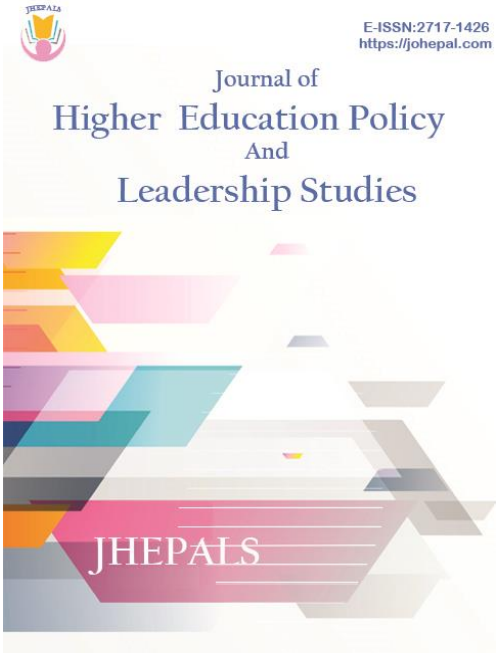
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Exploring *Hispanic-Serving* in Minority Serving Institutions: Pathways, Racial Equity, and STEM Doctoral Degree Production in the United States

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Exploring *Hispanic-Serving* in Minority Serving Institutions: Pathways, Racial Equity, and STEM Doctoral Degree Production in the United States

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Highlights

- Minority Serving Institutions (MSIs) can play a role in advancing racial diversity in STEM Ph.D. production and STEM workforce participation in the United States.
- To understand the role of MSIs, it is necessary to consider the institutional pathways of racial/ethnic STEM Ph.D. recipients that considers Hispanic-Serving Institutions (HSIs), which are federally designated MSI campuses with an enrollment of 25% or more undergraduate full-time equivalent Hispanic students.
- Due to national data limitations, HSIs often are excluded in the discussion of MSIs and STEM Ph.D. attainment despite awarding STEM doctoral degrees.
- Our study found that U.S. STEM Ph.D. production differs by race/ethnicity across types of institutions. Among HSI campuses, we found HSIs did not graduate more Hispanics STEM Ph.D. holders as their federal classification would suggest. At the same time, HSIs graduated a larger share of Hispanic STEM Ph.D. holders than HBCUs or PWIs. Suggesting that STEM Ph.D. production at HSIs might be more inclusive and serving a greater share of students beyond one racial/ethnic group.

Keywords: Hispanic-Serving Institutions (HSIs); Minority Serving Institutions (MSIs); STEM pathways; Graduate education; Race/Ethnicity

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Introduction

Despite national efforts, there continues to be a lack of racial/ethnic diversity among the science, technology, engineering, and math (STEM) workforce in the United States. For instance, Black and Hispanic people represented only 13% of the U.S. STEM workforce, whereas Whites make up 71% (Martínez & Gayfield, 2019). The lack of representation by people of color is a cause for concern because diversity in the workforce is recognized as a key mechanism for advancing U.S. innovation and its economy (Turner, 2018). In 2018, the National Academies of Sciences, Engineering, and Medicine [NASEM] reported that the nation's Minority Serving Institutions (MSIs) could be an overlooked resource towards increasing racial diversity in STEM degree attainment and STEM workforce participation. MSIs are federally classified institutions enrolling large proportions of racial/ethnic groups of students and include such institutional types as Historically Black Colleges and Universities (HBCUs) and Hispanic-Serving Institutions (HSIs).

Previous scholarship on MSIs have demonstrated evidence of success in recruiting, preparing, and graduating large numbers of STEM students of color in U.S. higher education (McGee, 2020a). Countless studies have also demonstrated that students of color at Predominantly White Institutions (PWIs) in the U.S. struggle to find inclusion, mentoring, and sense of belonging in STEM spaces on PWI campuses (McGee, 2020b). But the body of scholarship on MSIs and racial equity in STEM has primarily relied on the outcomes and perspectives of racially underrepresented students at the undergraduate level (NASEM, 2018). Although STEM undergraduate disparities remain a focus of concern, recent statistics finds that 29% of the current U.S. STEM workforce hold a graduate degree, with almost 6% earning a doctorate (Martínez & Gayfield, 2019).

Even with the large proportion of the U.S. STEM workforce who hold postbaccalaureate degrees, STEM graduate education at MSIs have not received much attention in education research. Also, relatively few studies have examined graduate student outcomes inclusive of Hispanic-Serving Institutions (HSIs) (e.g., Garcia & Alvarado, 2021). Excluding U.S. HSIs is related to limitations with national education data that do not identify or collect information on HSIs despite their federal classification and STEM graduate offerings. As a result, there is a limited view of the overall role MSIs play in closing the United States' racial/ethnic gap in STEM. Thus, examining a more realistic landscape of the institutional pathways of racially underrepresented U.S. STEM Ph.D. holders can provide insight about whether (in)justices in STEM representation might be playing out not only at the student-level, but also within these types of institutions in U.S. higher education.

This study links data on Hispanic-Serving Institutions (HSIs) with national data on doctoral recipients to examine the interplay between race/ethnicity and institutional pathways for U.S. STEM Ph.D. holders. This is the first study to examine institutional pathways of U.S. STEM Ph.D. students that earned their degree from a Hispanic-Serving Institution. As such, this study aims to explore the nuance in the United States' MSIs and racial equity in STEM and describe whether there are racial/ethnic variations among three pathways: HBCUs, HSIs, and PWIs. In doing so, we provide descriptive evidence about racial/ethnic STEM Ph.D. outcomes at HSIs that extends what has previously been observed in the United States' national datasets on HBCUs and PWIs but usually is not considered in the overall discussions about the role of MSIs in U.S. higher education.

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Methodology

Our study combined U.S. data from the National Science Foundation's (NSF) Survey of Earned Doctorates (SED), the National Center for Education Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS) and *Excelencia* in Education's data on HSIs. The sample included data from the SED on U.S. doctoral degree recipients during the period between 2015-2017. We restricted this sample to STEM doctoral degree recipients by identifying students who reported earning a Ph.D. in the fields of Agriculture, Biological/Biomedical Sciences, Engineering, Mathematics, and Physical Sciences. Data from IPEDS were used to classify the degree granting institution as an HBCU or PWI. Whereas degree granting institutions classified as HSIs were identified using 2015-2017 data from *Excelencia* in Education, a Washington, DC-based advocacy organization for HSIs. To explore the racial/ethnic variation of U.S. STEM Ph.D. degree recipients' institutional pathways, we analyzed the data descriptively and compared trends in STEM Ph.D. production across HBCUs, HSIs, and PWIs for each racial/ethnic subgroup.

Findings

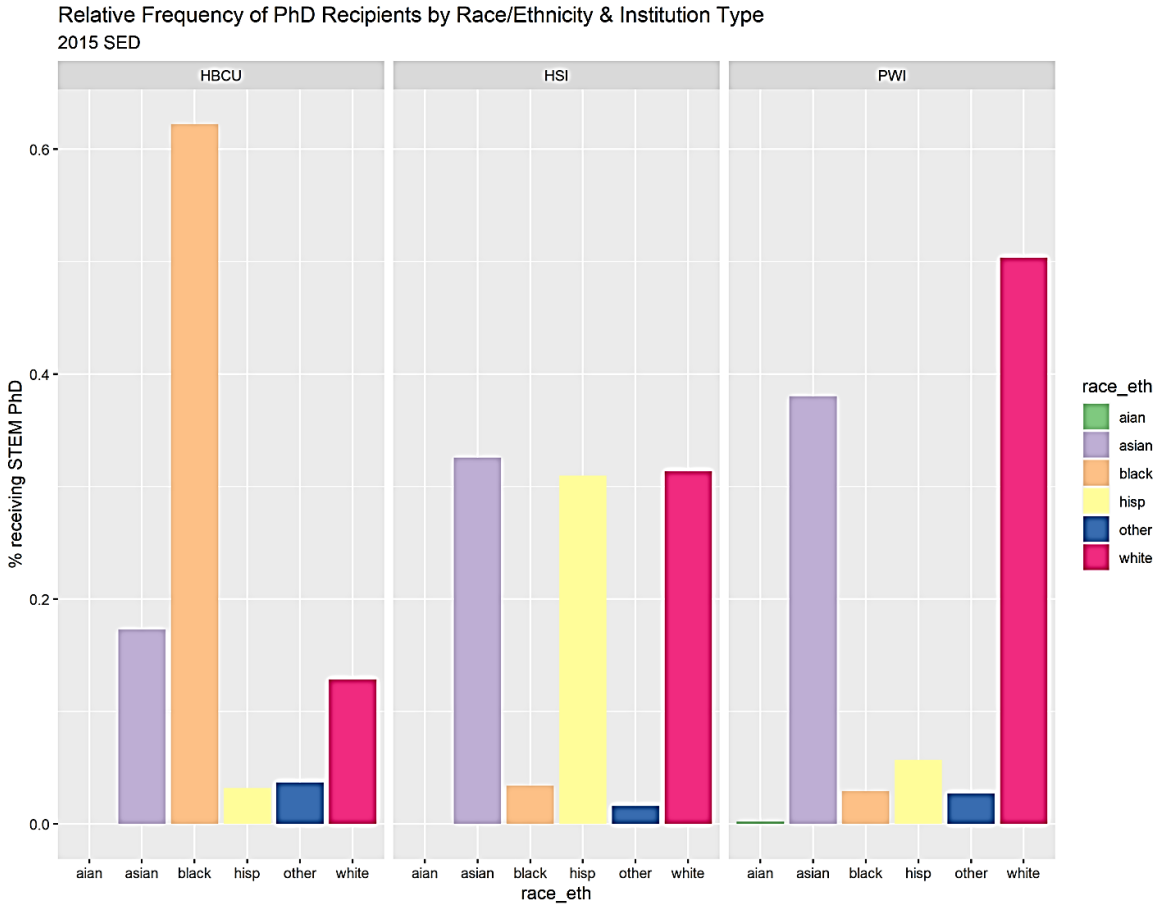


Figure 1. Relative Frequency of Ph.D. Recipients by Race/Ethnicity and Institution Type, 2015-2017

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Figure 1 shows the percent of students receiving a STEM Ph.D. by race/ethnicity and institution type. The results identified that 65% of the total STEM Ph.D. degrees earned at HBCUs were awarded to Black students. The second highest proportion of STEM Ph.D. graduates at HBCUs were Asian students (18%). Among HSIs, the highest proportion of students graduating with a STEM Ph.D. were White (35%), followed by Asians (33%), and then Hispanics (30%). For PWIs, more than half of all STEM Ph.D. degrees were awarded to White students, and 35% were awarded to Asian students. A little more than 10% of the STEM Ph.D. graduates at PWIs were from a Black, Hispanic, Alaskan Native, or Other racial/ethnic background.

Discussion

MSIs may advance the number of STEM graduate degrees awarded to students of color in U.S. higher education. Our study explored this hypothesis but advanced previous knowledge by considering HSIs and STEM doctorates. Results showed U.S. STEM Ph.D. production differs by race/ethnicity across institutions. HBCUs graduated more Black students, and PWIs graduated more White students. But HSIs did not graduate more Hispanics as their federal classification would suggest. We found HSIs awarded a higher proportion of their STEM Ph.D. degrees to Asian and White students. This is a significant finding given that prior literature has shown how HSIs intentionally serve *undergraduate* Hispanic STEM students in the U.S. despite not having a mission to serve them (NASEM, 2018).

We believe these findings suggest that HSI inclusivity in STEM doctorates might not be just for Hispanics. Instead, HSIs might be serving a broader swath of students beyond just one group or identity. At the same time, HSIs in the U.S. seem to be serving Hispanics—graduating a larger share than HBCUs or PWIs. But more research is needed to better understand the patterns identified in this study. Future research should consider how well HSIs serve Hispanic STEM doctorates in the United States. Future research can also help us better understand U.S. MSI STEM Ph.D. production by considering how HSI organizational factors, like institutional capacity and funding, at the doctoral level could influence outcomes differently for students by race/ethnicity and institutional type.

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest.

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Human Participants

Deidentified data was used to protect the privacy of research subjects and the confidentiality of their personal information. All ethical guidelines are observed in accordance with the rules and regulations of the universities in terms of the participants of the current research and further considerations based on the Declaration of Helsinki.

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