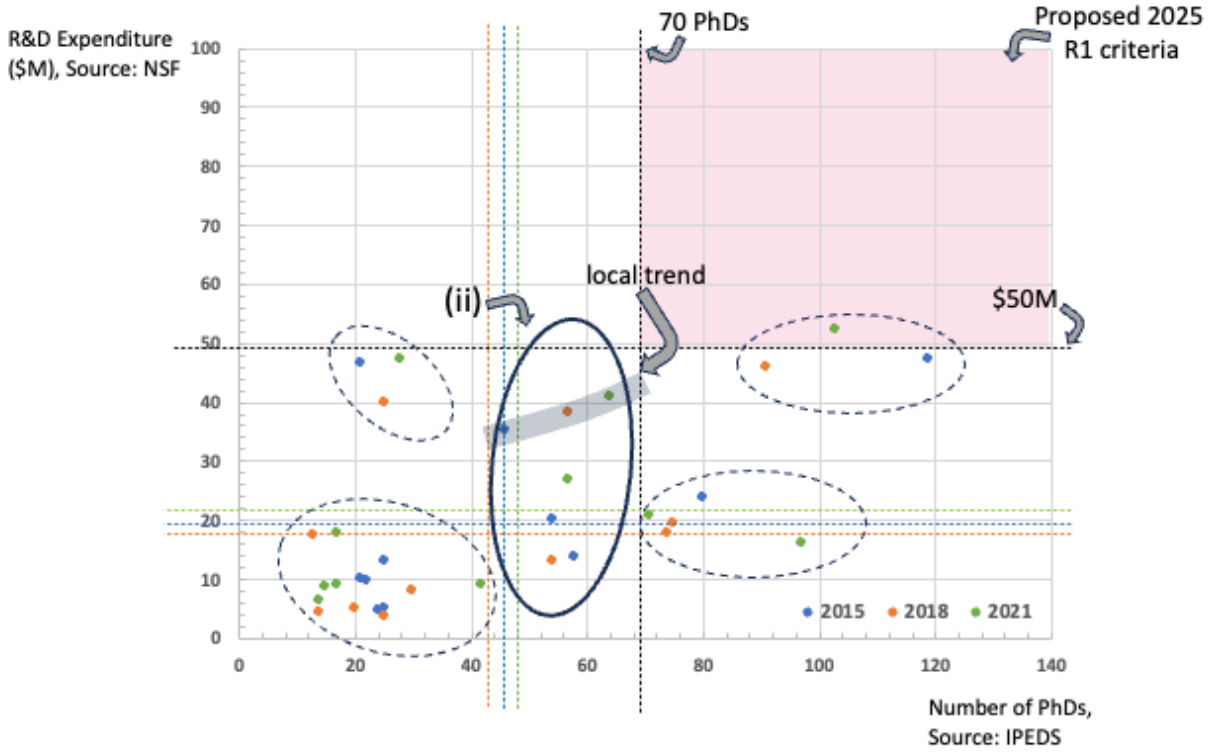


Sources: HERD; IPEDS.

A broad cluster is labeled (ii) in Figure 4, where the points exceed the yearly mean for expenditures, for PhD conferrals, or for both. Within this cluster, a local trend is labeled for points that are above $30 million. This trending data belongs to NC A&T SU. If this trend continues, this university has the potential to reach R1 status between 2026 and 2027. This cluster also includes Morgan State University (2015, 2018) and Tennessee State University (2015, 2021). The data from the other institutions within cluster (ii) shows no trends indicating a potential to reach R1 status in a time frame similar to NC A&T SU. Additionally, data shared in the Appendix shows NC A&T SU leads among all R2 HBCU institutions with 54 percent of its PhDs conferred in STEM

fields. As discussed earlier, this STEM focus has to be considered a basis for this strong showing in R&D spending.

Figure 4. R2 HBCU R&D Expenditures and PhD Conferrals that Exceed Yearly Mean for 2015, 2018, and 2021, including Local Trend (NC A&T SU)



Sources: HERD; IPEDS.

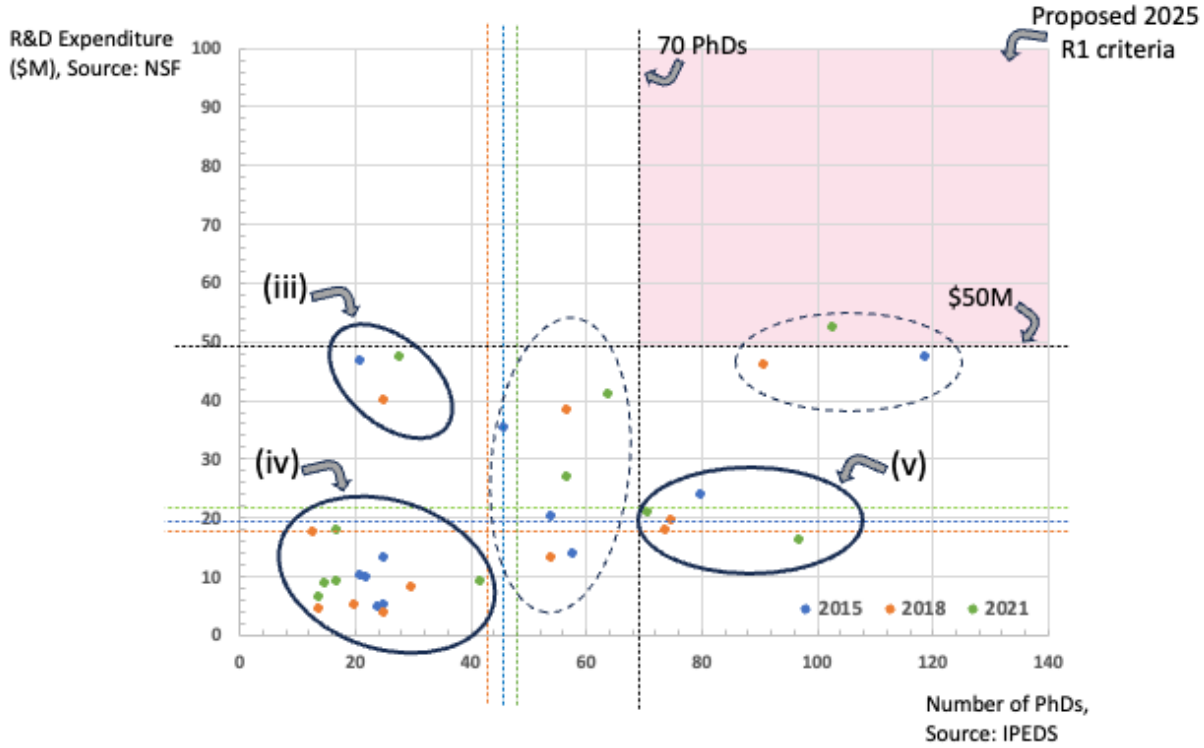
The remaining clusters of data are labeled in Figure 5 as (iii), (iv), and (v). With respect to the 2025 R1 criteria, the institutions represented by the data in these clusters have done the following:

(iii) Not conferred enough research PhDs but achieved R&D expenditures near the 2025 threshold
(iv) Not met either threshold
(v) Exceeded the threshold for research PhD conferrals but not achieved the appropriate R&D expenditures

These conditions indicate that it is unlikely that the institutions in these three clusters will achieve R1 status in the near future. For example, the cluster of points labeled (iii) in Figure 5 corresponds to FAMU. In order to meet the 2025 R1 criteria, PhD conferrals

would have to more than double. The cluster labeled (v) contains institutions with more than 70 PhDs in a year but with yearly R&D expenditures of about $20 million, well below the $50 million threshold for 2025. Jackson State University falls within this category for each of the three years, while Tennessee State University (74 research PhDs in 2018) and Morgan State University (71 research PhDs in 2021) also appear in this cluster. As the *Chronicle* article pointed out: What is the incentive for R2 institutions with consistently high research PhD output to nearly double research expenditures in search of the R1 goal?[49]

Figure 5. R2 HBCU R&D Expenditures and PhD Conferrals for 2015, 2018, and 2021, Highlighting Schools Furthest away from R1 Thresholds



Sources: HERD; IPEDS.

Finally, the data labeled (iv) in Figure 5 represents R2 HBCUs below the yearly mean values for R&D expenditures and PhD production. In general, all institutions within this group would have to significantly increase yearly R&D expenditures and research PhD conferrals to reach the 2025 thresholds. This cluster includes Clark Atlanta University, PVAMU, Southern University and A&M College, Texas Southern University, and UMES. According to this data, sustaining R2 status is the best near-term focus for this group of institutions. Among these institutions, UMES and Texas Southern University stand

out for having STEM PhDs at 33 percent and 35 percent, respectively, of research PhDs granted. Additionally, for Texas Southern University, nearly 30 percent of the 2021 R&D expenditures come from institutional funds. These percentages are in line with those of top-performing R1 institutions discussed earlier (see Appendix). This is an indication that, even with low R&D expenditures and PhD production, aligning resources to yield proportions of institutional funding and STEM PhDs comparable to top performing R1 institutions is possible among R2 HBCUs.

Discussion

The observations highlighted here indicate that under the new Carnegie classification criteria adopted in 2025, pathways to R1 status can be imagined for R2 HBCUs that fit certain profiles in the available historical data. For example, Howard University has consistently delivered over the 70 PhD threshold and, for the first time, surpassed the $50 million expenditure threshold in 2021. The data also showed NC A&T SU with 2021 R&D expenditures and PhD production near the 2025 thresholds. It is foreseeable that NC A&T SU could be the next HBCU R1 institution in 2026–2027 or soon after. While the data shows promise for certain institutions among the 11 R2 HBCUs to reach the R1 designation, challenges were uncovered as well, such as historic underfunding and the fact that these institutions generally produced a low proportion of STEM PhDs.

Given the challenges of underfunding and lack of STEM PhDs, several HBCUs that produce remarkable amounts of talent will struggle to meet the R1 classification. STEM-based PhD research drives R&D expenditures higher because of larger federal awards versus non-STEM PhD research. More institutional spending is also required to support STEM research infrastructure and talent, such as hiring nonfaculty PhD science and engineering researchers. Based on current R&D expenditures and research doctorate production, the majority of R2 HBCUs are unlikely to achieve R1 status in the near future. For example, Southern University and A&M College, UMES, PVAMU, and Texas Southern University have consistently registered outcomes well below the 2025 thresholds for R1 PhD conferrals and R&D expenditures. Therefore, while these institutions play a critical role in providing defense research capacity, they are unlikely to soon reach R1 status based on the 2025 criteria. Additionally, several institutions—namely Jackson State University, Morgan State University, and Tennessee State University—have exhibited the necessary production of research doctorates but are far from the necessary threshold in R&D expenditures. Finally, Florida A&M University almost meets the expenditure level required in 2025 but lags significantly in research PhD conferrals.

Conclusions and Recommendations

Starting in 2025, the CCIHE has drastically simplified the criteria that determine its highly coveted R1 ("very high research activity") classification. The thresholds will be simply spending $50 million on R&D and awarding 70 doctoral degrees in any research field—including non-STEM fields—within a year. Section 223 of the 2023 NDAA recognizes the strategic importance of increasing the defense research capacity of minority-serving institutions, including HBCUs, by encouraging at least some of them to achieve R1 status. This legislation follows a history of congressional intent to strengthen engagement between the DOD and the nation's HBCUs, beginning with the 1987 NDAA. By empowering the DOD through Section 223, Congress is signaling a move beyond symbolic gestures toward measurable outcomes to grow defense research capacity of these institutions. However, the fact that Section 223 relies on the 2015 CCIHE criteria, rather than what is being put in place for 2025, raises concerns about the impact of the new criteria on the key goal of the act: to encourage eligible HBCUs and other minority-serving institutions to achieve R1 status.

Under the 2015 criteria, no HBCU was among the nation's 146 R1 universities. The 2025 criteria sets simple thresholds that can become the basis for progress toward top-tier research status for eligible HBCUs. Several key points emerge when considering the data in the analysis presented here:

1. Institutions that are top performers in the 2015 CCIHE R1 category exhibit the following characteristics (using 2021 data): total R&D expenditures of more than $1 billion, STEM research PhD production above 44 percent, and institutional funding at roughly 30 percent, with very few exceptions.
2. Among the 11 R2 HBCUs (using 2021 data): total R&D expenditures averaged roughly $23 million, federal R&D expenditures average about $16 million (roughly $6 million less than the overall average for R2 institutions), STEM PhD production is above 30 percent for only three of the institutions, and, while two institutions display a proportion of institutional R&D expenditures above 30 percent, the majority of the institutions are at or below 20 percent, with many below 10 percent.
3. Considering the 2025 CCIHE criteria, R2 HBCUs fall into three major categories:
    a. one (Howard University) exceeds the yearly thresholds of $50 million R&D expenditure and 70 research PhDs awarded and achieved R1 status in 2025;
    b. one (NC A&T SU) is within striking distance of both thresholds, with the potential to achieve R1 status in 2026–2027; and

c. a significant cluster of institutions are well below either or both thresholds, indicating much less likelihood of achieving R1 status in the near future.

Recommendations

Based on the conclusions of this analysis, when considering the path forward to achieving the goals of Section 223, we have the following recommendations

Revisit Section 223. Congress, the DOD, and HBCU leadership should revisit the goals and objectives of Section 223 to develop strategies for investment, programming, and sustainment based on the CCIHE criteria being adopted in 2025. Section 223 of the 2023 NDAA authorized the DOD to expand defense research capacity by encouraging R1 status for eligible minority-serving institutions based on the 2015 CCIHE criteria. In light of the changes coming to the criteria in 2025, Congress, the DOD, and HBCU leadership together should define metrics to inform development, measure progress, and evaluate success toward congressional goals.

Increase the proportion of STEM research PhDs. For the key objectives of achieving and sustaining R1 status, strategies for eligible R2 HBCUs should focus on increasing the proportion of STEM research PhD degrees to at least 33 percent, with 45 percent as a long-term goal. Among the best-performing R1 institutions examined here, the proportion of STEM PhDs conferred being at or above 44 percent is a significant common characteristic. While causation cannot be traced to this single attribute, the highest performing R1 institutions produce higher percentages of STEM PhDs compared to R2 institutions. For the newly minted R1 institutions examined, the proportion of STEM PhDs ranged from 33 percent up to 62 percent. However, the proportion of STEM research PhDs was generally below 25 percent and ranged down to single digits among R2 HBCUs in 2021. This presents an opportunity for DOD and congressional leaders to use insights about these proportions among successful R1 institutions to help achieve the goals of Section 223.

Increase the proportion of institutional expenditures. To address the gap between R2 HBCUs and highly successful R1 institutions, R2 HBCUs focused on top-tier research status should increase the proportion of institutional funding of R&D, largely driven by endowment income, to levels of 30 percent or greater. Although HBCUs generally have lower R&D funding across all relevant categories, the biggest disparity is in expenditures from institutional funds. Typical R2 institutions outspend R2 HBCUs by nearly three to one in institutional funds dedicated to R&D, and yet total output of research PhDs from the R2 HBCUs is not far behind on a yearly basis. Potential

progress toward the goals of Section 223 would be greatly enhanced if HBCUs were not constantly having to do more with less. Recognizing that endowment income makes up the bulk of institutional funds reported in the HERD survey, building the endowments of HBCUs specifically to increase R&D expenditure would help to address one of the most significant gaps in research funding between R2 HBCUs and other R2 institutions. However, growing endowments for R2 HBCUs is a long-term strategy, and important consideration must be given to the significant lift required to sustain top-tier research capacity, with $50 million in R&D expenditures and 70 PhDs awarded yearly as the key thresholds.

Close the funding gaps. Focus should be placed on those institutions closest to 70 research PhD conferrals per year, where near-term infusions of state and local R&D funding can provide a bridge to developing long-term strategies to grow the proportion of institutional funding of R&D. The goal should be increasing STEM PhD production, as mentioned above. Closing the gaps in federal funding and institutional funding between the typical R2 institution and the R2 HBCUs is a key area to address. The federal funding gap has persisted over more than a decade, and federal agencies intent on building the research capacity of HBCUs must address it head-on. The institutional funding gap is a longer-term issue dependent on the ability of these institutions to grow their endowment income. The approach taken by North Dakota (see Appendix for more details) offers a model for HBCU, DOD, and congressional leadership, along with state and local officials, to consider.[50] Overcoming the issue of lagging institutional funding is key to achieving a key strategic objective of Section 223: growing the defense research capacity of HBCUs and other minority-serving institutions.

Authors

Jaret Riddick is senior fellow at CSET.

Brendan Oliss is a student data research assistant at CSET, and a senior at Georgetown University pursuing degrees in biology and political economy.

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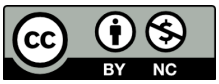

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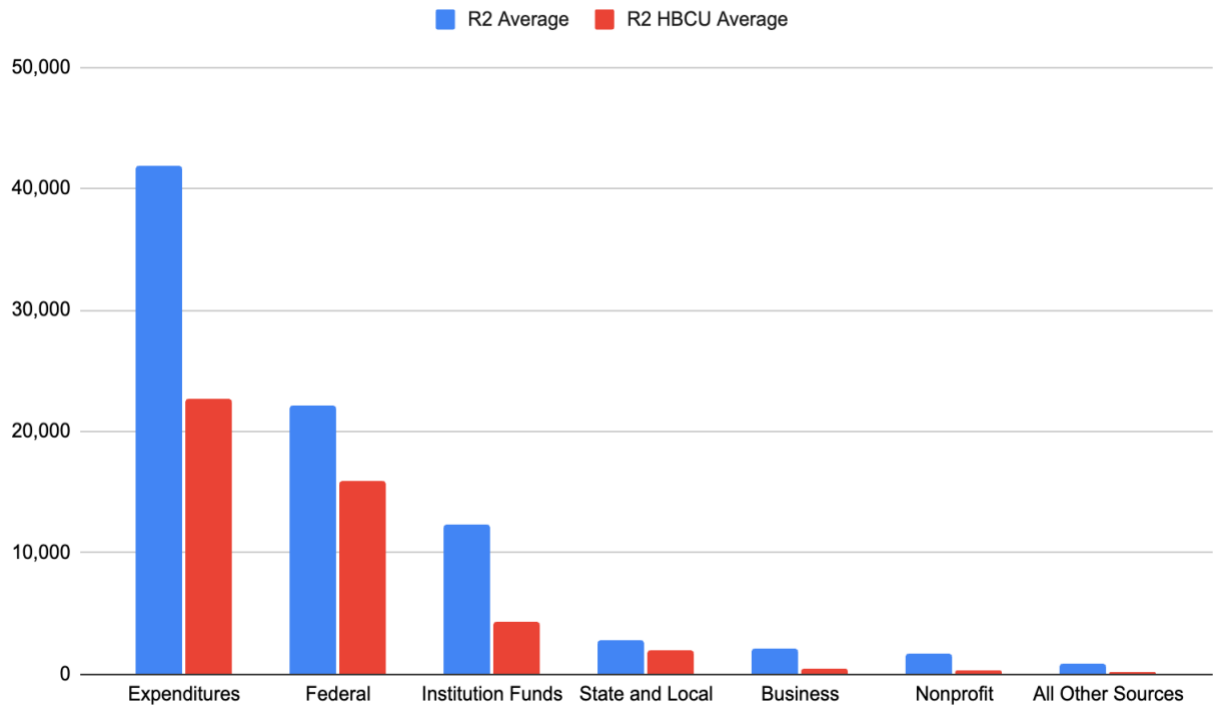
Appendix

Compared to other R2 institutions in 2021, the 11 R2 HBCUs had lower R&D expenditures. When considering total R&D expenditures (see Figure A1, below), data from the HERD survey suggests that R2 HBCUs on average spent just over 50 percent of the research dollars that the average R2 institution spends. With the reduced R&D expenditures, R2 HBCUs still produced 75 percent of the research doctorates that the average R2 institution did (see Table 3, above). When examining the specific sources of funds for expenditures, the disparities between the average R2 HBCU and R2 institution are more apparent.

Figure A1. Comparison of Average R&D Expenditures for R2 and HBCU R2 Institutions, 2021, by category.



Sources: HERD; IPEDS.

Table A1 below represents the data from Table 1 above in terms of percent institutional funds and percent STEM doctorates; Table A2 does the same for the data in Table 2. The data in Tables A1 and A2 offers clues about the composition of funding and PhD output for a range of R1 institutions. For instance, in Table A1, for the R1 institutions that performed best in the PCA approach, the institutional funding ranged between 30 and 35 percent. For the same high-performing institutions, the proportion

of STEM PhDs is significant. It is notable that the schools with the highest STEM PhD percentages do not top the list, implying that while high proportions of STEM PhDs is clearly requisite, other factors beyond sheer volume of STEM PhD production drove success under the PCA approach.

Table A1. Representing Table 1 in Terms of Percentage of Institutional Funds and Percentage of STEM PhDs, 2021

Institution	Total Research PhDs	% Research PhDs in STEM	R&D Expenditures	State/Local Funds	Institutional Funds	% Institutional Funds
Stanford U.	817	71%	$1.27B	$17.8M	$136M	11%
U. Michigan, Ann Arbor	793	66%	$1.64B	$2.07M	$582M	36%
U. Wisconsin, Madison	696	51%	$1.38B	$136M	$413M	30%
Harvard U.	656	49%	$1.25B	$5.14M	$384M	31%
U. Pennsylvania	555	44%	$1.63B	$20.7M	$512M	31%

Sources: HERD; IPEDS.

Considering Table A2, it is notable that, for many of the newly minted R1s, the institutional funds make up more than 40 percent of the total R&D expenditures in 2021. This is an indication that these schools contributed heavily from their own funding (i.e., beyond federal, state, and local funding), very likely as part of a strategy to achieve and maintain R1 status. The data from these newly minted R1s may offer guidance for HBCU and DOD leadership seeking to fulfill the goals of Section 223. According to the 2021 data presented in Table 3 and Table A3, R2 HBCUs lag in the proportion of institutional funds tapped for R&D expenditures: R2 HBCUs have a proportion of roughly 15 percent, while the average for R2 institutions is about 30 percent. Historical data indicates that many of these newly minted R1s rapidly accelerated institutional spending to achieve this 30 percent rate in the years leading up to their gaining R1 status.

The state of North Dakota is an excellent example. In the 2021 data for North Dakota State University (see Tables 2 and A3), the state and local R&D expenditures surpass the federal investment, and the institutional funding exceeds that. This type of considerable state investment, over time, is allowing the North Dakota schools to grow

infrastructure, recruit faculty, and begin new degree programs. As a result, North Dakota State University has achieved R1 status, and reports of the expansion of its endowments continue.

Table A2. Representing Table 2 in Terms of Percentage of Institutional Funds and Percentage of STEM PhDs, 2021

Institution	Total Research PhDs	% Research PhDs in STEM	Total R&D Expenditures	State/ Local Funds	Institutional Funds	% Institutional Funds
Kent State U.	134	34%	$50.4M	$9.22M	$31.4M	62%
Baylor U.	131	37%	$48.8M	$1.89M	$26.7M	55%
Ohio U., Athens	128	39%	$49.8M	$0.883M	$24.7M	50%
North Dakota State U.	126	44%	$164M	$43.8M	$69.1M	42%
Tufts U.	115	61%	$225M	$3.24M	$15.4M	7.0%
U. Maryland, Baltimore County	89	40%	$84.4M	$7.22M	$12.4M	15%

Source: HERD; IPEDS.

Table A3. R2 HBCU R&D Expenditures and PhD Conferrals in Terms of Percentage of Institutional Funds and Percentage of STEM PhDs, 2021

Institution	Research PhDs	% of Research PhDs in STEM	Total R&D Expenditures	State/Local Funds	Institutional Funds	% Institutional Funds
Howard U	103	24%	$52.4M	$1.18M	$12.1M	23%
Jackson St U	97	4%	$16.2M	$0	$1.43M	9%
Morgan St U	71	28%	$20.6M	$2.78M	$390K	2%
NC A&T SU	64	54%	$40.8M	$540K	$14.0M	34%
Tennessee St U	57	29%	$26.9M	$460K	$5.99M	22%
Clark Atlanta U	42	19%	$8.89M	$0	$3.44M	39%
Florida A&M U	28	18%	$47.1M	$5.74M	$3.89M	8%
PVAMU	17	18%	$17.6M	$4.04M	$3.42M	20%
Texas Southern U	17	35%	$9.13M	$760K	$2.70M	30%

Sources: HERD; IPEDS.

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