Journal of Urban Mathematics Education
December 2023, Vol. 16, No. 2, pp. 14–30

Educational Aspirations of Diverse Groups among Undergraduate Statistics Majors

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Understanding the educational aspirations of diverse groups among statistics majors provides insight into the discipline of statistics. This study utilizes multi-institution data from the 2019 and 2020 administrations of the National Survey of Student Engagement (NSSE) to explore educational aspirations for statistics majors through comparisons to other major types as well as among gender identity and race/ethnicity in a sample of 225,892 seniors, including 521 majoring in statistics. Preliminary results from a series of chi-squared analyses suggest that while other STEM majors are more likely to aspire for doctoral or professional degrees, statistics majors are more likely to aspire for a master's degree. However, among the statistics majors, there were no statistically significant differences in educational aspiration by gender identity and race/ethnicity.

KEYWORDS: statistics education; postsecondary education; educational aspirations; diversity

There is a gap between the number of individuals with statistics degrees or formal statistical training and the needs of academic and non-academic statistical work (Brown & Kass, 2009; Higgins, 1999; Horton, 2015). This issue, described aptly as "statistics without statisticians" (Moore, 2001), is not new (Horton, 2015) and underscores the importance of understanding and developing interest and aspirations in the field. Further, the field of statistics occupies a unique space as a "transdiscipline" (Scriven, 2008): a discipline that serves as a method used within other disciplines and a discipline of study in its own right. For this reason, many individuals studying and using statistics to varying extents (such as class work, research projects, or statistics minors) might not consider themselves statisticians at all.

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A student's educational and career aspirations represent an important area of study, as they can provide key indicators of individual self-concept and future career-related behavior. For example, aspirations are closely related to degree enrollment and attainment (Carter, 1999, 2002; Eagan et al., 2013), and career aspirations have been linked to future attainment and income (Edwin et al., 2018). Further, aspirations can shed light on how students view their identity (Edwin et al., 2018). Research examining the STEM aspirations of diverse groups is essential for school and career counselors advising students or developing targeted interventions (Edwin et al., 2018). This focus on diverse groups is consistent with the field of urban mathematics education, which foregrounds the need to work against inequity (Martin & Larnell, 2013).

Educational and career aspirations related to science, technology, engineering, and math (STEM) have been examined among various populations including, for instance, undergraduate engineering students (Litzler & Lorah, 2018), high school students in the United States (Edwin et al., 2018), and high school students in Australia (Holmes et al., 2018). However, little is known about the aspirations of undergraduate students majoring in statistics in the United States.

The Discipline of Statistics

Within the STEM fields, statistics is notable for a few reasons. Statistics classes are often required for many postsecondary students across various majors, in addition to those students majoring in statistics (Lorah & Valdivia, 2021). Some research has found that completing statistics classes improves students' critical thinking, such as for undergraduate psychology students (Dempster & McCorry, 2017). However, students taking statistics classes, particularly from other disciplines such as the social sciences, may feel fear or anxiety associated with their experience with statistics (Dempster & McCorry, 2017; Moore, 2001; Zysberg, 2010). Further, there may be low interest associated with taking quantitative courses, particularly for women (Ceci et al., 2009), which is unfortunate due to the documented worldwide declines in numeracy and mathematical abilities (Mamedova & Pawlowski, 2021; Uttl & Smibert, 2017).

The field of statistics grapples with issues of a singular, well-defined identity. This could be related to its dual purpose as a unique area of inquiry as well as a method used in many different areas of inquiry. In particular, the field struggles to identify who really "counts" as a statistician (Brown & Kass, 2009; Minton, 1983) as well as to define the purpose and associated outcomes of an undergraduate statistics degree (Higgins, 1999). As this lack of identity permeates the field, it may make it difficult for students to understand the utility of a statistics degree and what opportunities it offers.

It is widely understood that a graduate degree (MS or PhD) is necessary to work as a professional statistician (Higgins, 1999; Moore, 2001). In fact, unlike many other fields, there are more statistics graduates at the master's degree level than at the bachelor's degree level (Horton, 2015). Specifically, statistics programs may have been originally developed to produce statisticians to fill academic and industry positions, and this requires a graduate degree (Higgins, 1999). This leaves the exact purpose of the undergraduate statistics degree unclear (Higgins, 1999). There is ambiguity and inconsistency across programs in terms of the skill set acquired and appropriate job placement for students with an undergraduate statistics degree (Higgins, 1999). This ambiguity is further reflected in the fact that an undergraduate degree in statistics is a fairly recent offering (Horton, 2015).

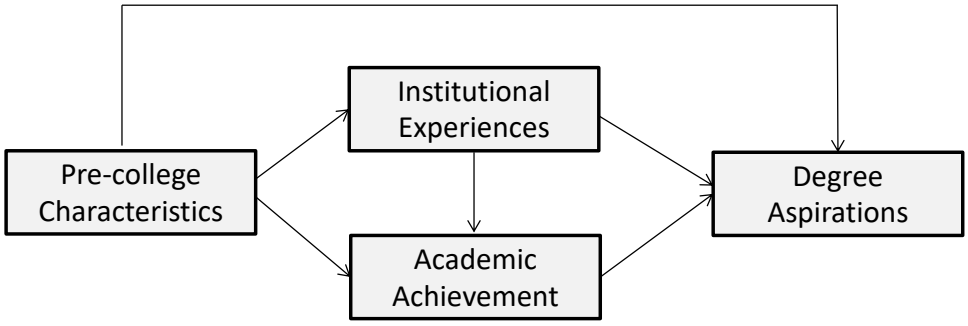
Educators have recommended adjusting the undergraduate statistics curriculum to address these issues. For example, Brown and Kass (2009) suggest broadening the view of statistical education, given its lack of appeal and accessibility. They suggest focusing on building interest and emphasizing conceptual understanding over specific techniques and skills. Similarly, Higgins (1999) suggests focusing on the nonmathematical aspects of statistics as an approach to expanding undergraduate statistics programs. These nonmathematical aspects could include topics such as study design, graphical analyses, and communication skills. These types of topics are important to quantitative research, but often overlooked in statistics classes. Recruiting students from other disciplines, such as the social sciences, who might be interested in a statistics minor or concentration could be another promising way to expand these programs (Moore, 2001).

Integrating social justice topics into statistics curriculum could be another way to recruit more, and increasingly diverse, students. This strategy has been suggested in mathematics education (Ladson-Billings, 2021), and topics examined in mathematics classes (incarceration rates, suspension rates, etc.) could be used equally in statistics classes. These social justice-related topics might appeal to students more broadly, with the potential to appeal to a more diverse group of students. In addition, a youth participatory action research (YPAR) framework has been used successfully in the mathematics classroom (Battey & Coleman, 2021; Raygoza, 2016) to help students use and develop their quantitative skills to conduct authentic research related to real-life social justice issues. This type of work could be a promising avenue for involving more students in statistics, since both the students and broader society could benefit from the development of these skills.

Conceptual Framework

Similar to other studies examining educational aspirations (Cuellar & Gonzalez, 2021; Litzler & Lorah, 2018; Wofford et al., 2022), the present study is motivated by the theoretical model for college students' degree aspirations suggested by Carter (2002). Derived from the status attainment model, Carter (2002) provides important updates in her proposed aspirations model to account for diverse gender and racial/ethnic groups and to further include institutional context within the model. Therefore, this model explains aspirations as a function of individual agency, as well as social constraints (Litzler & Lorah, 2018). Further, Carter (2002) suggests that the model should be estimated separately for diverse groups as the mechanisms impacting aspirations may differ. The model is visualized succinctly by Litzler and Lorah (2018, p. 168) and reproduced here (see Figure 1).

Figure 1: Theoretical model for college students' degree aspirations



This framework is motivated by the understanding that educational aspirations are strong predictors of outcomes, including student enrollment and retention (Carter, 1999, 2002). Further, this framework emphasizes that the model may function differently for different racial/ethnic groups (Carter, 2002). Given that there is little to no available research on aspirations for statistics students, the present study uses this framework to motivate the use of the educational aspiration's outcome and examination of group differences.

In addition, the present study is grounded in the statistics education literature pointing to the disconnect between the needs of individuals with statistical expertise and the availability of graduates to fill these roles (Brown & Kass, 2009;

Higgins, 1999; Horton, 2015). This literature rests on the assumption that society will benefit from capable statisticians filling these roles.

Lastly, the present work rests on the assumption that, similar to the work of mathematics education researchers, statistics education, and the associated critical thinking skills, remain a tool for addressing inequality (Battey & Coleman, 2021; Ladson-Billings, 2021; Raygoza, 2016) and for recruiting a more diverse STEM workforce (Edwin et al., 2018). As quantitative data becomes more ubiquitous, and mathematical and statistical thinking skills become more essential, understanding the aspirations of diverse students within the discipline can be a first step in enhancing the recruitment and retention efforts of educators and counselors.

The present focus on diverse groups of students connects the present work to that of urban education researchers and educators working in urban environments. Milner (2012) attempts to fill a gap in the literature by providing definitions and context related to the concept of urban education. Specifically, he defines "urban intensive" as contexts related to large cities such as Los Angeles; "urban emergent" as contexts related to medium-sized cities with populations of less than one million people; and "urban characteristic" as contexts outside of large or medium-sized cities where challenges, such as increases in English language learners, occur that are typically associated with an urban context. The present study includes both students who have, or who are currently attending urban intensive or urban emergent schools. But more importantly, the present study centers around urban characteristic issues including access and diversity. Milner (2012) implores authors to consider areas of emphasis within urban education, including equity and personal development issues, which is consistent with the present study. Examination of issues related to equity may be more consistent with the emergence of urban mathematics education as opposed to mainstream mathematics education. In contrast to mainstream mathematics education, urban mathematics education offers a de-emphasis on the deficit narrative with regards to diverse groups and increased emphasis on inequities (Martin & Larnell, 2013).

In general, knowledge of issues related to access and diversity is necessary for educators working in urban schools (Young et al., 2022). Issues of urban education extend beyond geography and encompass the diverse backgrounds and needs of students more broadly (Matthews, 2008) and equity issues specifically (Milner, 2012). Further, quantitative civic literacy, defined as the ability to think quantitatively about situations within and beyond a given community, represents an important equity goal for mathematics education (Young et al., 2022). In a society increasingly dominated with quantitative data, from politics to personal

finance, basic statistical knowledge could arguably be considered an important piece of quantitative civic literacy for all students. Additionally, students from urban environments are more likely to be first-generation college students and part of economically marginalized groups, and research shows concerning gaps in their career education (Garriott, 2020). Instructors, advisors, and administrators need to better understand the experiences and aspirations of these students to design and implement positive interventions for their success.

Educational Aspirations and Diversity

Although research examines issues related to STEM education and diversity, there is very little research related specifically to statistics education and diversity (Lorah & Valdivia, 2021). One study examining this topic found that Black, Hispanic, and White students are underrepresented compared with Asian and international students. However, the representation by gender is fairly equitable among students majoring in statistics (Lorah & Valdivia, 2021). Within other STEM fields, research demonstrates that women and underrepresented students of color are underrepresented in mathematics education (Lubienski & Brown, 2000) and that women and underrepresented students of color received proportionally fewer engineering degrees than White men (Litzler et al., 2014).

Various factors are related to educational aspirations. Among a group of Latina/o undergraduate students, higher GPA and faculty interactions were shown to be related to aspirations (Cuellar & Gonzalez, 2021). Another study found that math interest and self-efficacy were statistically significant predictors of STEM aspirations among a sample of 9th grade students (Mau & Li, 2018). In addition, a study examining educational aspirations in the field of computing among undergraduate students found that identity and computing self-efficacy were key predictors (Wofford et al., 2022). Research examining students from multiple universities found only small differences between the average aspirations at each university, implying that individual factors may play a larger role than institutional factors (Litzler & Lorah, 2018).

Although the educational aspirations of diverse groups within students majoring in statistics is unknown, previous research has looked at this question within other fields. When considering the connection between gender and educational aspirations in general, this relationship has been found to vary (Hossler & Stage, 1992). Females are more likely to aspire to a STEM degree; one study found that 43% of high school females aspired to achieve a degree in STEM, while only 25% of males did (Edwin et al., 2018). On the other hand, another study examining STEM aspirations in ninth-grade students found that females were less likely to aspire to a STEM degree (Mau & Li, 2018). In a study

examining graduate school aspirations in computing, researchers found that women were less likely to report these aspirations (Wofford et al., 2002). In addition, research also indicates that females leave STEM degree programs and careers at higher rates than males (Edwin et al., 2018). A recent article reviewed several studies and found that most studies find either no gender differences in aspirations or higher aspirations for men, although a few find higher aspirations for women (Litzler & Lorah, 2018).

Regarding race/ethnicity, research has found various group differences. In one study Asian students were most likely to aspire to a STEM degree, while Hispanic students were the least likely (Edwin et al., 2018). In another study, Black and Hispanic 9th grade students were found to be least likely to aspire to a STEM degree (Mau & Li, 2018). In contrast, one study found that Black and Hispanic students were most likely to report computing graduate school aspirations among a sample of undergraduate students (Wofford et al., 2022). Underrepresented undergraduate students of color have been shown to display higher educational aspirations than White students, a finding referred to as the "aspirations-achievement paradox" (Kao & Tienda, 1998). In addition, research has found that underrepresented students of color demonstrate decreased graduate school aspirations across their undergraduate years, while White students maintain their graduate school aspirations across their undergraduate years (Jones et al., 2002).

Research Questions

The present study builds on these findings to investigate the following research questions: How do the educational aspirations of a multi-institution sample of undergraduate senior students majoring in statistics vary when comparing by statistics majors, all other STEM majors, and non-STEM majors? Furthermore, how do the educational aspirations of a multi-institution sample of undergraduate senior students majoring in statistics vary by gender identity and race/ethnicity?

Method

This study utilizes data from the 2019 and 2020 administrations of the National Survey of Student Engagement (NSSE). NSSE annually collects information from first year and senior students about the nature and quality of the programs and activities they are engaged in at their higher education institutions. NSSE asks students about their experiences, time spent on certain activities, and perceptions of institutional support. The reasons that institutions participate differ and include national and regional accreditation, departmental/program reviews, curricular reform (general education), and institutional improvement efforts (e.g., retention rates, high-impact practices, and first-year experience programming).

Since its inception, NSSE has always sampled first-year and senior students. These students are at two key points in their undergraduate educational journeys - first-year students are laying the foundation of their higher education experience while seniors, who are nearing completion, have had the most exposure to college (National Survey of Student Engagement, 2018).

The full survey instrument can be found at www.nsse.indiana.edu. In the demographics section, the survey asks participants to report major(s), categorized into 138 different categories, one of which is statistics. This study grouped the majors into three categories: Statistics, Other STEM, and non-STEM. Gender identity and race/ethnicity are also asked in the demographics section. Another demographic item asks respondents "What is the highest level of education you ever expect to complete?". The response options are: Some college but less than a bachelor's degree (which was not included in the present analysis due to small *N*s), bachelor's degree, master's degree, and Doctoral or professional degree.

Sample

The final sample included a variety of students and institutions closely representing the diversity of college students in the United States. It was limited to only seniors because they have had more experiences within their major, and more experience in higher education overall that might inform their understanding of the difference in types and levels of degrees. Overall, 225,892 seniors at 882 colleges and universities responded to the core survey in 2019 and 2020. The average institutional response rate was 28% in 2019 and 30% in 2020 (NSSE, 2019; NSSE, 2020). There were a range of institutional types and sizes in the sample. Carnegie classifications of the participating institutions were: 25% Doctoral level, 42% master's level, 26% Baccalaureate level, and 7% another Carnegie classification. Private institutions comprised 57%, and public institutions 43%. The locale breakdowns were: 46% city, 24% suburb, 25% town, and 5% rural. Enrollment size ranges were: 15% had fewer than 1,000; 34% 1,000 – 2,499; 18% 2,500 – 4,999; 17% 5,000 – 9,999; 9% 10,000 – 19,999; and 8% had 20,000 or more. Historically Black Colleges and Universities (HBCUs) comprised 5% of the institutional sample, with 8% qualifying as Hispanic-Serving Institutions (HSIs) and 16% qualifying as Minority-Serving Institutions (MSIs).

In terms of student identities, women (65%) outnumbered men (33%), and those responding with "another gender identity" and "prefer not to respond" (<2%) were not able to be included in the analyses due to low counts in the Statistics majors group. The majority were 23 years old or younger (66%) and enrolled full-time (85%). Nearly half (44%) were first-generation college students. Students of color represented smaller percentages of the sample (7% Asian or Asian American, 10% Latino or Hispanic, 8% Black or African American, 9% multi-

racial, <1% Native American, <1% Pacific Islander, <1% Middle Eastern, and 3% reported "other" or "prefer not to respond"), while 61% of respondents identified as White. International students (of all racial identities) comprised 4% of the sample. For the statistics majors (n=521) subgroup, many of these distributions were similar. However, there were notably fewer women (46%), first-generation (24%), and Black (2%) and Latinx-identifying (5%) students, as well as more traditionally aged (81%), Asian-identifying (18%), and international (13%) students.

Analyses

A series of three chi-squared analyses were done to address the research questions, similar to other studies examining educational aspirations (Edwin et al., 2018). The first analysis compared educational aspirations by the major groupings of Statistics, Other STEM, and non-STEM. The second and third analyses were selected for statistics majors only and compared educational aspirations by gender identity and race/ethnicity, respectively.

Chi-squared tests are appropriate for examining the relationship between two categorical variables (Field, 2009), and were therefore chosen for the present analysis. In addition, a Bonferroni correction was considered for the problem of multiplicity associated with the present set of analyses. In particular, the Bonferroni correction involves dividing the overall Type I error rate (set at $\alpha = 0.05$ for the present study) by the number of tests (three tests are conducted in the present study; Field, 2009). This results in an α value of 0.017 for each individual test. However, in the present study, this correction does not change the interpretation of statistical significance of any of the three tests, as none of the *p*-values are in the 0.017 to 0.05 range. Further, in presenting associated descriptive statistics, probabilities were used (see Tables 1, 2, and 3) since other commonly used statistics for categorical variables, such as odds ratios, are more easily interpreted for binary variables (Field, 2009).

Cramer's *V* coefficient is used as a measure of effect size, since two of the three analyses included variables with more than two categories. This measure quantifies the magnitude of the relationship and can theoretically range from zero to one, with larger values representing stronger relationships. Traditionally, a value of about 0.20 is considered a small effect, about 0.50 a medium effect, and a value of 0.80 or higher is considered a large effect (Cohen, 1992). However, more recent studies suggest that in education and the social sciences, the traditional effect size interpretations may be too conservative (Gignac & Szodorai, 2016) and studies of NSSE data specifically may be best interpreted with small effects starting at about .1, medium effects starting at about .3, and large effects starting at

about .5 (Rocconi & Gonyea, 2018). All data cleaning and analyses were performed using SPSS version 27.

Results & Discussion

When looking at comparisons based on major grouping (Table 1) to address the first research question, the chi-squared results were statistically significant, indicating that the three groups (non-STEM, other STEM, and statistics majors) reported statistically significantly different educational aspirations. The effect size, Cramer's *V*, is approximately 0.10 indicating a small effect in terms of the strength of the relationship. Interestingly, statistics majors displayed similar patterns to non-STEM majors, but different patterns from other STEM majors. Specifically, other STEM majors were more likely to report doctoral degree aspirations (31% of other STEM majors) compared with a little less than 20% of statistics majors reporting doctoral degree aspirations. Non-STEM majors were similarly likely to report doctoral degree aspirations at about 18%. For both statistics majors and non-STEM majors, slightly less than half of the students reported master's degree aspirations, while only about 35% of other STEM majors reported master's degree aspirations. And for bachelor's degree only aspirations, all three groups reported similarly (about 37% of non-STEM; about 35% of other STEM; and about 32% of statistics majors).

Table 1

Chi-Square Results for Major Type (n=225,892)

Aspires to:	% Non-STEM Majors	% STEM Majors	% Statistics Majors	% Total	χ^2 value	Sig.	Cramer's V (Effect size)
Bachelor's degree	36.9%	34.5%	31.7%	36.3%			
Master's degree	45.0%	34.5%	48.6%	42.4%	4441.129	<.001	.099
Doctoral/professional degree	18.1%	31.0%	19.8%	21.3%			

Note: *Some college but less than a bachelor's degree* responses were excluded due to small cell counts.

This finding indicates that in some ways the field of statistics education may be distinct from other STEM fields. As previous research has classified the field as a transdiscipline (Scriven, 2008), where it constitutes its own substantive area in addition to use as methodology for other disciplines, this may indicate that students are interested in a more applied degree at the master's level, compared with a more traditional research-based degree at the doctoral level. The fact that

of the three groups, the statistics majors are least likely to aspire to only a bachelor's degree, may suggest that students majoring in statistics feel that they need to acquire an advanced degree before their skills are marketable. This is consistent with the research indicating that the professional degree in the field of statistics is at the master's degree level (Higgins, 1999; Moore, 2001) and that more master's degrees are awarded than bachelor's degrees in the field of statistics (Horton, 2015). Future research should continue to investigate this finding by considering the specific types of graduate programs students want to study to assess whether undergraduate statistics students aspire to graduate programs in statistics or in other disciplines.

This finding may be useful for educators and counselors. Understanding the potential pathways for students interested in statistics can assist teachers and counselors in providing career-related advice to students. Specifically, the present findings indicate that students who are interested in working as a statistician may want to consider continuing their education beyond a bachelor's degree to completion of a master's degree, which is also considered as the professional degree for statisticians based on the literature (Higgins, 1999; Moore, 2001). Given that the present results show that almost half of the students majoring in statistics chose aspirations to a master's degree as their terminal degree, this represents a common pathway for students interested in statistics. As statistics is inherently an applied field, it makes sense that fewer students expect to attain a more research-based doctoral degree. As some subgroups of students, such as first-generation students, begin college at a relative disadvantage when it comes to career education and cultural capital (Garriott, 2020), professors and advisors may need to provide even more context around the expectations and requirements for a career in statistics for these groups.

The second (Table 2) and third (Table 3) chi-squared analyses, which focused on the smaller subset of statistics majors only, addressed the second research question. Here, the findings were not statistically significant, meaning that there were no statistically significant differences in educational aspirations of statistics majors by gender identity or by race/ethnicity. Although these results may be encouraging from an equity perspective, it is also important to note that given the smaller sample size (about 500 for each analysis), the results presented in Tables 2 and 3 may be under-powered. In line with this, note that although the results were not statistically significant, the Cramer's V (effect size) was found to be 0.102 for the test involving race/ethnicity (Table 3). Since around 0.10 is usually considered a small but interpretable effect size for this kind of data, this provides further evidence that this test may be underpowered. Thus, future research should consider larger sample sizes or significance tests designed specifically for claims

of equality. However, as previous research has demonstrated smaller gaps by race/ethnicity and gender identity in statistics than other STEM fields (Lorah & Valdivia, 2021), this finding may indicate that diverse groups of students are experiencing a more welcoming climate, compared with the chilly climate often experienced by underrepresented groups in other STEM fields such as engineering (Litzler & Lorah, 2018). This finding aligns with the finding from research question 1, indicating that the discipline of statistics may be unique within the STEM fields and in some ways may perhaps be more similar to non-STEM fields.

Table 2

Chi-Square Results for Statistics Majors: Gender Identity (n=506)

Aspires to:	% Man	% Woman	% Total	χ^2 value	Sig.	Cramer's V (Effect size)
Bachelor's degree	32.1%	30.7%	31.4%			
Master's degree	51.3%	46.1%	48.8%	3.601	.165	.084
Doctoral/professional degree	16.6%	23.2%	19.8%			

Note: *Some college but less than a bachelor's degree, another gender identity,* and *prefer not to respond* responses are excluded due to small cell counts

Table 3

Chi-Square Results for Statistics Majors: Race/Ethnicity (n=518)

Aspires to:	% Asian	% Latinx	% White	% Multiracial	% Other (collapsed)	% Total	χ^2 value	Sig.	Cramer's V (Effect size)
Bachelor's degree	21.3%	28.0%	34.9%	32.4%	33.3%	31.9%			
Master's degree	58.5%	44.0%	47.4%	38.2%	42.9%	48.5%	10.813	.213	.102
Doctoral/professional degree	20.2%	28.0%	17.7%	29.4%	23.8%	19.7%			

Note: *Some college but less than a bachelor's degree* responses were excluded due to small cell counts. *American Indian or Alaska Native, Black or African American, Middle Eastern or North African, Native Hawaiian or Other Pacific Islander, another race or ethnicity*, and *prefer not to respond* responses are collapsed into "Other" due to small cell counts.

Previous research has found various relationships between gender identity and aspirations, including evidence of no relationship (Hossler & Stage, 1992; Litzler & Lorah, 2018), which is consistent with the present study's findings of no differences between men and women. In general, previous research has found underrepresented students of color indicating higher educational aspirations (Kao &

Tienda, 1998), whereas this study differed and found no relationship. Although no statistically significant relationship was found, future research should continue to examine this question, as results of the present study (Table 3) showed similar trends to past research (Kao & Tienda, 1998), with White students indicating potentially lower aspirations compared with other groups. Future research should also address whether these trends were impacted by the COVID-19 pandemic, as higher education overall experienced fluctuations in enrollment patterns, student motivations, and engagement (Wiley, 2022).

The results disaggregated by gender identity and race/ethnicity have implications for educators. Although no differences among groups in terms of educational aspirations were found, previous research has found differences in representation. Specifically, Black, Hispanic, and White students have been found to be underrepresented and international and Asian students were overrepresented among students studying statistics (Lorah & Valdivia, 2021). Taken together, this could indicate a gap between aspirations and achievement, consistent with the aspirations-achievement paradox identified in previous research (Kao & Tienda, 1998). Counselors should consider this information when advising students. Specifically, counselors should encourage all students and recognize the differential supports needed by different students. Further, educators should recognize that pursuing statistics is not only useful to students, but of interest to both underrepresented students of color and White students. Therefore, providing appropriate encouragement and support is critical for helping all students reach their own goals. Helping more students achieve higher levels of quantitative abilities will benefit those individual students, as well as society at large.

Limitations

Although there are many strengths of this study, some limitations should be noted. Given the data collection procedures, the sample may not be representative of all seniors at four-year universities and caution should be made when generalizing. Low counts within the statistic major subgroup prevented the examination of nonbinary students and required some less-than-ideal collapsing of the race/ethnicity categories, and consequently these findings are not as inclusive as they might have been with a larger sample of statistics majors. The effect sizes were also relatively small and suggest that the inferential aspects of the analyses may have been impacted by the low counts as well. Furthermore, this study relied on self-reported data. However, most studies looking at self-reports in education suggest that self-reports and actual measures of things like abilities and behaviors are positively related (Anaya, 1999; Greene, 2015; Pike, 1995) and that social desirability bias does not play a major role in student responses to surveys of basic cognitive and academic behaviors (Miller, 2012). Additionally, research has also

demonstrated that educational aspirations specifically can be linked to actual degree attainment (Carter 1999, 2002; Guo et al., 2015).

Conclusions

Overall, the results of this study suggest that the experience of students majoring in statistics may in some ways be more aligned with students studying non-STEM majors than with students studying within STEM. Almost half of statistics majors indicate aspirations to obtain a master's degree, underscoring the unique status of statistics as both a discipline in and of itself as well as a method that is utilized by a variety of other disciplines. Since no statistically significant differences were found in aspirations by gender or race/ethnicity, this may indicate that statistics is be a promising discipline for engaging a more racially and gender diverse population of students. Future research should continue to examine this question as research continues to shed light on the unique and important role of statistics education and the experience of diverse groups within it.

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