The AIR Professional File

Spring 2024 Volume

Supporting quality data and decisions for higher education.

air | ASSOCIATION FOR INSTITUTIONAL RESEARCH

PREFACE

This issue of *AIR Professional File* features a set of articles offering insights and practical recommendations for tackling questions central to the IR/IE community. Specifically, how do we define and measure key constructs such as minority-serving institutions (MSIs), students with disabilities, or student-institution fit, and when is a measure appropriate to use? Notably, the authors spotlight several different institution types—MSIs, community colleges, and a large public research university.

Jacqueline Mac and her co-authors review criteria for defining MSIs and propose a holistic approach to understanding the extent to which MSIs serve their target population. They stress the need for comprehensive metrics that go beyond enrollment numbers, such as equitable student outcomes and markers of a serving culture. The authors draw attention to the important role of MSIs in advancing educational equity and call for improved data collection practices—such as additional variables in IPEDS—to facilitate research about MSIs and their impact on student success.

John Zilvinskis writes about student use of disability services, a topic covered in a recent Data report by the *Chronicle of Higher Education*. Importantly, Zilvinskis examines *differences* in how the use of disability services is measured. Comparing Community College Survey of Student Engagement (CCSSE) and Integrated Postsecondary Education Data System (IPEDS) data, he finds moderate correlations between reported service use and the number of students formally registered with the institution's Office of Disability Services, suggesting an incongruity between measures. Similar to Jacqueline Mac and her co-authors, Zilvinskis advocates for a comprehensive approach to measuring the use of disability services, one that is not limited to only those students who formally register on campus.

Steven Graunke examines the applicability of a student-institution fit survey instrument across educational settings. Using confirmatory factor analysis, he analyzes the results of the survey administered at a large public university and describes modifications to the underlying factor structure needed for adapting the instrument to the new institutional context. His study highlights that, in addition to administering surveys, institutional research offices must test and potentially modify

existing instruments for use in their unique settings.

Together, these articles underscore the important role that IR/IE professionals can play in ensuring data integrity and adopting a holistic, contextually relevant approach to institutional research, ultimately contributing to the advancement of educational equity and student success in higher education.

Inger Bergom
Assistant Editor

ISSN 2155-7535

Table of Contents

In Search of Institutional Servingness: Institutional Characteristics and Outcomes of Minority-Serving Institutions

Jacqueline Mac, Kandi Bauman, Karen Bussey, Esen Gokpinar-Shelton, Shane Schellpfeffer, and Claudine McLaren Turner

About the Authors

Jacqueline Mac is assistant professor of higher education at Northern Illinois University. Kandi Bauman is a research scientist with the Brotherhood Initiative at the University of Washington. Karen Bussey is deputy chief of staff at Fayetteville State University. Esen Gokpinar-Shelton is a user-experience researcher and designer at Indiana University. Shane Schellpfeffer is director of institutional effectiveness and accreditation at University of North Dakota. Claudine McLaren Turner is the University Innovation Alliance Fellow and is program manager for the Center for Higher Education Innovation at the University of Central Florida.

Acknowledgments

We thank seminar participants and mentors at the National Center for Education Statistics (NCES) Data Institute, current and former staff with the NCES, and the Association for Institutional Research (AIR). We thank Adam Nelson for sharing his knowledge of the Integrated Postsecondary Educational Data System (IPEDS) and Tinsley Smith and Sean Simone for their enthusiastic support. This material is based on work supported by the AIR and the NCES. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the AIR or the NCES.

Abstract

Minority-serving institutions (MSIs) are considered models of excellence to support underrepresented racial and ethnic students; however, multiple definitions of MSIs complicate the consumption and production of research on these critical institutions. The U.S. Department of Education (ED) uses set

The AIR Professional File, Spring 2024

Article 165

https://doi.org/10.34315/apf1652024

criteria to define MSIs, based primarily on enrollment. However, scholars and practitioners have argued for considering factors beyond enrollment, such as equitable student outcomes and institutional markers of a serving culture. This study used descriptive analyses of IPEDS data to explore the extent to which MSIs served their target population. We use national weighted averages to report results on each MSI category compared to all other institutions. We found that MSIs enrolled higher percentages of MSI-aligned students and employed more-significant percentages of MSI-aligned instructional staff. Most MSIs generally retained higher percentages of MSI-aligned students. Most MSIs showed higher completion proportions, though nearly all MSI categories had lower graduation rates among MSI-aligned students. Some MSIs provided institutional aid to higher proportions of students; others provided lower proportions. Findings confirm that enrollment alone cannot be a proxy for servingness. We encourage researchers, practitioners, and government agencies to use more-holistic definitions. We make recommendations for government agencies to remove burdens to researching MSIs.

Keywords: minority-serving institutions (MSIs), quantitative research, higher education, Integrated Postsecondary Education Data System (IPEDS), secondary data

INTRODUCTION

As a growing body of literature continues to center on the outputs and outcomes of minority-serving institutions (MSIs), multiple perspectives have emerged about what it should mean to be an educational institution identified as serving racially minoritized students (García, 2017; García et al., 2019). For example, some scholars argued that, instead of focusing solely on enrollments, MSI identity should also encompass equitable outcomes across graduation and persistence (Contreras et al., 2008; García 2017). Other researchers point to the inclusion of culturally relevant curricula content in the form of established and robust ethnic studies programs as an essential marker of MSIs (Catallozzi et al., 2019; Romero et al., 2020; Wang et al., 2021). Still, some scholars assert that academic outcomes do not go far enough. Instead, these scholars see that a more culturally relevant conceptualization of serving would include increased racial and ethnic identity salience (García et al., 2018; Guardia & Evans, 2008), student engagement (García, 2019), and internally driven organizational identity dimensions (García, 2017; Museus et al., 2018; Nguyen et al., 2018).

To further complicate the process of consuming and conducting research about MSIs, the U.S. Department of Education (ED) includes set criteria to identify MSI status through its grant designation and award process. These criteria also differ by MSI category. Researchers have also self-identified MSI institutions by reviewing enrollment data by race and ethnicity. The enrollment thresholds vary by MSI category, however. These definitions impact the sample institutions included in institutional

structures and outcomes analysis. Since MSIs are increasingly looked at as models of excellence for educating underrepresented racial and ethnic students, it is critical to have a clear understanding of the institutions.

This study uses descriptive analyses of IPEDS data to examine how MSIs serve their target populations. In this research, the term "MSI-aligned" refers to the population for which the institution has MSI status. We sought to clarify the extent to which select factors of servingness are embodied at federally funded MSIs. Two questions guided our inquiry: (1) To what extent are institutional servingness characteristics (e.g., enrollment, instructional staff, institutional aid) reflected at federally funded MSIs? and (2) To what extent are MSI-aligned student outcomes (e.g., completion, graduation) reflected at federally funded MSIs?

The significance of the results of this study is two-fold. First, results provide a basis for understanding what factors contribute to the characteristics, practices, and success of MSIs. While the results are shared individually per MSI category, an observational comparison between MSIs can be made. We heed awareness of the structural inequities within all systems and structures that are racialized and proceeded with this project to reduce harm by intentionally not comparing MSI categories. Indeed, Ray (2019) theorized that the racialization of structures is rooted in whiteness, diminishes the agency of non-white structures, and results in the unequal distribution of resources. The historical and inclusionary need for MSIs suggests that higher education is racialized, and research should not exacerbate inequities (Bhatt, 2013; Bonilla-Silva, 1997; Bussey, 2022; Hegji, 2017; Ray, 2019; Tomaskovic-Devey, 1993; Wooten, 2006). Second, this study provides a methodological understanding of the degree to which IPEDS, as a secondary data source, can be used to examine MSIs. In the following sections of this introduction, we briefly describe the emergence of MSIs, the legislative definitions of newer MSIs, and the impact of MSIs on student success.

Emergence of Minority-Serving Institutions

Education leaders in the United States have historically used students' racial and ethnic backgrounds to determine who receives formal education and what kind of formal education they receive (Howard & Navarro, 2016). MSIs were established to meet, and subsequently persisted in meeting, the academic and career development needs of those who have long been excluded from institutions of learning in the United States. The nation's first MSIs, now known as Historically Black Colleges and Universities (HBCUs), and Tribal Colleges and Universities (TCUs), also known as Tribally Controlled Colleges and Universities, or TCCUs, were established to provide higher education opportunities for Black and Native Americans (Gasman et al., 2015; Li & Carroll, 2007). Government funding to support these institutions began in the late 19th century and varied in terms of intended and actual levels of funding provided (Gasman et al., 2015). The passage of the Civil Rights Act in 1964 and the Higher Education Act in 1965 marked the most significant legislative acts that began the federal recognition of and funding for MSIs (Flores & Park, 2013; Gasman et al., 2015). Additional legislative actions, such as the Indian Civil Rights Act (1968), Indian Self-Determination and Educational Assistance Act (1975), additional

classifications of land grant institutions (1994), and several additional iterations of the Higher Education Act in subsequent years all provided additional funding opportunities and recognition for TCUs and other MSIs (Gasman et al., 2015).

More recently, as the number of Asian American, Pacific Islander, and Latin*[1] students entering colleges across the nation has grown, the student populations of many historically white institutions have shifted drastically, prompting an expansion of MSIs and subsequent changes to the definition of MSIs. Newer MSIs were designated as such because a specified percentage of their student population is an identified minority group, and most of their students are categorized as low income (Gasman et al., 2015; Li & Carroll, 2007). This demographic shift in postsecondary enrollment has continued well into the 21st century, as minority student enrollment continues to increase (Flores & Park, 2013). Many of these newer MSIs meet the postsecondary educational needs of students from historically underrepresented, marginalized, or minoritized communities who are continuing their education in historically white educational spaces, preparing them for graduate studies or careers that change their lives and their communities (Gasman et al., 2015; Li & Carroll, 2007; Museus et al., 2018; Núñez et al., 2016).

Legislative Definitions of Newer Minority-Serving Institutions

In current federal MSI legislation, an institution is eligible to apply for federal discretionary funding after it has met specific criteria, such as a minimum enrollment percent of the target student population (e.g., 25% for Hispanic-serving institutions [HSIs], 10% for Asian American and Native American Pacific Islander–serving institutions [AANAPISIs]) and a minimum percent of Pell Grants eligibility among the students (ED, 2018). These institutions should also have comparatively low average expenditures per full-time equivalent student, as well as legal authorization to award associate's or bachelor's degrees, or both (ED, 2018). Such eligibility factors suggest that these institutions typically enroll significant numbers of target student populations and have fewer institutional resources to support their student population. Therefore, the spirit of MSI legislation intends to support institutional capacity building through federal funding programs (Espinosa et al., 2017). Under this definition, more than 700 federally designated MSIs serve students today, representing approximately 14% of all degree-granting, Title IV–eligible higher education institutions (National Academies of Sciences, Engineering, and Medicine, 2019).

Although required ED performance measures for grantees of MSI funding programs may vary from program to program, grantees are generally required to report student persistence rates and graduation rates from the first year to the second year at the same institution. A more detailed review of these performance measures, however, reveals that funded AANAPISIs, Alaska Native and Native Hawaiian–serving institutions (ANNHSIs), Native American–serving nontribal institutions (NASNTIs), and predominantly Black institutions (PBIs) are not required to report these performance measures specifically for their target student populations. Except for the Hispanic-Serving Institutions—Science, Technology, Engineering, or Mathematics (HSI–STEM) Program, funded MSIs are not required to report performance measures on how specific

1. We use the term "Latin*" to refer to people and communities that have historic, social, and geographic roots in Mexico, Central and South America, and the Caribbean. As the usage and understanding of the term varies, we follow Salinas's (2020) recommendation of using Latin*. We use the term "Hispanic" when referencing studies, reports, or data sources that used that term.

racial and ethnic student populations are faring at their institution.

The Impact of Minority-Serving Institutions on Student Success

Researchers reveal distinct and significant differences between MSIs and non-MSIs in practice and outcomes (Contreras & Contreras, 2015; Espinosa et al., 2018; Espinosa et al., 2017; García et al., 2018). When it comes to serving students of color, specifically those from low-income families, studies have shown that MSIs serve proportionally more students of color than non-MSIs (Espinosa et al., 2018; Harmon, 2012). Espinosa et al. (2018) found that HSIs and PBIs serve more than three times their respective populations than is the case with non-MSIs. Despite often having to do more with fewer institutional resources, an increasing body of work shows that MSIs produce more-equitable educational and economic mobility outcomes when compared with non-MSIs (Espinosa et al., 2018; Espinosa et al., 2017). A study using Equality of Opportunity Project data (www.equality-of-opportunity.org/data) from 1,911 institutions, found that MSIs across all categories (4-year and 2-year) accelerated students from the bottom to the top of the income distribution at higher rates than non-MSIs (Espinosa et al., 2017).

Students of color, especially those from low-income backgrounds, generally endure more barriers throughout their educational pursuits (Museus et al., 2015; Patton & Njoku, 2019; Truong et al., 2016). To address these barriers, MSIs create environments and implement practices to meet the needs of underserved students in three distinct ways. First, most MSIs make efforts to maintain low tuition and fees because their population includes more students that are financially disadvantaged due to systemic racial inequities (Harmon, 2012). MSIs also excel in providing their students with a more diverse faculty: Cunningham and Leegwater (2010) found that more than half of the faculty at HBCUs were Black, 24% of faculty at HSIs were Hispanic, and 41% of faculty at TCUs were American Indian. The racial distribution of faculty at MSIs is far more than at all other institutions—5% of faculty were Black, 4% were Hispanic, and less than 1% were American Indian. Diversifying faculty increases role modeling and mentorship opportunities for MSIs' respective students (Bensimon & Dowd, 2012; Castro Samayoa, 2018). Furthermore, MSIs are leaders in weaving heritage and culture into their students' learning experiences (Cunningham & Leegwater, 2010). For example, TCUs embed cultural components from tribal customs and knowledge into their curricula (Crazy Bull et al., 2020). Similarly, HBCUs integrate African American history into various campus practices, curricula, celebrations, and student activities (Williams et al., 2022). Furthermore, HSIs often try to provide students and their families with resources and support to assist with language barriers by offering essential student resources in Spanish (Romero et al., 2020).

As with other postsecondary sectors, no grouping of institutions is monolithic, and contextualizing all MSIs as being the same obscures meaningful variations in their educational purposes, practices, and outcomes. Equally important, not all MSIs have comparable resources. Shrinking public revenues and grant resources for most MSIs means they spend significantly less per student than non-MSIs. Case studies by Cunningham et al. (2014) found that this resource scarcity has meant that MSIs have tended to be more cost-effective and wide-reaching in implementing services and initiatives to increase degree completion. Still, when no consistent contextualization of MSIs exists, it presents

challenges for understanding how MSIs serve the growing number of racially diverse students who enroll in college each year.

METHODS

This project is an extension of a study conducted by an interdisciplinary team of practitioners and scholars who were enrolled in the 2021 NCES Data Institute. We used descriptive analyses of IPEDS data to examine how MSIs serve their target populations and answer our research questions.

Defining Minority-Serving Institutions in This Study

We used the federal definitions of various MSIs for this study (see Table 1). As mentioned, the definition of MSIs in data sets varies widely, often according to how specific scholars operationalized MSI in their study. Current scholarship on MSIs largely follows federal definitions of MSIs to inform their inquiry. Some scholars have used narrower definitions, such as selecting MSIs that received federal designation and funding (e.g., Aguilar-Smith, 2021; Museus et al., 2021), while other scholars have used broader

Table 1. Definitions of Various Minority-Serving Institutions

MSI Category	Acronym	Definition
Historically Black colleges and universities	HBCUs	Any historically Black colleges or universities established prior to 1964 whose primary mission was the education of Black Americans.
Tribal colleges and universities	TCUs	Institutions chartered by their respective Native American tribes through sovereign authority of the tribes or by the federal government with the specific purpose to provide higher education opportunities to Native Americans through programs that are culturally based, holistic, and supportive. Also known as tribally controlled colleges and universities, or TCCUs.
Hispanic-serving institutions	HSIs	Institutions with at least 25% total undergraduate Hispanic full-time equivalent student enrollment.
Alaska Native and Native Hawaiian–serving institutions	ANNHSIs	Alaska Native–serving institutions are institutions that have at least 20% total undergraduate Alaska Native full-time equivalent student enrollment. Native Hawaiian–serving institutions are institutions that have at least 10% total undergraduate full-time equivalent Native Hawaiian student enrollment. These institutions, though distinct, are collectively referred to as ANNHSIs.
Asian American and Native American Pacific Islander–serving institutions	AANAPISIs	Institutions that have at least 10% total undergraduate full-time equivalent Asian American and Pacific Islander enrollment.
Predominantly Black institutions	PBIs	Institutions that serve at least 1,000 undergraduate students, and with at least 40% total undergraduate full-time equivalent African American student enrollment.
Native American–serving nontribal institutions	NASNTIs	Institutions that have at least 10% total undergraduate full-time equivalent Native American student enrollment.

Note: For MSI categories enrollment thresholds listed in this table, it is also expected that at least 50% of an institution's undergraduate students are eligible for need-based financial aid, have low average expenditure per full-time equivalent student compared to similar institutions, and have legal authorization to award associate's and/or bachelor's degrees.

definitions, such as MSIs that meet the enrollment criteria for each student population (e.g., Espinosa et al., 2018). One additional definition of note comes from Excelencia in Education: this national nonprofit defined "emerging HSI" as an institution with a student enrollment between 15% and 24% (Excelencia in Education, 2022). Some studies on HSIs use this definition (e.g., Cuellar & Johnson-Ahorlu, 2020). Such variation makes it difficult for scholars, practitioners, and policymakers to synthesize existing scholarship and to conduct additional research, especially when generating or selecting an appropriate data set.

Data Source

We used two federal data sets—the Integrated Postsecondary Education Data System (IPEDS) (17:18) and the 2020 MSI eligibility and award data provided by the ED (2020). IPEDS is a comprehensive census of all postsecondary education institutions in the United States and related jurisdictions. It is maintained by the NCES, which serves as the "primary federal entity for collecting, analyzing, and reporting data related to education in the United States and other nations" (NCES, n.d., para 1). The information available through IPEDS includes fundamental areas such as enrollment, program completion and graduation rates, institutional costs, student financial aid, and human resources. Our analysis utilized data from the 2017–2018 data collection cycle, since this was the most complete public-facing data set at the time of analysis. The MSI eligibility and award data is an annually published matrix of all accredited postsecondary institutions according to their eligibility and funding status for each ED MSI program. For each program, institutions are "funded" (currently receiving funding), "eligible" (eligible to apply for and receive MSI funding but not a current grant recipient), "waiver-needed" (eligible to apply for and receive MSI funding but requiring a waiver for enrollment of minority students or low-income students), or "ineligible" (ineligible to apply for and receive MSI funding).

Study Sample

The study sample included public, private, and nonprofit institutions that had been awarded MSI funding as of 2020 (n = 366; ED, 2020). To generate the list of federally funded institutions, we used the 2020 MSI eligibility matrix that synthesized eligibility information based on IPEDS 2018–2019 provisional enrollment data. We created the final sample set of institutions from the MSI eligibility matrix by sorting institutions by status to indicate whether the institution was receiving at least one MSI grant; we included these institutions in the analysis. We also included institutions falling into more than one MSI category in the analysis for each category. The analysis did not include institutions that were eligible to compete for MSI grants but did not receive a grant.

To add a layer of context to our MSI analysis, we created adjusted national comparison groups from the IPEDS universe of institutions for each MSI category. Our comparison category initially included all Title IV, U.S. service, and degree-granting institutions from the 2018 IPEDS universe, excluding administrative units and institutions designated as "less than 2-year" (N = 4138). We excluded all funded MSI-specific institutions from "All Other Institutions" for each MSI comparison, and used those excluded institutions as the comparison group.

Variable Selection

Variables for the study were selected based on extant scholarship exploring institutional characteristics and outcomes within and across MSI categories and informed by prior literature on factors contributing to student success. The study looked at two critical dimensions of MSIs: institutional characteristics and structures of servingness (Bensimon & Dowd, 2012; Cole, 2011; Contreras, 2017; García et al., 2019) and student outcomes (Contreras & Contreras, 2015; Espinosa et al., 2017; García et al., 2019).

Institutional characteristics and structure variables included the MSI-aligned proportion of Fall enrollment, MSI-aligned instructional staff racial representation, and the percentage of first-time/full-time (FT/FT) students receiving institutional aid. Although racial enrollment representation is an essential defining characteristic of most MSI designations (except for HBCUs and TCUs, which are defined by federal legislation), enrollment proportions vary considerably within MSI categories. We utilized the IPEDS-provided derived variables from the Fall enrollment survey component to construct our first variable concerning MSI-aligned undergraduate enrollment by race/ethnicity (e.g., percent of Black students enrolled at an HBCU).

Similar to previous studies, our interest in faculty representation rests on the assumption that faculty—particularly permanent, full-time faculty—are uniquely positioned to foster impactful relationships with students at MSIs (Vargas et al., 2019). To measure MSI-aligned instructional staff representation (e.g., percent of Native American instructional staff at a TCU), we created a derived variable with total and race-specific employment numbers from the IPEDS Human Resources survey (IPEDS, n.d.).

The final variable in this dimension is the percentage of FT/FT students receiving institutional aid. Students may receive aid from various sources in their financial aid packages, including private and government loans, scholarships, and grants from the federal government, state, and their respective institutions. Although many MSI categories require a significant percentage of Pell-eligible students to be enrolled, we sought a variable that would ideally reflect the individual institution's contribution to supporting their MSI-aligned student population. Unfortunately, IPEDS does not disaggregate financial indicators by race, so we included a variable reflecting the overall percentage of FT/FT students receiving aid from their institution.

We heeded the call from previous studies to examine relevant student outcomes that advance a more robust definition of servingness (e.g., García et al., 2019); student outcomes (e.g., grades, transfer, completion) are products of serving structures but are also influenced by individual experiences and external forces. To explore how the distinct institutional characteristics and structures of MSI categories might align with distinct student outcomes, we incorporate variables of MSI-aligned completion proportion and MSI-aligned graduation rates. We also provide Fall-to-Fall retention rates for all students, which is a required outcome to report for most MSIs receiving federal MSI grant dollars. The data definitions for all variables in the study are shown in Table 2.

Table 2. Variable Definitions

Variable Name	Data Source	Definition
MSI-Aligned Student Enrollment Representation	IPEDS Enrollment [EF2018A_RV]	[Continuous] The percent of undergraduate Fall enrollments comprising students identified in the racial group associated with each specific MSI category. *(Ex: The percent of Fall undergraduate enrollment comprising Hispanic students at HSIs.)*
MSI-Aligned Instructional Staff Representation	IPEDS [S2018_IS_RV]	[Continuous] [(Count of MSI-aligned instructional staff / total count of instructional staff) *100] The percent of instructional staff comprising individuals identified in the racial group associated with a specific MSI category. *(Ex: The percent of instructional staff identified as Native American individuals at TCUs.)*
Fall-to-Fall Retention Rate for All Students	IPEDS Fall Enrollment [EF2018D_RV]	[Continuous] The percent of the entire (i.e., all races) Fall full-time cohort from the prior year (minus exclusions from the Fall full-time cohort) that reenrolled at the institution as either full- or part-time students in the current year.
Percent of FT/FT Students Receiving Institutional Aid	IPEDS [SFA1718_RV]	[Continuous] Percent of all FT/FT degree- or certificate-seeking undergraduate students who were awarded any institutional aid.
MSI-Aligned 150% Graduation Rate	IPEDS Completions [DRVGR2018_RV]	[Continuous] The 6-year graduation rate for FT/FT students identified in the racial group associated with each specific MSI category. *(Ex: The 6-year graduation rate for Alaska Native and Native Hawaiian students at ANNHSIs.)*
MSI-Aligned Completion Proportion	IPEDS Completions [C2018_B_RV]	[Continuous] [(Awards conferred by race/ethnicity/total awards conferred) *100] The percent of total completions (degrees or certificates) conferred to students identified in the racial group associated with each specific MSI category. *(Ex: The proportion of total completions conferred to Asian American students at AANAPISIs.)*

Analysis

We used descriptive analysis from the IPEDS database. Descriptive statistics is an appropriate method to explore our research questions because it provides an in-depth understanding of the population by describing the participants in the study (e.g., number and characteristics) and by identifying underlying patterns regarding specified variables. Descriptive results help interpret seemingly complex or significant amounts of raw data. Our study incorporates standard deviation as a measure of dispersion to help bring clarity to the MSI data. We created and used weighted averages to calculate metrics to account for differences in student success metrics across different institutional types and sectors (see Table 3). This analysis's findings are descriptive and do not imply causality or identify reasons for the trends or differences observed.

Table 3. Institutional Type and Sector Weights

MSI Category	AANAPISI		ANNHSI		HBCU		HSI		NASNTI		PBI		TCU	
4-Year	*W*	N	*W*	N	*W*	N	*W*	N	*W*	N	*W*	N	*W*	N
Doctorate														
Public	*0.75*	9	*0.38*	3	*0.31*	26	*0.28*	25	*0*	0	*0.40*	4	*0*	0
Not for Profit	*0*	0	*0.13*	1	*0.07*	6	*0.17*	15	*0*	0	*0*	0	*0*	0
For Profit	*0*	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*	0
Master's														
Public	*0*	0	*0.13*	1	*0.12*	10	*0.13*	11	*0.5*	1	*0.20*	2	*0.25*	4
Not for Profit	*0*	0	*0.13*	1	*0.14*	12	*0.20*	18	*0*	0	*0.40*	4	*0.06*	1
For Profit	*0*	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*	0
Bachelor's														
Public	*0.25*	3	*0.25*	2	*0.05*	4	*0.2*	18	*0.50*	1	*0*	0	*0.44*	7
Not for Profit	*0*	0	*0*	0	*0.31*	26	*0.01*	1	*0*	0	*0*	0	*0.25*	4
For Profit	*0*	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*	0
Total	*1.0*	12	*1.0*	8	*1.0*	84	*1.0*	88	*1.0*	2	*1.0*	10	*1.0*	16
2-Year														
Associate's														
Public	*1.0*	11	*1.0*	4	*0.92*	11	*1.0*	82	*1.0*	4	*1.0*	23	*0.89*	17
Not for Profit	*0*	0	*0*	0	*0.08*	1	*0*	0	*0.0*	0	*0*	0	*0.11*	2
For Profit	*0*	0	*0*	0	*0*	0	*0*	0	*0.0*	0	*0*	0	*0*	0
Total	*1.0*	11	*1.0*	4	*1.0*	12	*1.0*	82	*1.0*	4	*1.0*	23	*1.0*	19

Limitations and Delimitations

There are a few critical limitations to our study that are worth discussing. First, although IPEDS administrators regularly undergo data integrity procedures, we navigated incomplete data where some values were zero and others were null. Where values were zero, we double-checked to assess if the value was indeed zero and not an error. A second limitation is that there are smaller sample sizes for specific MSI categories. We encourage readers to interpret this small sample size beyond statistical significance and within a larger context of postsecondary institutions and the complexities of securing federal designation and funding.

Decisions concerning variable selection and disaggregation also presented important delimitations to our study. Although our focus on FT/FT metrics is consistent with previous studies on organizational outcomes, such metrics are limited in providing a complete picture of outcomes for racially marginalized students classified as transfer or part-time. Additionally, our study disaggregated institutions by sector and control, but we reported findings only by sector due to interest and brevity.

FINDINGS

We organized the results of the analysis by MSI category below. For each category, we highlight differences within and across MSI categories. It is important to note that we made an explicit decision to present each MSI category holistically in addition to drawing comparisons between MSI categories and all other institutions. To help bring additional context to the essential dimensions of MSIs, we present national averages for all six variables. Tables 4 and

Table 4. Minority-Serving Institution–Aligned 2-year Institutions: Institutional Characteristics and Structures

			MSI-Aligned Student Enrollment Representation		MSI-Aligned Instructional Staff Representation		MSI-Aligned 150% Graduation Rate		MSI-Aligned Completion Proportion	
MSI Category	**Aligned Population**	***N***	**M**	***(SD)***	**M**	**(*SD*)**	**M**	**(*SD*)**	**M**	**(*SD*)**
AANAPISI	Asian	11	21.3	*(11.9)*	13.5	*(6.6)*	34.1	*(16.0)*	23.1	*(13.6)*
All Other	Asian	1348	3.4	*(5.5)*	3.3	*(5.0)*	33.1	*(27.4)*	3.5	*(6.2)*
AANAPISI	NH/OPI	11	0.2	*(0.4)*	0.7	*(1.8)*	14.9	*(20.0)*	0.4	*(0.5)*
All Other	NH/OPI	1348	0.4	*(5.1)*	0.5	*(3.6)*	21.6	*(33.4)*	0.5	*(5.0)*
ANNHSI	AI/AN	4	0	*(0)*	0.8	*(1.0)*	0	*(0)*	0.3	*(0.4)*
All Other	AI/AN	1362	2.7	*(12.1)*	1.4	*(6.6)*	21.3	*(28.2)*	2.8	*(12.3)*
ANNHSI	NH/OPI	4	4.8	*(1.5)*	11.3	*(4.6)*	12.0	*(6.7)*	3.9	*(5.3)*
All Other	NH/OPI	1355	0.4	*(5.1)*	0.4	*(3.5)*	21.5	*(33.3)*	0.5	*(5.0)*
HBCU	Black	12	58.4	*(26.6)*	52.9	*(29.5)*	16.2	*(8.4)*	61.2	*(29.8)*
All Other	Black	1347	13.1	*(3.6)*	6.7	*(1.8)*	20.4	*(5.9)*	11.9	*(3.3)*
HSI	Hispanic	82	48.7	*(15.4)*	15.8	*(11.7)*	25.4	*(8.2)*	45.8	*(16.6)*
All Other	Hispanic	1277	14.8	*(17.6)*	4.5	*(10.0)*	27.5	*(19.6)*	13.1	*(16.8)*
NASNTI	AI/AN	4	20.0	*(10.9)*	8.0	*(4.8)*	24.0	*(12.4)*	19.8	*(6.3)*
All Other	AI/AN	1355	2.6	*(12.0)*	1.3	*(6.6)*	21.2	*(28.2)*	2.7	*(12.2)*
PBI	Black	23	48.3	*(11.0)*	25.4	*(14.2)*	17.9	*(12.2)*	45.5	*(11.2)*
All Other	Black	1336	11.9	*(13.8)*	6.7	*(10.7)*	18.2	*(16.2)*	10.9	*(13.5)*
TCU	AI/AN	19	81.7	*(19.9)*	42.6	*(26.2)*	13.3	*(12.0)*	82.4	*(20.1)*
All Other	AI/AN	1340	1.2	*(0.4)*	0.6	*(0.2)*	23.9	*(7.8)*	1.2	*(2.2)*

Note: AA = Asian American; AN = Alaska Native; NH = Native Hawaiian; OPI = other Pacific Islander; TCU = tribal colleges and universities.

5 display results for variables under the MSI-aligned institutional characteristics and structural dimension by MSI categories and all other institutions by 2- and 4-year institutions. Tables 6 and 7 display results for variables under institutional characteristics and structural dimensions where disaggregation by MSI alignment is unavailable.

Asian American and Native American Pacific Islander–Serving Institutions

AANAPISIs comprised 6% (*n* = 23) funded MSIs in 2020. The group comprises all public institutions and is split between 4-year (*n* = 12) and 2-year (*n* = 11) designations. Concerning institutional

Table 5. Aligned 4-year Minority-Serving Institution Institutional Characteristics and Structures

			MSI-Aligned Student Enrollment Representation		MSI-Aligned Instructional Staff Representation		MSI-Aligned 150% Graduation Rate		MSI-Aligned Completion Proportion	
MSI Category	**Aligned Population**	***N***	**M**	***(SD)***	**M**	***(SD)***	**M**	***(SD)***	**M**	***(SD)***
AANAPISI	Asian	12	21.2	*(10.1)*	16.3	*(5.2)*	55.9	*(19.7)*	18.7	*(9.1)*
All Other	Asian	2767	5.1	*(2.2)*	8.9	*(2.5)*	54.7	*(24.0)*	5.2	*(2.3)*
AANAPISI	NH/OPI	12	4.0	*(12.3)*	2.1	*(6.6)*	45.1	*(19.9)*	4.8	*(15.2)*
All Other	NH/OPI	2767	0.3	*(0.3)*	0.3	*(1.5)*	43.9	*(5.4)*	0.4	*(0.3)*
ANNHSI	AI/AN	8	13.8	*(20.9)*	1.9	*(2.6)*	25.8	*(35.0)*	14.4	*(24.6)*
All Other	AI/AN	2771	1.5	*(0.6)*	0.9	*(0.9)*	41.9	*(16.0)*	1.6	*(0.6)*
ANNHSI	NH/OPI	8	6.0	*(7.1)*	3.8	*(4.1)*	49.3	*(30.2)*	6.0	*(6.9)*
All Other	NH/OPI	2771	0.5	*(0.8)*	0.3	*(0.1)*	44.6	*(16.6)*	0.5	*(0.2)*
HBCU	Black	84	79.7	*(20.0)*	59.0	*(17.0)*	33.6	*(16.3)*	80.2	*(18.1)*
All Other	Black	2695	10.1	*(3.5)*	4.1	*(1.4)*	42.8	*(14.7)*	8.6	*(3.0)*
HSI[a]	Hispanic	88	54.8	*(26.3)*	29.3	*(34.7)*	41.8	*(17.2)*	48.8	*(28.6)*
All Other	Hispanic	2691	12.7	*(4.5)*	5.1	*(1.8)*	45.3	*(16.0)*	10.3	*(3.6)*
NASNTI	AI/AN	2	9.0	*(2.8)*	1.0	*(1.4)*	28.0	*(28.3)*	8.9	*(3.4)*
All Other	AI/AN	2777	3.2	*(1.6)*	1.7	*(0.9)*	34.2	*(17.4)*	3.4	*(1.7)*
PBI[b]	Black	10	49.3	*(13.5)*	24.7	*(14.2)*	31.8	*(11.4)*	45.3	*(16.0)*
All Other	Black	2769	13.0	*(5.9)*	6.3	*(2.9)*	40.4	*(18.4)*	11.6	*(5.3)*
TCU	AI/AN	16	85.6	*(13.5)*	41.9	*(17.7)*	18.4	*(16.3)*	86.7	*(13.6)*
All Other	AI/AN	2763	0.8	*(0.3)*	0.5	*(0.2)*	37.0	*(15.0)*	0.8	*(0.3)*

Notes: [a] University of Puerto Rico Medical Sciences, John F. Kennedy University, and The University of Texas Health Science are graduate-focused HSIs that did not report data for "Percent of FT/FT Students Receiving Institutional Aid" as well as "MSI-Aligned 150% Graduation Rate."
[b] CUNY Graduate School and University Center is a PBI that enrolls less than 1% FT/FT undergraduates. Data for this institution is not reported for either "Percent of FT/FT Students Receiving Institutional Aid" or "MSI-Aligned 150% Graduation Rate." Additionally, Marygrove College was a PBI that stopped enrolling undergraduate students in 2017 and officially closed in 2019. Data for Marygrove College is not reported for "MSI-Aligned Student Enrollment Representation."

Table 6. General 4-year Minority-Serving Institutions: Institutional Characteristics and Structures

		Percent of FT/FT Students Receiving Institutional Aid		Fall-to-Fall Retention Rate for All Students	
MSI Category	***N***	**M**	**(*SD*)**	**M**	**(*SD*)**
AANAPISI	12	41.3	*(22.9)*	81.1	*(7.3)*
All Other	2767	49.1	*(28.7)*	75.7	*(32.8)*
ANNHSI	8	50.9	*(29.0)*	75.3	*(5.1)*
All Other	2771	56.9	*(30.1)*	75.4	*(28.6)*
HBCU	84	51.8	*(23.5)*	62.9	*(11.8)*
All Other	2695	64.1	*(22.2)*	74.2	*(25.6)*
HSI	88	48.0	*(34.4)*	74.1	*(10.0)*
All Other	2691	60.2	*(21.4)*	72.9	*(25.7)*
NASNTI	2	66.0	*(42.4)*	72.0	*(8.5)*
All Other	2777	42.5	*(21.8)*	70.1	*(35.1)*
PBI	10	59.1	*(38.9)*	62.8	*(13.4)*
All Other	2769	64.6	*(29.5)*	73.8	*(33.6)*
TCU	16	39.5	*(32.9)*	56.4	*(26.8)*
All Other	2763	49.8	*(20.6)*	70.5	*(28.0)*

Note: "All Other" reflects the weighted average and standard deviation based on the proportion of sectors and highest degrees represented in each MSI category.

characteristics, our analysis found that the overall MSI-aligned Fall enrollment proportion at AANAPISIs averaged 23.4% (*SD* = 16.3). For both 4-year and 2-year AANAPISIs, a considerable proportion of enrollment were students with Asian identities as opposed to those identifying as Native Hawaiian or other Pacific Islander. Across all racial backgrounds included in the designation, AANAPISIs employed nearly twice as many MSI-aligned instructional staff as non-AANAPISI institutions employed. On average, AANAPISIs served a relatively small proportion of students with institutional aid. Notably, 4-year AANAPISIs had a higher average proportion of FT/FT degree- or certificate-seeking undergraduate students receiving institutional aid (*M* = 41.3, *SD* = 22.9) than did their 2-year counterparts (*M* = 7.8, *SD* = 10.4).

Fall-to-Fall retention for all students at AANAPISIs ranged from 69.3% (*SD* = 8.2) at 2-year institutions to 81.1% (*SD* = 7.3) at 4-year institutions, both of which are higher than the weighted national averages for each sector (60.3% and 75.7%, respectively) and all other MSI categories. The average MSI-aligned 150% graduation rate was 24.5% (*SD* = 16.1) for 2-year AANAPISIs and 51.5% (*SD* = 18.4) for 4-year AANAPISIs. While the MSI-aligned completion proportion at 2-year AANAPISIs (*M* = 23.5, SD =13.6) mirrored that of their graduation rates, the average MSI-aligned completion proportion at 4-year

Table 7. General 2-year Minority-Serving Institutions: Institutional Characteristics and Structures

		Percent of FT/FT Students Receiving Institutional Aid		Fall-to-Fall Retention Rate for All Students	
MSI Category	***N***	**M**	***SD***	**M**	***SD***
AANAPISI	11	7.8	*(10.4)*	69.3	*(8.2)*
All Other	1348	19.9	*(19.3)*	60.3	*(8.9)*
ANNHSI	4	34.0	*(7.4)*	59.0	*(5.7)*
All Other	1355	20.4	*(20.0)*	60.4	*(9.0)*
HBCU	12	21.3	*(12.9)*	46.8	*(17.3)*
All Other	1347	21.5	*(5.9)*	61.0	*(16.6)*
HSI	82	14.0	*(14.9)*	65.0	*(7.7)*
All Other	1277	21.1	*(20.3)*	59.9	*(8.9)*
NASNTI	4	38.5	*(16.4)*	46.8	*(4.3)*
All Other	1355	20.4	*(19.9)*	60.5	*(8.9)*
PBI	23	16.3	*(21.5)*	57.5	*(6.9)*
All Other	1336	20.6	*(19.9)*	60.5	*(9.0)*
TCU	19	46.1	*(35.2)*	53.9	*(18.0)*
All Other	1340	21.4	*(3.7)*	61.1	*(19.1)*

Note: "All Other" reflects the weighted average and standard deviation based on the proportion of sectors and highest degrees represented in each MSI category.

AANAPISIs (M = 23.5, SD = 21.0) was much lower in comparison.

Alaska Native and Native Hawaiian–Serving Institutions

ANNHSIs represented 3% (n = 12) of the MSIs funded in 2020. ANNHSIs were predominantly public colleges (n = 8) located in the states of Hawaii (n = 8) and Alaska (n = 4). Due to the different enrollment threshold requirements for Native Hawaiians (10%) and Alaska Natives (20%), the overall group demonstrated a wide range of MSI-aligned student enrollment representation at both 2-year (M = 4.8, SD = 1.5) and 4-year institutions (M = 19.8, SD = 19.9).

Similar to AANAPISIs, MSI-aligned instructional staff representation at ANNHSIs was much higher than the national average. At 2-year institutions, the representation of Native Hawaiian and other Pacific Islander instructional staff (M = 11.3, SD = 4.6) was almost twice that of undergraduate students (M = 4.8, SD = 1.5)—the only MSI category to demonstrate such a difference. While the proportion of FT/FT undergraduates receiving institutional aid at 2-year institutions (M = 34.0, SD = 7.4) was less than that of those receiving such aid at 4-year institutions (M = 50.9, SD = 29.0), it remained higher than the weighted national average (M = 20.4, SD = 20.0) and was also higher than the majority of other 2-year MSI categories.

The average Fall-to-Fall retention rate at ANNHSIs was 59.0% (*SD* = 5.7) at 2-year institutions and 75.3% (*SD* = 5.1) at 4-year institutions—both of which are comparable to the weighted national averages (i.e., 60.4% and 75.4%, respectively). MSI-aligned graduation rate outcomes at ANNHSIs varied widely, with the highest rate for Native Hawaiians at 4-year institutions (*M* = 49.3, *SD* = 30.2). The lowest average graduation rate within the ANNHSI subgroups was for Alaska Natives and Native Americans at 2-year institutions (*M* = 0.0. *SD* = 0). However, these data should be considered with caution since only two of the four 2-year colleges reported out on this outcome. All four 2-year institutions are in Hawaii, with few Alaska Native and Native American enrollments. The subgroup averages for MSI-aligned completion proportion also varied widely. The highest proportion was for Alaska Native and Native American students (*M* = 14.4, *SD* = 24.6) at 4-year institutions, however, which is an average substantially higher than the national average (*M* = 1.6, *SD* = 0.6).

Hispanic-Serving Institutions

By far, HSIs were the most prevalent MSI category (*n* = 170), representing nearly 46% of funded MSIs in 2020. Nearly 80% (*n* = 135) of HSIs were public, and a little more than half (52%) were 4-year institutions. Roughly 10% (*n* = 17) of HSIs were in Puerto Rico, creating distinct student and faculty composition differences. For example, all 17 HSIs in Puerto Rico had between 94% and 100% Hispanic Fall enrollment representation. Similarly, Hispanic faculty representation at MSIs ranged between 90% and 100%. The MSI-aligned enrollment proportion at 2-year (*M* = 48.7, *SD* = 15.4) and 4-year (*M* = 54.8, *SD* = 26.3) HSIs was the highest of the enrollment-based MSI categories. MSI-aligned instructional staff representation at 4-year institutions (*M* = 29.3, *SD* = 34.7) was nearly twice that of 2-year institutions (*M* = 15.8, *SD* = 11.7). Although the percent of students receiving institutional aid at 4-year HSIs (*M* = 48.0, *SD* = 34.4) was, on average, more than three times greater than students receiving aid at 2-year HSIs (*M* = 14.0, *SD* = 14.9), both subgroups were below the adjusted national average for their sector (60.2% and 21.1%, respectively).

Overall Fall-to-Fall retention averages at 2-year (*M* = 65.0) and 4-year (*M* = 74.1) HSIs were some of the highest across MSI categories, and were slightly higher than the national averages for each sector. MSI-aligned FT/FT graduation rates for HSIs—25.4% (*SD* = 8.2) for 2-year institutions and 41.8% (*SD* = 17.2) for 4-year institutions—were higher than other MSI categories, and slightly lower than the weighted national averages. The MSI-aligned completion proportion of 2-year (*M* = 45.8, *SD* = 16.6) and 4-year (*M* = 48.8, *SD* = 28.6) HSIs was relatively comparable, and was substantially higher than the respective national averages at 2-year (*M* = 13.1) and 4-year (*M* = 10.3) institutions.

Historically Black Colleges and Universities

HBCUs were the second-most-prevalent MSI category (*n* = 96) in the analysis, representing 26% of funded MSIs in 2020. Approximately 88% of the group were 4-year institutions, and the group was roughly split between public and private control. While the HBCU designation is not based on enrollment, 2-year (*M* = 58.4, *SD* = 26.6) and 4-year (*M* = 79.7, *SD* = 20.0) HBCUs had the second-highest MSI-aligned student enrollment across MSI categories. MSI-aligned instructional staff representation was 59.0% (*SD* = 17.0) at 4-year HBCUs and 52.9% (*SD* = 29.5) at 2-year institutions. Such representation was the highest across the

MSI categories, and was far more than the national averages in each sector. Although the proportion of students receiving institutional aid was much higher at 4-year (*M* = 51.9, *SD* = 23.5) than at 2-year (*M* = 21.3, *SD* = 12.9) HBCUs, the 2-year HBCU average was comparable to that of the weighted national 2-year institutional average (*M* = 21.5, *SD* = 5.9).

The Fall-to-Fall retention rates for both 2-year (*M* = 46.8, *SD* = 17.3) and 4-year (*M* = 62.9, *SD* = 11.8) HBCUs were less than the national sector averages (*M* = 61.0, *SD* = 16.6; and *M* = 74.2, *SD* = 25.6, respectively). Similarly, HBCUs in both sectors had average MSI-aligned graduation rates lower than the national average. Graduation rates at 2-year institutions averaged 16.2% (*SD* = 8.4), while those at 4-year institutions averaged 33.6% (*SD* = 16.3). The MSI-aligned completion proportion for 2-year HBCUs was 61.2% (*SD* = 29.8) and 80.2% (*SD* = 18.1). Notably, the average proportion of completions conferred to Black students at HBCUs is almost 10 times that of the national average (*M* = 8.6, *SD* = 3.0), which is higher than all enrollment-based MSI categories.

Native American–Serving Nontribal Institutions

NASNTIs were the smallest MSI category (*n* = 6), representing less than 2% of the funded MSI population. Four of the six institutions were 2-year institutions, and all institutions in the group were publicly controlled. Similar to AANAPISIs, the average MSI-aligned enrollment proportion at NASNTIs was higher at 2-year institutions (*M* = 20.0, *SD* = 10.9) than at 4-year institutions (*M* = 9.0, *SD* = 2.8). MSI-aligned instructional staff representation at 2-year NASNTIs was 8.0% (*SD* = 4.8) and at 4-year institutions was 1.0% (*SD* = 1.4). Instructional staff representation was low among the MSI categories but higher than the national averages. The average proportion of students receiving institutional aid at 2-year (*M* = 38.5, *SD* = 16.4) and 4-year (*M* = 66.0, *SD* = 42.4) NASNTIs was higher than the proportion receiving aid at all MSI categories and the national averages.

The average Fall-to-Fall retention rate at 2-year NASNTIs was 46.8% (*SD* = 4.3), which is a full 25 percentage points less than the 4-year institutional average (*M* = 72.0, *SD* = 8.5). The average MSI-aligned graduation rates were more comparable between 2-year (*M* = 24.0, *SD* = 12.4) and 4-year (*M* = 28.0, *SD* = 28.3) NASNTIs. Similar to other MSIs with enrollment requirements between 10% and 20% (see Table 1), the MSI-aligned completion proportion at 2-year (*M* = 19.8, *SD* = 6.3) and 4-year (*M* = 8.9, *SD* = 3.4) NASNTIs was lower in comparison to other MSI categories, but was much higher than the weighted national averages.

Predominantly Black Institutions

PBIs represented nearly 9% (*n* = 33) of funded MSIs in 2020. Two-thirds of PBIs were 2-year institutions, and most institutions in the group were publicly controlled (about 88%). PBIs have one of the highest enrollment requirements (i.e., their enrollment must be at least 40% African American students) of the enrollment-based MSIs, with relatively high MSI-aligned enrollment at 2-year (*M* = 48.3, *SD* = 11.0) and 4-year PBIs (*M* = 49.3, *SD* = 13.5). The average MSI-aligned instructional staff representation at PBIs was among the highest across MSI categories, with 25.4% (*SD* = 14.2) at 2-year institutions and 24.7% (*SD* = 14.2) at 4-year institutions. The average proportion of students receiving institutional aid at 2-year institutions was 16.3% (*SD* = 21.5) and 59.1% (*SD* = 38.9) at 4-year PBIs. The 42 percentage-point

difference between the sectors was the largest across MSI categories.

The average Fall-to-Fall retention rates for 2-year (*M* = 57.5, *SD* = 6.9) and 4-year (*M* = 62.8, *SD* = 13.4) PBIs were lower than the adjusted national averages in each sector. Similar to the majority of MSI categories, the MSI-aligned graduation rate at 4-year institutions (*M* = 31.8, *SD* = 11.4) was higher than that of 2-year institutions (*M* = 17.9, *SD* = 12.2) but lower than that of the weighted national averages. Despite the difference in graduation rates, the MSI-aligned completion proportion at 2-year (*M* = 45.5, *SD* = 11.2) and 4-year (*M* = 45.3, *SD* = 16.0) PBIs was notably similar, and both were higher than the adjusted national averages.

Tribal Colleges and Universities

TCUs was the third most prevalent category of funded MSIs (*n* = 35) in 2020. TCUs in 2020 were a balance of 2-year (*n* = 18) and 4-year (*n* = 16) institutions, all of them predominantly controlled by the public. In addition to having the highest average MSI-aligned enrollment across 2-year (*M* = 81.7, *SD* = 19.9) and 4-year MSI institutions (*M* = 85.6, *SD* = 13.5), TCUs demonstrated MSI-aligned enrollments far greater than the adjusted national averages (i.e., *M* = 1.2 for 2-year institutions and *M* = 0.8 for 4-year institutions). Average representation from MSI-aligned instructional staff followed a similar trend. At 2-year TCUs, the average MSI-aligned instructional staff proportion was 42.6% (*SD* = 26.2) and 41.9% (*SD* = 17.7) at 4-year institutions. Comparatively, the weighted national average for MSI-aligned instructional staff representation at 2-year institutions was 0.6% (*SD* = 0.2) and 0.5% (*SD* = 0.2) at 4-year institutions. The average proportion of students receiving institutional aid at TCUs was also distinct in that it was the only MSI category in which 2-year institutions (*M* = 46.1, *SD* = 35.2) had a higher average than 4-year institutions (*M* = 39.5, *SD* = 32.9).

The average Fall-to-Fall retention rate for 2-year TCUs was 53.9% (*SD* = 18.0) and 56.4% (*SD* = 26.8) for 4-year institutions. Both sector averages were lower than the weighted national average, but the average for 4-year TCUs was lower than any other MSI category. Average MSI-aligned graduation rates were also low for TCUs compared to the weighted national rates and other MSI categories. The average 6-year graduation rate at 2-year TCUs was 13.3% (*SD* = 12.0), while that rate at 4-year TCUs was 18.4% (*SD* = 16.3). In contrast, the average MSI-aligned completion proportion for 2-year (*M* = 82.4, *SD* = 20.1) and 4-year (*M* = 86.7, *SD* = 13.6) TCUs was higher than any other MSI category, while being magnitudes more than the weighted national averages.

DISCUSSION AND IMPLICATIONS

This study used descriptive analyses of IPEDS data to explore the extent to which MSIs served their target population. We found that MSIs enrolled higher percentages of MSI-aligned students and employed more-significant percentages of MSI-aligned instructional staff. Most MSIs generally retained higher percentages of MSI-aligned students. In addition, most MSIs showed higher completion proportions, though nearly all MSI categories saw lower graduation rates among MSI-aligned students. The average proportions of FT/FT students receiving institutional aid were higher at some MSIs, while being lower at other MSIs. While the findings provide evidence that MSIs overall embody a spirit of servingness, it was noticeable that history, structure,

and mission matter. Given these conclusions, two themes arose that are important to discuss:

1| Enrollment alone is not a proxy for servingness. And

2| MSIs are not monolithic in how they serve or their ability to serve students.

García et al. (2019) argue that servingness is a multidimensional and conceptual way to understand what it means for HSIs to move from simply *enrolling* Hispanic students to actually *serving* them. The findings from this study support García et al.'s conceptual framing, and we extend it to other MSI categories. Surely, enrollment of a target racial population is a critical factor in defining and categorizing MSIs. However, enrollment as a sole factor can be misleading because the enrollment thresholds vary among MSI categories, especially if we are using the thresholds identified by ED. For example, the 40% enrollment threshold for PBIs is the highest among MSIs. Likewise, the results for ANNHSIs were very dependent on the differences between the threshold requirements for Native Hawaiians and Native Alaskans (10% and 20%, respectively).

Furthermore, location interestingly appeared in the results as a covariate in future research. A further examination of the results showed that the 94% to 100% enrollment of Hispanic students at HSIs could be influenced by the 10% of HSIs (n = 17) located in Puerto Rico. This finding suggests that location in U.S. territories (e.g., Guam, American Samoa) and the Freely Associated States (e.g., Republic of Palau), along with the historical background of U.S. colonization of these lands, might be an important factor to examine in future analyses.

Previous literature suggests that the variance in the instructional staff and institutional aid factors is likely driven by the institution's overall mission and the prioritization of inclusive practices. For example, HBCUs and TCUs were founded to educate Black and Indigenous students; that remains their mission, regardless if their student population has diversified over time. HBCUs and TCUs had the highest average percentage of MSI-aligned instructional staff. We also observed a pattern between the timeframe of establishing an MSI category and some of the findings: most MSIs that were designated earlier had averages of MSI-aligned instructional that were generally higher than averages in later-designated MSIs. For example, the averages at HBCUs, HSIs, PBIs, and TCUs were higher than all other MSIs in comparison. Still, the instructional staff at most MSIs is still predominantly white, a finding that supports previous scholarship that observed many MSIs possess predominantly white faculty, staff, and administrators (Contreras, 2017; Raines, 1998). Such findings imply that, as institutions grow their student body to meet threshold requirements, they must be equally mindful—intentionally or unintentionally—of diversifying and retaining their faculty (Raines, 1998; Turner et al., 2008).

We also found that the proportion of MSI-aligned students receiving institutional aid varied widely. At some MSIs, such as AANAPISIs, HSIs, and 4-year TCUs, the proportion of MSI-aligned students receiving institutional aid was lower than national weighted averages. The proportion was higher than the national weighted averages at other MSIs, such as ANNHSIs, HBCUs, NASNTIs, PBIs, and 2-year TCUs. Examining the factors contributing to these variations was beyond the scope of this study. Some existing scholarship suggests no disparate impact of performance-based funding policies on

2-year MSIs (e.g., Hu, 2019; Li et al., 2018), however, while other scholarship negatively impacted 4-year MSIs (Ortagus et al., 2022). Still, scholars have repeatedly discussed the financial precarity MSIs face (e.g., Aguilar-Smith, 2021; Museus et al., 2021; Vargas et al., 2019). Future studies should examine institutional factors—such as federal and state-level funding, institutional endowments, and state funding policies—that may contribute to these variations.

We were also curious how IPEDS data could be used to learn more about the servingness of MSIs. IPEDS data that were meaningful to our examination of MSIs were fragmented and not always available. For example, we could not find or derive meaningful equivalents of the variables suggested by García and colleagues (2019) in their framework of servingness, such as culturally relevant curricula or student support services. As such, we were limited in our ability to utilize their framework fully.

Furthermore, the analysis was complicated by the NCES's exclusion of variables for MSI status, other than HBCUs and TCUs, and inconsistent racial and ethnic identity disaggregation with identities included in the federal definitions (e.g., AANAPISIs use "Native American Pacific Islander" but IPEDS collects only "Native Hawaiian and other Pacific Islander" as a racial category). Garcia and Mayorga (2017) argue that analyzing racial data can be challenging when using secondary data; our study also found this to be true.

Additional research would be beneficial to advance the understanding of servingness at MSIs. Future research might consider using a different data set with the same or similar variables. For example, a future comparative and correlational study design should explore the statistical differences and significant relationships between the selected variables in this study and student outcomes. Researchers could also conduct a longitudinal study to learn more about how the racial population of institutions, MSI-designated institutions, and servingness change over time.

Our findings have several implications for practice. First, while we understand that institutional status as an MSI may change over time, the NCES can create additional MSI variables in IPEDS and across other data systems to alleviate the capacity burdens for researchers. The current existence of an "HBCU" and a "TCU" variable alleviates some of these burdens; however, such a variable for other MSI categories or even a comprehensive MSI variable does not exist. Such variables can also support practitioners at MSIs who seek to apply for federal funding competitions.

Furthermore, IPEDS can expand its racial and ethnic categories, particularly for the Asian American, other Pacific Islander, Alaska Native, and Native Hawaiian communities, to better reflect these communities and to increase the ease of data use (Lee et al., 2017; Nguyen, 2020). Practitioners, including those from community-based organizations, often turn to other sources to make data-informed decisions or to collect their data because of limitations in federal data systems (AAPI Data, 2022; Byon, 2020; Nguyen et al., 2013). Because our team drew on publicly available government agency data (e.g., from ED and IPEDS), we urge these agencies to work together to alleviate research burdens for scholars and practitioners.

CONCLUDING THOUGHTS

When we embarked on this journey, we explored the possibility of conducting a meaningful study with secondary data related to MSIs, which collectively

enroll and serve large numbers of students of color, especially students from low-income backgrounds. These institutions embody profound differences across institutional characteristics, yet, as demonstrated in this descriptive analysis, these institutions are still graduating significant numbers of students of color.

Simply put, these institutions are important to the fabric of higher education with regard to advancing educational equity and contributing to society. As we proceeded, we found the complexities of race, racism, and processes of racialization, as well as colonization, to be important considerations. However, these elements are missing in IPEDS data and are reflected in how the data are collected. We made a few concrete recommendations and supported recommendations made by other scholars, practitioners, and leaders. We call on government agencies, educational institutions, and other organizations to support research on these important institutions by attending to race complexities, alleviating research barriers, and increasing researcher capacity. Conducting and using research about these institutions should be and can be made easier.

REFERENCES

AAPI Data. (2022). 2022 Asian American, Native Hawaiian, and Pacific Islander (AA and NHPI) roadmap for data equity in federal agencies. AAPI Data & National Council of Asian Pacific Americans. http://aapidata.com/wp-content/uploads/2022/05/AANHPI-DataEquityReport-May-2022.pdf

Aguilar-Smith, S. (2021). Seeking to serve or $erve? Hispanic-serving institutions' race-evasive pursuit of racialized funding. *AERA Open, 7*, 233285842110570. https://journals.sagepub.com/doi/10.1177/23328584211057097

Bensimon, E. M., & Dowd, A. C. (2012). *Developing the capacity of faculty to become institutional agents for Latinos in STEM.* Rossier School of Education, University of Southern California. https://bpb-us-e1.wpmucdn.com/sites.usc.edu/dist/6/735/files/2016/01/Bensimon_Developing-IAs_NSF-Report-CUE_2012.pdf

Bhatt, W. (2013). The little brown woman: Gender discrimination in American medicine. *Gender & Society, 27*(5), 659–680. https://journals.sagepub.com/doi/10.1177/0891243213491140

Bonilla-Silva, E. (1997). Rethinking racism: Toward a structural interpretation. *American Sociological Review, 62*(3), 465. https://www.jstor.org/stable/2657316?origin=crossref

Bussey, K. E. (2022). Examining the racialization of higher education: A focus on student loan debt, institutional revenue, and agency at historically Black colleges and universities (Publication No. 29399081) [Doctoral Dissertation, Howard University]. ProQuest Dissertations Publishing. https://www.proquest.com/dissertations-theses/examining-racialization-higher-education-focus-on/docview/2736318588/se-2?accountid=37965

Byon, A. (2020). Edited by A. J. Roberson. Everyone deserves to be seen: Recommendations for improved federal data on Asian Americans and Pacific Islanders (AAPI). Southeast Asia Resource Action Center & Institute for Higher Education Policy. https://files.eric.ed.gov/fulltext/ED605726.pdf

Castro Samayoa, A. (2018). "People around me here, they know the struggle": Students' experiences with faculty member's mentorship at three Hispanic serving institutions. *Education Sciences, 8(*2), 49. https://www.mdpi.com/2227-7102/8/2/49

Catallozzi, L. A., Tang, S. S., Gabbard, G., & Kiang, P. N. (2019). Modeling AANAPISI community college–university collaboration: A case study of Asian American Studies‐centered faculty and curriculum development. *New Directions for Higher Education, 2019*(186), 79–92. https://onlinelibrary.wiley.com/doi/10.1002/he.20325

Cole, W. M. (2011). Minority politics and group-differentiated curricula at minority-serving colleges. *Review of Higher Education, 34*(3), 381–422. https://muse.jhu.edu/article/420726

Contreras, F. E. (2017). Latino faculty in Hispanic-serving institutions: Where is the diversity? *Association of Mexican American Educators Journal, 11*(3), 223–250. https://journals.coehd.utsa.edu/index.php/AMAE/article/view/82

Contreras, F. E., & Contreras, G. J. (2015). Raising the bar for Hispanic serving institutions: An analysis of college completion and success rates. *Journal of Hispanic Higher Education, 14(*2), 151–170. https://journals.sagepub.com/doi/abs/10.1177/1538192715572892

Contreras, F. E., Malcolm, L. E., & Bensimon, E. M. (2008). Hispanic-serving institutions: Closeted identity and the production of equitable outcomes for Latina/o students. In Gasman, M., Baez, B., & C. Turner (Eds.), *Understanding minority-serving institutions* (pp. 71–90). State University of New York Press. https://sunypress.edu/Books/U/Understanding-Minority-Serving-Institutions

Crazy Bull, C., Lindquist, C., Burns, R., Vermillion, L., & McDonald, L. (2020). Tribal colleges and universities: Building nations, revitalizing identity. *Change: The Magazine of Higher Learning, 52*(1), 23–29. https://www.tandfonline.com/doi/full/10.1080/00091383.2020.1693819

Cuellar, M. G., & Johnson-Ahorlu, R. N. (2020). Racialized experiences off and on campus: Contextualizing Latina/o students' perceptions of climate at an emerging Hispanic-Serving Institution (HSI). *Urban Education, 58*(9). https://journals.sagepub.com/doi/10.1177/0042085920927772

Cunningham, A., & Leegwater, L. (2010). Minority serving institutions—What can we learn? In *Recognizing and serving low-income students in higher education: An examination of institutional policies, practices, and culture*, pp. 176–191. Routledge. https://www.routledge.com/Recognizing-and-Serving-Low-Income-Students-in-Higher-Education-An-Examination/Kezar/p/book/9780415803229

Cunningham, A., Park, E., & Engle, J. (2014). *Minority-serving institutions: Doing more with less.* Institute for Higher Education Policy. https://www.ihep.org/publication/minority-serving-institutions-doing-more-with-less/

Espinosa, L. L., Kelchen, R., & Taylor, M. (2018). *Minority serving institutions as engines of upward mobility.* American Council on Education. https://www.acenet.edu/Documents/MSIs-as-Engines-of-Upward-Mobility.pdf

Espinosa, L., Turk, J. & Taylor, M. (2017). *Pulling back the curtain: Enrollment and outcomes at minority serving institutions.* Report. American Council on Education. https://www.acenet.edu/Documents/Pulling-Back-the-Curtain-Enrollment-and-Outcomes-at-MSIs.pdf

Excelencia in Education. (2022). Emerging Hispanic-Serving Institutions (eHSIs): 2020–21. https://www.edexcelencia.org/research/publications/emerging-hsis-ehsis-2020-21

Flores, S. M., & Park, T. J. (2013). Race, ethnicity, and college success: Examining the continued significance of the minority-serving institution. *Educational Researcher, 42*(3), 115–128. https://journals.sagepub.com/doi/10.3102/0013189X13478978

García, G. A. (2017). Defined by outcomes or culture? Constructing an organizational identity for Hispanic serving institutions. *American Educational Research Journal, 54*(1_suppl), 111S–134S. https://journals.sagepub.com/stoken/default+domain/10.3102/0002831216669779/full

García, G. A. (2019). Becoming Hispanic serving institutions: Opportunities for colleges & universities. Johns Hopkins University Press.

García, G. A., Núñez, A. M., & Sansone, V. A. (2019). Toward a multidimensional conceptual framework for understanding "servingness" in Hispanic-serving institutions: A synthesis of the research. *Review of Educational Research, 89*(5), 745–784. https://psycnet.apa.org/record/2019-54581-003

García, G. A., Patrón, O. E., Ramirez, J. J., & Hudson, L. T. (2018). Identity salience for Latino male collegians at Hispanic serving institutions (HSIs), emerging HSIs, and non-HSIs. *Journal of Hispanic Higher Education, 17*(3), 171–186. https://journals.sagepub.com/doi/10.1177/1538192716661907

Garcia, N. M., & Mayorga, O. J. (2017). The threat of unexamined secondary data: a critical race transformative convergent mixed methods. *Race Ethnicity and Education, 21*(2), 231–252. https://www.tandfonline.com/doi/full/10.1080/13613324.2017.1377415

Gasman, M., Nguyen, T.-H., & Conrad, C. F. (2015). Lives intertwined: A primer on the history and emergence of minority-serving institutions. *Journal of Diversity in Higher Education, 8*(2), 120–138. https://psycnet.apa.org/doiLanding?doi=10.1037%2Fa0038386

Guardia, J. R., & Evans, N. (2008). Student development in tribal colleges and universities. *NASPA Journal, 45*(2), 237–264. https://www.academia.edu/78916734/Student_Development_in_Tribal_Colleges_and_Universities

Harmon, N. (2012). The role of minority-serving institutions in national college completion goals. Institute for Higher Education Policy. https://files.eric.ed.gov/fulltext/ED528603.pdf

Hegji, A. (2017, September 12). Programs for minority-serving colleges and universities under the Higher Education Act. *Congressional Research Service*. https://sgp.fas.org/crs/misc/R43237.pdf

Howard, T. C., & Navarro, O. (2016) Critical race theory 20 years later: Where do we go from here? *Urban Education, 51*(3), 253–276. https://journals.sagepub.com/doi/10.1177/0042085915622541

Hu, X. (2019). Efficiency for whom? Varying impact of performance-based funding on community colleges in Louisiana. *Community College Review*, *f*(4), 323–359. https://journals.sagepub.com/doi/10.1177/0091552119864409

Integrated Postsecondary Education Data System (IPEDS). n.d. "Human Resources." National Center for Education Statistics, U.S. Department of Education. https://nces.ed.gov/ipeds/survey-components/3

Lee, S., Xiong, C., Pheng, L., & Vang, M. (2017). The model minority maze: Hmong Americans working within and around racial discourses. *Journal of Southeast Asian American Education and Advancement*, 12(2). https://docs.lib.purdue.edu/jsaaea/vol12/iss2/1/

Li, A. Y., Gándara, D., Assalone, A. (2018). Equity or disparity: Do performance funding policies disadvantage 2-year minority-serving institutions? *Community College Review, 46*(3), 288–215. https://journals.sagepub.com/doi/10.1177/0091552118778776

Li, X., & Carroll, C. D. (2007). *Characteristics of minority-serving institutions and minority undergraduates enrolled in these institutions: Postsecondary education descriptive analysis report* (NCES 2008-156). Report. National Center for Education Statistics. https://nces.ed.gov/pubs2008/2008156.pdf

Museus, S. D., Ledesma, M. C., & Parker, T. L. (2015). Racism and racial equity in higher education. *ASHE Higher Education Report, 42*(1), 1–112. https://onlinelibrary.wiley.com/doi/10.1002/aehe.20067

Museus, S. D., Mac, J., Wang, A. C., Sarreal, A., Wright-Mair, R., & Manlove, J. (2021). How Asian American and Native American Pacific Islander-serving Institution (AANAPISI) initiatives respond to institutional racism. *Journal of Higher Education, 93*(3), 452–476. https://www.tandfonline.com/doi/full/10.1080/00221546.2021.1996168

Museus, S. D., Wright-Mair, R., & Mac, J. (2018). *How Asian American and Native American Pacific Islander serving institutions (AANAPISIs) are creating the conditions for students to thrive*. Penn Center for MSIs. https://cmsi.gse.rutgers.edu/sites/default/files/Research%20Brief%2C%20AANAPISI%20Thrive.pdf

National Academies of Sciences, Engineering, and Medicine. (2019). *Minority serving institutions: America's underutilized resource for strengthening the STEM workforce*. Contributors include L. L. Espinosa, K. McGuire, & L. M. Jackson. The National Academies Press. https://doi.org/10.17226/25257

National Center for Education Statistics (NCES). (n.d.). About NCES. https://nces.ed.gov/about/

Nguyen, B-M D., Nguyen, M. H., & Nguyen, T-L K. (2013). Advancing the Asian American and Pacific Islander data quality campaign: Data disaggregation practice and policy. *Asian American Policy Review, 24*, 55–67. https://searchworks-lb.stanford.edu/articles/aph__109382585

Nguyen, M. H. (2020). Asian American and Native American Pacific Islander Serving Institutions (AANAPISIs): Serving and advocating for the educational needs of Southeast Asian American students. *Journal of Southeast Asian American Education and Advancement, 15*(2), art. 3. https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1205&context=jsaaea

Nguyen, T.-H., Nguyen, M. H., Nguyen, B. M. D., Gasman, M., & Conrad, C. F. (2018). From marginalized to validated: An in-depth case study of an Asian American, Native American and Pacific Islander serving institution. *Review of Higher Education, 41*(3), 327–363. https://muse.jhu.edu/article/687738

Núñez, A.-M., Crisp, G., & Elizondo, D. (2016). Mapping Hispanic-serving institutions: A typology of institutional diversity. *Journal of Higher Education, 87*(1), 55–83. https://muse.jhu.edu/article/603133

Ortagus, J. C., Rosinger, K. O., Kelchen, R., Chu, G., & Lingo, M. (2022). The unequal impacts of performance-based funding on institutional resources in higher education. *Research in Higher Education, 64*, 705–739. https://link.springer.com/article/10.1007/s11162-022-09719-2

Patton, L. D., & Njoku, N. R. (2019). Theorizing Black women's experiences with institution-sanctioned violence: A #BlackLivesMatter imperative toward Black liberation on campus. *International Journal of Qualitative Studies in Education, 32*(9), 1162–1182. https://www.tandfonline.com/doi/full/10.1080/09518398.2019.1645908

Raines, R. T. (1998). Collaboration and cooperation among minority-serving institutions. *New Directions for Higher Education, 1998*(102), 69–80. https://onlinelibrary.wiley.com/doi/10.1002/he.10206

Ray, V. (2019). A theory of racialized organizations. *American Sociological Review, 84*(1), 26–53. https://journals.sagepub.com/doi/10.1177/0003122418822335

Romero, D. R., Gonzalez, M., Clark-Ibanez, M., & D'Anna-Hernandez, K. (2020). A culturally validated model of student success services and academic and curriculum enhancements at a Hispanic-Serving Institution. *Association of Mexican American Educators Journal, 14*(3), 84–103. https://amaejournal.utsa.edu/index.php/AMAE/article/view/401

Salinas, C. (2020). The complexity of the "x" in Latinx: How Latinx/a/o students relate to, identify with, and understand the term Latinx. *Journal of Hispanic Higher Education, 19*(2), 149–168. https://doi.org/10.1177/1538192719900382

Tomaskovic-Devey, D. (1993). *Gender & racial inequality at work: The sources and consequences of job segregation*. In the series Cornell Studies in Industrial and Labor Relations. Cornell University Press. https://www.degruyter.com/document/doi/10.7591/9781501717505/html

Truong, K. A., Museus, S. D., & McGuire, K. M. (2016). Vicarious racism: A qualitative analysis of experiences with secondhand racism in graduate education. *International Journal of Qualitative Studies in Education (QSE), 29*(2), 224–247. https://www.tandfonline.com/doi/full/10.1080/09518398.2015.1023234

Turner, C. S. V., González, J. C., & Wood, J. L. (2008). Faculty of color in academe: What 20 years of literature tells us. *Journal of Diversity in Higher Education, 1*(3), 139–168. https://psycnet.apa.org/doiLanding?doi=10.1037%2Fa0012837

U.S. Department of Education (ED). (2018). *Eligibility matrices for Title III and Title V programs*. https://www2.ed.gov/about/offices/list/ope/idues/eligibility.html#el-inst2

U.S. Department of Education (ED). (2020). *2020 MSI eligibility matrix*. https://www2.ed.gov/about/offices/list/ope/idues/2020eligibilitymatrix.xlsx

Vargas, N., Villa-Palomino, J., & Davis, E. (2019). Latinx faculty representation and resource allocation at Hispanic serving institutions. *Race Ethnicity and Education, 23*(1), 39–54. https://www.tandfonline.com/doi/full/10.1080/13613324.2019.1679749

Wang, A. C., Mac, J., & Museus, S. (2021). The power of ethnic studies at Asian American and Native American Pacific Islander Serving Institutions. *About Campus, 26*(1), 10–16. https://journals.sagepub.com/doi/10.1177/1086482220953164

Williams, K. L., Mobley, S.D., Campbell, E., & Jowers, R. (2022). Meeting at the margins: Culturally affirming practices at HBCUs for underserved populations. *Higher Education*, 1–21. https://link.springer.com/article/10.1007/s10734-022-00816-w

Wooten, M. E. (2006). Soapbox: Editorial essays. *Strategic Organization, 4*(2), 191–199. https://journals.sagepub.com/doi/10.1177/1476127006064068

Convergence Issues for Disability Measures at Public 2-Year Institutions

John Zilvinskis

About the Author

John Zilvinskis is associate professor at Binghamton University, State University of New York.

Abstract

The purpose of this study is to demonstrate how triangulating responses from the Community College Survey of Student Engagement (CCSSE) with information from the federal Integrated Postsecondary Education Data System (IPEDS) exposes data incongruency, specifically when considering the population of students with disabilities at 2-year institutions. Data from 503 CCSSE institutions were aggregated to calculate the average proportion of respondents who use services for students with disabilities, and then were compared to the percent of undergraduates who are formally registered with the institution's Office of Disability Services, as reported to IPEDS. Pearson correlation coefficients indicated statistically significant relationships, that are yet moderate in strength, between these measures of disability services use ($.274 < r < .331$), compared to strong correlations of measures of gender, race, and enrollment ($.618 < r < .955$). These effects indicate an incongruency between measures of disability, compared with other aspects of demography. Accounting for coverage of survey data using a multiple linear regression model did not improve convergence. These findings have implications both for institutional staff to triangulate their data to see if there is a need to review reporting procedures, and for higher education scholars who work with these data to understand the proportion of disabled students in the 2-year sector.

Keywords: students with disabilities, Community College Survey of Student Engagement (CCSSE), Integrated Postsecondary Education Data System (IPEDS)

The AIR Professional File, Spring 2024

Article 166

https://doi.org/10.34315/apf1662024

INTRODUCTION

Students with disabilities are prevalent in community colleges and deserve accurate reporting. According to the National Center for Educational Statistics (NCES), 19.4% of undergraduate students identify as having at least one disability; many of these students are concentrated at 2-year colleges (De Brey et al., 2021). In 2018 total undergraduate Fall enrollment at public 2-year institutions was 5,546,704, which represents 28% of all students enrolled in degree-granting postsecondary institutions. Using data from the National Longitudinal Transition Study-2 (NLTS2), Sanford et al. (2011) found that high school students with disabilities were most likely to enroll in "2-year or community colleges (44 percent) than in vocational, business, or technical schools (32 percent) or 4-year colleges or universities (19 percent)" (p. xv). Both this student population and this institution type represent substantial portions of the higher education landscape, yet remain understudied in scholarship (Madaus et al., 2021). Even measuring basic information, such as the size of the disabled student population on a college campus, can be difficult (Center for Student Success Research, 2020); in addition, measurements can vary greatly based on how instruments are designed to count this group (Van Noy et al., 2013). Because of the size of this population, correct measurement of students with disabilities in the 2-year sector is a relevant issue for both institutional researchers and academic scholars studying pathways to success for these students.

Measuring student disability in surveys can vary greatly between instruments. For example, the National Survey of Student Engagement asks respondents, "Do you have a disability or condition that impacts your learning, working, or living activities?" in line with the Americans with Disabilities Act (ADA) definition of disability (Zilvinskis et al., 2021).[1] Meanwhile, the National Postsecondary Student Aid Study (NPSAS, 2016) measures respondents' degree of disability or condition related to functions like walking, hearing, and concentrating. The current study aims to contribute to understandings of these students at these institutions by validating two common measures of disability, or rather student use of disability services, through data collected on the Community College Survey of Student Engagement (CCSSE) as well as information reported to the Integrated Postsecondary Education Data System (IPEDS). Accurate CCSSE reporting requires representative survey sampling among students who use disability services. On the other hand, accurate IPEDS reporting requires coordination between institutional reporters and disability service staff to count the number of students who have formally registered for accommodation.

Reporting an accurate proportion of disability students is important, because population size estimates may lead to reduced resource availability for institutions and a reduction in services for misidentified students. For example, institutions writing a Student Support Services Proposal for additional federal funding from the U.S. Department of Education need to begin their proposal with a section titled "Need for the Project." This section includes not only counts of students with disabilities, but also specific measures for improvement. Without accurate counts of these students, and therefore measurable benchmarks, these proposals, needs, and additional resource requests go underrealized.

Disability research has presented concerns regarding the validity of federal data collected

1 The ADA defines a person with a disability as a person who has a physical or mental impairment that substantially limits one or more major life activity

through the NPSAS by comparing these data to information collected in the NLTS2 (Leake, 2015). The current study contributes to this line of inquiry by using two cross-sectional large data sets to investigate the validity of disability measures. The current study realizes the recommendation posed by the Center for Student Success Research (2020) of "using multiple ways of understanding and representing disability is recommended, in order to provide more nuance and ultimately to better support students" (p. 1). In a recent systematic review of higher education literature from 1951 to 2017, Madaus et al. (2021) found only 113 articles on the topic of students with disabilities at community college. Of those few studies, only 11 used correlational research methods. This current study is important because it contributes to an under-researched, yet widely represented, sector of the academy.

The research questions that guided this study were as follows:

1| Is the aggregated institutional average use of disability services (measured on the CCSSE) statistically, significantly correlated with the federal percentage of formally registered students with disabilities (collected through IPEDS)? If so, what is the strength of these correlations compared with other aspects of demography such as gender, race, and enrollment?

2| When accounting for coverage of the CCSSE survey responses, does the strength of this relationship improve?

METHODS

Data used in the current study were drawn from institutions that participated in the 2017, 2018, or 2019 administration of the CCSSE. The original sample included 103,058 student survey responses from 584 2-year institutions. These data were merged with 2018 institution-level information from the IPEDS. Data were used with permission from the Center for Community College Student Engagement, *The Community College Survey of Student Engagement 2017–2019*, The University of Texas at Austin, funded through a research grant by the ACPA–College Student Educators International Foundation. Listwise deletion was used to remove individual respondents with missing data on the CCSSE measure of disability. Afterward, only institutions with at least 100 responses were retained for analysis to procure a representative subsample for the institutions, resulting in a sample of 96,985 respondents from 503 public community colleges. Student demography of the survey sample indicated 54% identified as women, 10% identified as Black or African American, and 30% were enrolled part time. IPEDS data indicated the average institution representation of women was 58%, of Black or African American students was 12%, and of part-time students was 62%.

INSTRUMENTS

The CCSSE has been demonstrated as a reliable measure of community college student engagement (McClenney & Marti, 2006; McCormick & McClenney, 2012). Furthermore, the instrument is representative of community college students as McClenney (2019) detailed: "Through 2017 the Center for Community College Student Engagement had surveyed more than 2.9 million students (representing a population

of 6.4 million) at 951 colleges in fifty states" (p. 88). However, as Kimball et al. (2016) distinguished in their assessment of research on students with disabilities, surveys on student engagement "are not nationally generalizable but . . . contain large samples of college students" (p. 126). The CCSSE (2024) was administered as a paper survey to randomly selected classes (credit courses only) at each participating college.

IPEDS (2018), "is an annual data collection distributed by the Postsecondary Branch of the National Center for Education Statistics (NCES), a non-partisan center within the Institute of Education Sciences under the U.S. Department of Education" (para. 2). IPEDS data include "postsecondary institutions that grant an associate's or higher degree and whose students are eligible to participate in Title IV federal financial aid programs" (De Brey et al., 2021, p. 215).

MEASURES

Disability service use is measured in two different ways on the instruments tested. On the CCSSE, respondents are asked, "How often have you used the following services during the academic year?" Student-level responses for use of disability services were aggregated to an institution average reflecting measures that were first liberal (at least one time per academic year), then conservative (two or more times per academic year). For the IPEDS data, the disability measure used was, "Percent of undergraduates who are formally registered as students with disabilities when percentage is more than 3 percent." These data were also recoded, first only with institutions reporting percentages more than 3% (a conservative estimate), then replacing missing institutional measures with an average value of 1.5% (a liberal estimate). "Use" and "registration" are not the same measures conceptually, an important discrepancy explored more below, and one that precludes this work from being a data quality paper, but instead leaves it as an investigation on data incongruency.

ANALYSIS

To answer the first research question, Pearson correlation coefficients were calculated to determine if there are statistically significant and practically significant relationships between CCSSE sample measures aggregated to the institution level and the reported IPEDS values from the institutions in the sample. When reviewing the scatterplots of the corresponding variables (e.g., the CCSSE aggregated value of part-time respondents with the IPEDS institution value of part-time students) the assumption of linearity was met considering the visual evidence of association (Lomax & Hahs-Vaughn, 2013). When interpreting the results, a conservative threshold for statistical significance was used ($p < .01$), while Cohen's (1988) interpretation of r as an effect size determined practical significance ($r = .1$ as trivial, $r = .3$ as moderate, and $r = .5$ as strong; also adopted in higher education research [Mayhew et al., 2016]).

To answer the second research question, a multiple linear regression model was built to measure the relationship between the liberal IPEDS measure of disability service use (dependent variable) with the conservative CCSSE sample measure and institutional coverage (number of CCSSE responses divided by the institution's total enrollment). This analytical approach used proportions as the dependent variable, which potentially led to range restriction. As an alternative, population counts

could have been estimated; this analytical approach is considered valid, however, considering the results for normality reported next. These two independent variables were combined to include an interaction effect, measuring the relationship between increases in CCSSE disability use with increases in coverage. To improve model fit, the initial regression was screened for cases with undue influence using Cook's distance, centered leverage value, and Mahalanobis distance measures. To assess threats to the statistical validity of this regression, tests for independence, homogeneity of variance, linearity, normality, and multicollinearity were also conducted.

RESULTS

When comparing the descriptive statistics between CCSSE and IPEDS measures of disability service use, the survey averages are higher than the federal reported values (see Table 1). The mean for the liberal calculation of disability service users among the CCSSE aggregated variable (students who used these services at least once per academic term) was 0.10(0.03), with a range of 0.02–0.25. These values indicate that, among the 503 community colleges in the CCSSE sample, the average institutional proportion of students using these services at least once was 10%, with one 2-year institution having only 2% of respondents meet this threshold, and another having 25% of respondents meet it. The same descriptive statistics were calculated for the conservative CCSSE estimate 0.06(0.03), the liberal IPEDS measure 0.03(0.02), and the conservative IPEDS measure 0.058(0.02).

The relationships between CCSSE and IPEDS measures of disability service use were weaker than other measures of demography. The calculated Pearson correlation coefficients between corresponding variables were positive and statistically significant ($p < .01$), rejecting the null hypothesis that there is no relationship between CCSSE aggregated values and IPEDS reported measures. Each of the four permutations of liberal or conservative, CCSSE or IPEDS, measures of disability service use were statistically significant; even the largest value between the conservative CCSSE measure and the liberal IPEDS measure was moderate in size ($r = .331$), however. When considering the practical significance of these relationships, the correlations for the corresponding variables measuring the share of female students ($r = .618$), the share of Black or African American students ($r = .955$), and the share of students enrolled on a part-time basis ($r = .699$) were strong in magnitude.

An initial multiple linear regression model was run to detect outlier cases exerting undue influence on the model (see Table 2). To measure the influence of outlying cases, no institution (case) held a Cook's distance or centered leverage value above its threshold (Lomax & Hahs-Vaughn, 2013); however, 12 cases had Mahalanobis distance measures greater than 13.28 ($p < .01$, $df = 4$) and were removed from the analysis. A review of the scatterplot between the dependent variable (liberal IPEDS measure of disability service use) and the independent variable (the conservative CCSSE sample measure) revealed a positive, linear relationship between these variables. This conclusion was further supported by the plotted unstandardized residuals and unstandardized predicted values having a mostly random grouping and a majority of values resided within |2|. When measuring distribution, the S-W test for normality ($SW = .91$, $p < .01$, $df = 503$) suggested that the sample distribution was statistically different from a normal distribution. However, this finding was

Table 1. Descriptive Statistics and Correlations for Study Variables

Variable	*M*	*SD*	Range	1	2	3	4	5	6	7	8	9
CCSSE aggregated variables												
1. Disability service users (liberal)[a]	0.10	0.03	0.02–0.25	–								
2. Disability service users (conservative)[b]	0.06	0.03	0.01–0.17	0.88*	–							
3. Female students	0.55	0.07	0.22–0.79	–0.09	–0.10	–						
4. Black or African American students	0.10	0.11	0.00–0.67	0.05	0.01	0.19	–					
5. Part-time students	0.29	0.10	0.04–0.5	–0.20*	–0.14*	0.15	0.05	–				
IPEDS values from institutions in sample												
6. Disability service users (liberal)[c]	0.03	0.02	0.02–0.14	0.27*	0.33*	–0.12*	–0.15*	0.08	–			
7. Disability service users (conservative)[d]	0.06	0.02	0.04–0.14	0.29*	0.31*	–0.09	–0.11	–0.10	1.00*	–		
8. Female students	0.58	0.05	0.33–0.70	–0.08	–0.08	0.62*	0.31*	0.10	–0.10	–0.07	–	
9. Black or African American students	0.12	0.12	0.00–0.73	0.02	0.00	0.17*	0.96*	0.09	–0.13*	–0.11	0.30*	–
10. Part-time students	0.62	0.12	0.21–0.87	–0.19*	–0.13*	0.09	–0.11	0.70*	–0.06	–0.13	0.01	–0.08

[a] Students who used disability services more than once per academic year. [b] Students who used disability services twice or more per academic year. [c] Institutions reported "3 percent or less" of students registered as students with disabilities recoded to 1.5%. [d] For IPEDS, institutions reported "3 percent or less" of students registered as students with disabilities coded as missing. *$p < .01$.

offset through examination of the distribution of the unstandardized residual; both the skewness (1.047) and kurtosis (1.076) values, along with the standardized DFBETA values for the independent variables, resided within acceptable parameters of |2|.

To test the assumption of independent errors, the Durbin-Watson statistic was calculated and its value of 2.08 indicated the model met this assumption. Returning to the scatterplots, the studentized residual was graphed with the unstandardized predicted value, along with each independent variable. Each plot displayed points that were mostly randomly distributed, indicating that the assumption of the homogeneity of variance was met. When evaluating multicollinearity of the model, the variance inflation factor (VIF) was calculated for each of the independent variables. The conservative CCSSE sample measure (VIF = 6.10) indicated noncollinearity for this measure; however, the institutional coverage (VIF = 10.63) suggested that multicollinearity could have been an issue in this model.

Results from the final multiple linear regression model indicate that two of the independent variables—(1) the CCSSE measure of disability use and (2) the interaction effect between this measure and coverage—can be considered to be statistically and significantly related to the liberal IPEDS measure of disability service (dependent variable). Variation within the dependent variable is significantly related to the independent variables in the model $F(3, 487) = 24.41$ ($p < .01$).

The unstandardized partial slope of the conservative CCSSE sample measure (.535) is significant, positive, and stronger compared to the strength of relation measured in the correlation analysis ($t = 5.24$, $df = 3$, $p < .01$); however, they are far from identical measures. The slope measure indicates that, as estimated by the regression model, if 100% of CCSSE respondents were to select and use disability services two or more times per year, the proportion of formally registered students with disabilities reported to IPEDS would be only 54%. Institutional coverage was not statistically significantly related to the dependent variable ($t = 1.29$, $df = 3$, $p = 0.20$).

Table 2. Regressions of Association between IPEDS Liberal Measure[a] of Disability Service Use and CCSSE Survey Data Coverage

Variable	*B*	*SE*	*t*	*p*	95% CI	VIF
CCSSE disability service users (liberal)[b]	0.53	0.10	5.24	0.00	[0.33, 0.74]	6.10
Coverage	0.23	0.18	1.29	0.20	[–0.12, 0.59]	10.63
Disability service use X Coverage	–6.21	2.65	–2.34	0.02	[–11.42, –1.00]	15.75
R^2	0.17					

Note: [a] Institutions reported "3 percent or less" of students registered as students with disabilities recoded to 1.5%. [b] Students who used disability services twice or more per academic year. VIF = variance inflation factor; CI = confidence interval.

The interaction effect between the conservative CCSSE sample measure and institutional coverage would be considered statistically significant only by using a lower threshold ($t = -2.34$, $df = 3$, $p = 0.02$). Considering that the final model included only 491 cases, a lower threshold could be considered (Mayhew et al., 2016). Accepting a more liberal level of significance ($p < .05$), the negative interaction effect indicates that, as both the proportion of CCSSE respondents reporting using disability services and the proportion of total enrollment completing the survey rise, the estimation of the liberal IPEDS measure of disability service falls. When evaluating practical significance, multiple R2 indicates that the final model explains only 17% of the variance in the dependent variable, suggesting a trivial effect (Cohen, 1988).

DISCUSSION

The purpose of this research is to test the relationship of disability measures between survey data and federal information among more than 500 public community colleges. For campuses with at least 100 respondents, the data from the CCSSE were aggregated to create an institution average and then correlated with values reported to IPEDS. Consistently, the measures of disability were higher on what was selected by students than on what was reported by institutional staff. The measures of gender, race, and enrollment were strongly correlated; the measures related to disability, however, were moderate in magnitude. The CCSSE is administered via a paper survey to randomly selected classes at 2-year institutions; therefore, there may be some concern that a disproportionally high number of students with a disability completed the survey. However, when measuring the interaction effect between the CCSSE disability measure and coverage of the responses, the relation between survey data and federal information weakened, disproving this concern. These findings are discussed through the constructs of research validity measures.

First, this study should be evaluated through the understanding of face validity. Straightforward in name, researchers using this construct to examine the face value of a study's design. This study is not research on disability per se; instead, it is a measure of disability service use and registration. Furthermore, the two data sources measure disability in critically different ways. On the CCSSE, students are asked how often they use disability services during the academic year. On IPEDS, however, institutional researchers report on the percentage of students formally registered as students with disabilities. Fundamentally, these are two different measures because students might use these services without formal registration, moving this study from an investigation measuring data quality to one measuring data incongruency. Central concerns regarding the face validity of this study may invalidate it to some. To others, this research highlights the difficulty of measuring the concept of identity among students.

Second, construct validity can be a useful way to understand and critique these findings. Researchers using this type of validity examine the degree to which the tools in the study accurately measure the phenomena the research is intended to investigate. The largest threat to the construct validity in this study is understanding the degree to which the survey respondents can accurately differentiate between services for students with disabilities and other campus services. For example, students may

receive tutoring supportive of disability identity; however, these tutoring opportunities may be provided out of a functional area that is different from disability services. An inability to distinguish between services may lead to overinflation of survey averages.

Third, this study can be evaluated through the understanding of convergent validity. Researchers using this construct examine the strength of relation between study measures. To gain perspective on the relationship under consideration, other measures of demography were correlated between the survey and federal data. These correlations were strong, particularly when comparing the proportion of survey respondents who identify as Black or African American to the percentage of this population reported by each institution (r = .955). The measure of service use or accommodations is fundamentally different from measure of identity related to gender, race, and enrollment, which could be a reason for the lack of convergence among disability proportions between the data sets. This finding strengthens the premise that these two measures and their data sources are comparable, although their different definitions preclude them from the same measure of data quality and instead serve only as a way to explore data incongruency.

Fourth, discriminant validity can be a useful way to understand how to underline the importance of this study. As an antithesis of convergent validity, this type of validity is used by researchers to demonstrate the ways that measures diverge from each other. As proven by the correlation analysis, the relationship between the CCSSE survey data and the IPEDS federal data was moderate in strength and did not improve when accounting for coverage among survey samples. This middling correlation presents concerns that can inform both survey design and the uses of disability data by scholars, and federal reporting practice. While constructs of validity can be helpful in interpreting results, they offer conflicting findings of the usefulness of these results.

Implications for Practice

This study explores the ways disability is measured on the CCSSE and through IPEDS, and has implications for how institutional researchers and scholars interact with these data. For institutional researchers, the lack of convergence among these data suggests incongruency between measures. Of the 503 institutions included in this study, only 203 provided a value for the prompt, "percent of undergraduates who are formally registered as students with disabilities when percentage is more than 3 percent." Of the 300 institutions that did not report a value, 251 had aggregated CCSSE averages of at least 4% of respondents reporting using disability services two or more times per year. Even more concerning, 71 of the community colleges had at least 8% of respondents in this group, which is more than double the limit for not reporting a value. For the NCES, which is interested in ensuring ADA compliance, these margins of difference are concerning even with the issues of face validity and construct validity described earlier.

For scholars, the CCSSE measure is limited, and "this item does not measure the other two components of this model[: neither] (a) the person nor (b) the person's impairment" (Zilvinskis, 2020, p. 258). For scholars who are trying to understand pathways of success for students with disabilities, using survey items in which respondents can self-identify and provide more information about their disability

would enhance the usefulness of this information; in other words, the experiences of students with different types of disabilities, from physical to psychological, are different. Similarly, IPEDS data do not provide disability differentiation (Cox et al., 2020). For scholars, the moderate correlation found here cautions those who aggregate survey data for multilevel modeling because survey measures might not provide proper institution-level averages for disability. This issue becomes particularly problematic when researchers use the measures of "Use" and "Registration" interchangeably without considering how those measures differ qualitatively.

Broadly, these findings challenge if either of these instruments accurately measure disability among students. Policymakers should use more-comprehensive definitions of disability, since many students with disabilities do not register on campus. In a longitudinal study of high school students with disabilities transitioning to a higher-education institution, Newman and Madaus (2015) found that only 35% of those students will register with their disability services offices, meaning that a majority of students with disabilities are rendered invisible with these two measures.

Limitations

Along with the issues explored above through face validity and construct validity, there are a few other considerations influencing the accuracy of this study. First, as argued by Cox and Nachman (2020), because the format of the CCSSE is "eight pages long with over 115 bubbles to fill in," it might be difficult for some students with disabilities to complete it, thus suppressing the participation among this population (p. 244). Another source of suppression may exist within the exclusion of high school students in the CCSSE. If CCSSE excludes high schoolers but IPEDS includes high school students among the calculation of percentage of undergraduate students, that could impact the ability to translate one to the other. If suppression is occurring, then the difference between survey responses and IPEDS information may be even greater than recorded here.

Second, there is some additional misalignment between CCSSE and IPEDS measures beyond those related to disability measures. For example, on the survey, respondents are provided the stem, "Your gender identity:" with the options "Man," "Woman," "Other," and "I prefer not to respond," whereas the data reported to IPEDS are, "The percent of total enrollment that are women." This misalignment may diminish the strength of correlation of the other aspects of identity considered in this study.

Third, CCSSE institutions self-select to administer the survey, which presents another misalignment: the difference in part-time students in the CCSSE sample versus IPEDS (0.29 vs. 0.62), which is probably related to survey administration, and which is much more likely to capture full-time student responses in class than part-time ones. Although quite a few institutions were included in this study (503), there are more than 3,000 2-year institutions, thus articulating the distinction offered earlier by Kimball et al. (2016). This research explored a large survey sample, but it is not necessarily a nationally generalizable study.

CONCLUSION

The focus of this study is to understand the ways data incongruency may influence the ability to identify underserved students, thereby hindering goals to create equitable opportunities. This research can inform the ways higher education professionals leverage data to understand the size of the population of students with disabilities and improve their success. These inequitable power structures of data collection can further marginalize disabled students. A central issue in research on students with disabilities is that identifying these students can be difficult and educators cannot improve outcomes for students they cannot see (metaphor intended).

REFERENCES

Center for Student Success Research. (2020). *How many students with disabilities are there? Measuring disability on college campuses.* (Report No. CSSR 2020-102).

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Erlbaum.

Community College Survey of Student Engagement (CCSSE). (2024). *Frequently asked questions*. https://www.ccsse.org/aboutccsse/aboutfaqs.cfm

Cox, B. E., & Nachman, B. R. (2020). Five principles to improve quantitative research and assessment about college students with disabilities. *Journal of Postsecondary Education and Disability, 33*(3), 241–247.

Cox, B. E., Nachman, B. R., Thompson, K., Dawson, S., Edelstein, J. A., & Breeden, C. (2020). An exploration of actionable insights regarding college students with Autism: A review of the literature. *The Review of Higher Education, 43*(4), 935–966. https://doi.org/10.1353/rhe.2020.0026

De Brey, C., Snyder, T.D., Zhang, A., and Dillow, S.A. (2021). *Digest of Education Statistics 2019* (NCES 2021-009). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.

Integrated Postsecondary Education Data System (IPEDS). (2018). *Data collection & release procedures*. https://nces.ed.gov/ipeds/resource/download/IPEDS_DataReleaseProcedures.pdf

Kimball, E. W., Wells, R. S., Ostiguy, B. J., Manly, C. A., & Lauterbach, A. A. (2016). Students with disabilities in higher education: A review of the literature and an agenda for future research. In M. B. Paulsen (Ed.), *Higher education: Handbook of theory and research* (Vol. 31, pp. 91–156). Springer International.

Leake, D. (2015). Problematic data on how many students in postsecondary education have a disability. *Journal of Postsecondary Education and Disability, 28*(1), 73–87.

Lomax, R. G., & Hahs-Vaughn, D. L. (2013). *An introduction to statistical concepts*. Routledge.

Madaus, J. W., Gelbar, N. W., Dukes III, L. L., Faggella-Luby, M. N., Glavey, E., & Romualdo, A. (2021). Students with disabilities in the community college professional literature: A systematic review. *Community College Journal of Research and Practice, 45*(1), 31–40. https://doi.org/10.1080/10668926.2019.1639568

Mayhew, M. J., Rockenbach, A. N., Bowman, N. A., Seifert, T. A., & Wolniak, G. C. (2016). *How college affects students: 21st century evidence that higher education works*. Wiley.

McClenney, K. M. (2019). Guided pathways to college completion and equity. In T. O'Banion (Ed.), *13 ideas that are transforming the community college world* (pp. 85–103). Rowman & Littlefield.

McClenney, K. M., & Marti, C. N. (2006). *Exploring relationships between student engagement and student outcomes in community colleges: report on validation research* [Working paper]. Community College Survey of Student Engagement, Community College Leadership Program, University of Texas at Austin. https://eric.ed.gov/?id=ED529075

McCormick, A. C., & McClenney, K. (2012). Will these trees *ever* bear fruit? A response to the special issue on student engagement. *Review of Higher Education, 35*(2), 307–333. https://doi.org/10.1353/rhe.2012.0010

National Postsecondary Student Aid Study (NPSAS). (2016). National Center for Education Statistics PowerStats. https://nces.ed.gov/datalab/codebooks/by-variable-name/121-national-postsecondary-student-aid-study-2016-undergraduates

Newman, L. A., & Madaus, J. W. (2015). Reported accommodations and supports provided to secondary and postsecondary students with disabilities: National perspective. *Career Development and Transition for Exceptional Individuals, 38*(3), 173–181. https://doi.org/10.1177/2165143413518235

Sanford, C., Newman, L., Wagner, M., Cameto, R., Knokey, A. M., & Shaver, D. (2011). *The post-high school outcomes of young adults with disabilities up to 8 years after high school. A report from the National Longitudinal Transition Study-2* (NLTS2). SRI International.

Van Noy, M., Heidkamp, M., & Kaltz, C. (2013). How are community colleges serving the needs of older students with disabilities? *Issue Brief,* NTAR Leadership Center. https://www.dol.gov/sites/dolgov/files/odep/pdf/communitycollegesolderstudents.pdf

Zilvinskis, J. (2020). Using large survey data to understand the engagement of students with disabilities. *Journal of Postsecondary Education and Disability, 33*(3), 255–261.

Zilvinskis, J., Brown. K., & Holmes, B. (2021). The importance of outside expertise: Updating the NSSE disability items. *NSSE Sightings* (blog), May 6, 2021. https://nsse.indiana.edu/research/blog/2021/2021-05-06-the-importance-of-outside-expertise-updating-the-nsse-disability-items.html

Will Fit Work Here? Using Multiple Data Sources to Adapt a Student–Institution Fit Instrument to a New Institutional Context

Steven S. Graunke

About the Author

Steven Graunke is with the Office of Research and Analytics within Enrollment Management and Student Success at Miami University.

Acknowledgement

Portions of this article were presented at the 2022 Association for Institutional Research (AIR) Annual Forum, Phoenix, Arizona.

Abstract

Several authors (Bowman & Denson, 2014; Gilbreath et al., 2011) have claimed that measures of fit between a student and the institution they are attending should be useful for institutional decision-making. These student–institution fit instruments were originally developed for research with specific student populations in one institution, but have not been assessed at other institutions. Institutional research offices rarely assess surveys or other instruments that are developed at one institution to determine whether those same instruments would provide results that are reliable and valid in different institutional contexts. The purpose of this study was to determine if the factor structure of a measure of student–institution fit would be appropriate to use at another institution. A survey that included a student–institution fit instrument developed by Gilbreath et al. (2011) was administered to a random sample of first-year students and new external transfers at a large, public university in the Midwest. Confirmatory factor analysis was used to determine if the underlying factor structure in the original instrument provides an appropriate fit for data obtained from a new sample. In addition, open-ended comments were collected to gain insight into students' interpretation of each item. The results suggested changes from the original scale to create a more robust measure. Specifically, Great Support Services was moved from the Social Environment fit to the Academic Environment fit, and covariances between multiple items were integrated. Similar methods could be used by institutional researchers at other institutions to gather data on students' interpretation of survey items, to evaluate the underlying factor structure of external instruments, and to create appropriate modifications to account for their own institutional contexts.

The AIR Professional File, Spring 2024

Article 167

https://doi.org/10.34315/apf1672024

INTRODUCTION

Student–institution fit might be one data point in a broad array that could be used to determine a student's propensity to enroll at a university, to remain enrolled, and, eventually, to graduate. Care needs to be taken, however, when using instruments developed for basic, scholarly research at one institution before using those instruments to inform decision-making at another. The Association for Institutional Research's (AIR) Statement of Aspirational Practice for Institutional Research (AIR, 2016) advises institutional research (IR) professionals to ground their initiatives within a student-focused paradigm (Swing & Ross, 2016). If IR professionals are to adopt a new, validated instrument for the student population at their institution, it is important for them to understand whether that instrument will yield the data intended; if not, it is important for them to make appropriate adjustments to the instrument.

The purpose of this study was to determine if the factor structure of a measure of student–institution fit would be appropriate to use at another institution. In framing this analysis, however, the author hopes to outline procedures that IR professionals can use to assess the validity of an instrument for use with their students, and to make changes and adapt an instrument to their own institutional context. The procedure included confirmatory factor analysis (CFA) to assess if the factor structure discovered by previous researchers matched the data collected, the use of modification indices to identify potential changes, and the qualitative data collected directly from students to determine if changes suggested by quantitative data analysis could be triangulated using students' perspectives.

The article begins with a literature review highlighting institutional research and retention studies, and fit as a psychological construct. Next, the article describes the methods used, including data and data sources; survey procedures, sample, and respondents; and analytical techniques. The article continues with a description of the results and how results were used. Finally, the article concludes with a discussion of how institutional researchers can use similar procedures at their institutions.

LITERATURE REVIEW

Institutional Research and Retention Studies

Identifying which student behaviors, attitudes, or characteristics are associated with retention and degree completion has long been an area of interest for higher education researchers, dating back to at least the 1920s (Summerskill, 1962). Today, federal and state governments, as well as numerous nonprofit organizations, have endorsed a wide variety of initiatives designed to encourage institutions to improve retention and graduation rates. Bold college completion goals cannot be attained, however, if students leave higher education before earning their degree. According to Gardner (2022), about 66% of students who began college in the Fall of 2020 were still enrolled in their original institution in the Fall of 2021, and 75% were enrolled in any institution.

Increasingly, institutional researchers have begun to use predictive analytics to address challenges in student retention. Zheng and Zhou (2020) described a project in which East Carolina University partnered with IBM to integrate demographic information; high school academic performance;

and information from student applications, financial aid data, and first semester performance to identify students who were at risk of leaving the institution. Likewise, Renick (2020) discussed a program at Georgia State University in which registration behaviors, attendance, early course grades, grades in prerequisite courses, and other factors were used to flag students in need of additional interventions from academic advising. Such approaches have been criticized, most often for the ways in which predictive algorithms can unintentionally reinforce existing structural inequities (O'Neil, 2016; Zheng and Zhou, 2020). Also, Howard and Borland (2007) suggested that using data from a variety of different sources could help institutional researchers not only illuminate trends, but also better understand why those trends are occurring. For example, Borden et al. (2021) described a process they call the Insight Engine, in which results from machine learning research are triangulated using both qualitative and quantitative data from surveys and administrative records. Drawing data from university surveys could still be used to supplement or validate findings from predictive analytics and to identify students who might benefit from potential intervention.

While drafting original surveys to examine problems unique to a campus might be preferable, finding a survey that has already been validated can lend credibility to a research project. Suskie (1996) suggested that using surveys developed at another university could save IR professionals time by asking others for permission to use their instruments or adapting other professionals' instruments to a new context.

Fit as a Psychological Construct

Existing research on factors impacting retention and success suggests that psychological factors, including student–institution fit, could enhance the performance of models designed to predict Fall-to-Fall retention. Bean and Eaton (2000, 2001) particularly advocated for the integration of psychological constructs into retention models. Specifically, academic and social integration would lead the student to feel as if there were a fit between them and the institution. This sense of fit, along with a sense of organizational commitment, could foster an intent to persist, which would guide subsequent persistence behaviors.

Person–environment fit refers to the degree of match between an individual and the environment within an organization (Ostroff & Schulte, 2007). One conceptualization of person–environment fit, referred to as needs–supplies fit, explores the extent to which the environment provides something that an individual is lacking (Edwards & Ship, 2007): "needs" refers to personal strains caused by certain internal conditions or external situations, and "supplies" refers to the extent to which an environment supplies or meets someone's self-described needs (Gilbreath et al., 2011). For the purposes of this study, "fit" will be defined as the difference between students' self-reported needs and students' perceptions of the degree to which an organization meets those needs (i.e., supplies). Student–institution fit would therefore be defined as the fit between the student and their current higher education institution.

Conyne (1975, 1978) approached lack of student–institution fit as a source of stress to be addressed in college counseling centers. He advocated for students' needs to be examined in relation to how well the institution provides for those needs (Conyne, 1978). Conyne further advocated that counselors work with faculty and administrators to identify and address areas where students' needs are not being met.

Gilbreath et al. (2011) revived Coyne's conceptualization of fit when they proposed a student–institution fit instrument that could be used to identify, target, and recruit students who display high levels of fit with an institution. That instrument (i.e., questionnaire) was designed to assess the extent to which students' needs are met by the environment of their institution (supplies) (Edwards & Ship, 2007). A series of focus groups with students, academic advisors, and counselors in campus mental health centers provided the information needed to develop a 16-item instrument that measured the extent to which the supplies of an institution's social, academic, and physical environment met students' needs.

The social environment encompassed a wide variety of experiences, including social life, academic reputation, and diversity. The Academic Environment scale included the intellectual climate of the campus, availability of academic resources, and size of the university. The broadest scale in this instrument was the Physical Environment scale, which included items on campus location, aesthetics, and affordability. The Gilbreath et al. (2011) instrument asked students to rate the importance of various aspects of the social, academic, and physical environment and the degree to which their current institution satisfied their needs within these aspects, thus yielding a measure of both student's self-reported needs and their perceptions of the extent to which the supplies of the institution fulfill these needs. The final instrument produced six scales, which included Academic Environment needs and supplies scale, Social Environment needs and supplies scale, and Physical Environment needs and supplies scale.

Using polynomial regression analysis, Gilbreath et al. (2011) found that satisfaction with the university increased as students' perceptions of supplies provided by the university rose toward students' reported needs. In other words, as the degree to which the university met students' needs increased, student satisfaction also increased. Satisfaction increased at a lower rate as supplies along the academic and physical environment exceeded students' needs. All coefficients were statistically significant at $p < 0.01$. However, psychological well-being increased at a much greater rate as supplies along the physical environment exceeded students' needs.

According to Gilbreath et al. (2011), student–institutional fit instruments could be used to identify, target, and recruit students who are likely to find high levels of fit at an institution. Identifying students who are likely to have high levels of fit will increase retention rates, because students with high levels of fit would be more likely to persist and ultimately earn a degree. Similarly, Bowman and Denson (2014) advocate that student–institution fit instruments could be used as part of an early warning system: students demonstrating low levels of fit could be directed to appropriate interventions, thus decreasing the risk of departure. Before these instruments are used by institutions for these purposes, however, it is important to first consider whether the instruments can be used in ways other than how they have been originally developed.

One reason for further investigation of the Gilbreath et al. (2011) instrument is because of the relatively low levels of reliability obtained from the scales described in their original research. Cortina (1993) advised that an acceptable level for alpha (α) be based on the intended use of the scale. Both the Physical Environment needs ($\alpha = 0.54$) and Physical Environment supplies ($\alpha = 0.62$) scales had particularly low reliability estimates, which would suggest the need for additional evidence of fit. In

addition, the proposed Physical Environment fit scale included a diverse set of items covering campus aesthetics, safety, and affordability that might not be appropriate to combine in a different institutional context. While Gilbreath et al. may have deemed these to be acceptable levels of internal consistency for research purposes, a more reliable instrument would be preferred if these scales are to be used for institutional decision-making.

Second, even if sufficient evidence of internal consistency were demonstrated, evidence should be provided that the instrument is usable for its intended purpose. Messick (1995) suggested that, if an instrument is to claim construct validity, then the researcher must provide evidence that the instrument is valid for its intended use. Gilbreath et al. (2011) derived their scales almost entirely using data from the campus at which their study was originally conducted. While the survey is likely appropriate for that institution, further evidence would be needed to determine whether these same scales are valid at another university.

Finally, bringing qualitative data to supplement the findings of quantitative studies can provide additional insight into the validity of data. For example, Borden and Jin (2022) highlighted how the Insight Engine at one university combined advanced analytics, expert panels, and qualitative data to investigate strategies for closing achievement gaps in high-value courses. Triangulation of data from a variety of sources enabled faculty and staff to redesign existing training programs, develop support for students in Promise Scholarship programs, and assess the effectiveness of K–12 initiatives at the program level. A similar process involving triangulation of data from quantitative and qualitative sources could also be used to refine a survey for a new student population.

Faculty and staff at one large, public, urban university in the Midwest believed that the Gilbreath et al. (2011) instrument could be useful for identifying students who might be at risk of leaving the institution. Nonetheless, concerns about the appropriateness of this instrument suggested a need for further exploration. IR offices rarely assess survey instruments developed at other institutions to determine whether those same instruments are appropriate for their institutional context.

The purpose of this study was to determine if the student–institution fit measure developed by Gilbreath et al. (2011) fit the data obtained from students at this target university. Traditional methods, including CFA, were used to determine whether the original underlying factor structure was appropriate for different data that were obtained in a new administration of the survey. Results from the CFA were supplemented with qualitative data in the form of comments from students' interpretations of items from the student–institution fit instrument. This study could be used as an exemplar of the types of analyses that institutional researchers could use at their own institution to determine the appropriateness of a survey instrument for the student population at a different institution.

METHODS

These analyses used data obtained from a survey conducted as part of an exploratory study to identify the characteristics of students who felt a lack of fit with their university. Bowman and Denson (2014) advised that universities could use student–institution fit instruments to identify students in need of specific interventions, or to determine the characteristics of prospective students who could experience better fit with a university to inform

admissions decisions. Institutional researchers and student affairs professionals had planned to use these data to inform subsequent interventions designed to better meet students' needs.

Data and Data Sources

STUDENT–INSTITUTION FIT INSTRUMENT

The survey was adapted from the instrument used in Gilbreath et al.'s (2011) initial investigation of student–institution fit. The Gilbreath et al. instrument was conceptualized using the needs–supplies perspective first advocated by Conyne (1978) as an appropriate lens to conceptualize student–institution fit. This survey was selected because it was originally developed at an institution where undergraduate students primarily do not live on campus, similar to the population at the institution used in this analysis. First, the respondents were presented with 16 items and asked to rate the university on a seven-point scale (1 = Not at all, 7 = Very much) by answering the question, "How important are the following to you?" Respondents were then presented with the same 16 items and asked to rate the university on a similar seven-point scale (1 = Not at all, 7 = Very much) by answering the question, "To what degree does [your institution] do the following?" For these analyses, fit was calculated as the absolute value of the respondents' needs rating minus the respondents' supplies rating. Fit was evaluated along three dimensions: (1) Academic Environment fit, (2) Social Environment fit, and (3) Physical Environment fit. The proposed Academic Environment fit scale consisted of items that corresponded broadly with students' perceptions of the formal educational structures within the institution. Items ranged from abstract aspects of the academic environment, such as academic climate and reputation, to more-concrete features such as state-of-the-art classrooms and size of the institution. Conversely, the proposed Social Environment fit was concerned with aspects of the institution that were less overtly academic, such as social life, athletics, and student support services. Finally, the Physical Environment fit dimension consisted of items related to the material space of the institution, such as location and campus layout. In the Gilbreath et al. study, this factor also included an item called "Great affordability."

Exploratory factor analysis (EFA) conducted by Gilbreath et al. (2011) found that these 16 items (four Academic Environment items, seven Social Environment items, and five Physical Environment items) aligned with the three proposed factors of fit with the academic environment, social environment, and physical environment. A complete list of the items, as well as the factors with which each item was aligned in the initial study, is available in Appendix A.

ADDITIONAL SURVEY QUESTIONS

A series of open-ended items that asked respondents to provide their interpretation of each item were added to the end of this survey. The open-ended items were originally included for the purposes of internal survey development. Specifically, students were prompted, "In order to improve this survey for future administrations, we would like to know a little bit more about what you thought of the items. Please describe how you would define each of the following." The students' responses to this item were especially useful in understanding modification indices in the analysis. The full survey is available from the author upon request.

Survey Procedures, Sample, and Respondents

The initial survey was sent to 3,000 new bachelor's degree–seeking students three weeks after the beginning of classes. This period was selected because evidence from Woosley & Miller (2009) suggested that early experiences could influence Fall-to-Fall retention. Reminder emails were sent one, two, and three weeks following the initial survey distribution.

The random sample for this survey was drawn from students who were starting at a large, urban, public university in the Midwest at the beginning of the Fall semester. There were 3,622 first-year students and 1,296 new external transfers who were beginning at that institution (Institutional Research and Decision Support, 2015). From that group, a random sample of 3,000 new bachelor's degree–seeking first-year students and new transfers were selected to participate in this survey. Per Institutional Review Board guidelines, only students who were 18 years of age or older were selected. Of the students in the original random sample, emails to 14 students were returned as undeliverable, bringing the adjusted sample size to 2,986. A total of 414 students completed the survey for an overall response rate of 13.9%. Of those 414 students, 351 had completed all fit items and the responses were therefore deemed useable for this study. The sample was then halved, with 176 responses used for CFA, and the remaining 175 responses used to assess the factors derived. Tanaka (1987) advocates that a ratio of five observations per parameter to be estimated would be appropriate for structural equation models using maximum likelihood estimation. Given that 32 parameters are to be freely estimated in the CFA model to answer, the total of 175 survey respondents per analysis should be sufficient.

A comparison between the full survey population and respondents using data points retrieved from the Student Information System can be found in Tables 1 and 2. A slightly larger percentage of full-time students responded to the survey compared to the percentage of full-time students in the initial sample: 95% of respondents were full-time students compared to 91% of students in the survey sample. A t-test of fit scores revealed only one statistically significant difference in response patterns between full-time and part-time students. Specifically, part-time students were significantly more likely to experience a greater degree of misfit when asked whether their current or their ideal university had a "great student body" ($t = 3.87$, $p = 0.049$). Given the small number of part-time students who responded to this item ($n = 15$ part-time students) and the relatively small effect size ($\varphi = 0.041$), it is possible that this result is not a true effect (Button et al., 2013). No adjustments based on enrollment status were deemed necessary.

Respondents also had a significantly higher mean high school GPA and earned a higher mean GPA in their first Fall semester than nonrespondents. However, a similar difference was not noted with regard to transfer GPA. Respondents did have a significantly higher GPA in their first Fall semester than all students in the initial sample, however.

Analytical Techniques

CFA is the most appropriate method for determining model fit. CFA is a data reduction technique in which the relationships between the underlying latent constructs and the observed variables are specified in advance (Bollen, 1989). This technique differs from the EFA procedure in that EFA models determine the nature of the underlying structure of the data. To put the difference more succinctly, in

Table 1. Differences in academic characteristics between full sample and survey respondents

	Full Sample	Respondents
Admit Type		
First-year students	74.8%	73.2%
External transfer	25.2%	26.8%
Enrollment status [a] *		
Full time (12 hours or more)	91.3%	95.4%
Part time (less than 12 hours)	8.7%	4.6%
Received Pell Grant	40.6%	39.3%
Did not file a FAFSA	12.4%	10.0%

Source: All data were obtained from Indiana University Student Information System student enrollment and financial aid records.

Note: [a] As of August 31, 2015.
* Chi-square test revealed statistically significant difference between respondents and total population at $\alpha < 0.05$.
FAFSA is the Free Application for Federal Student Aid.

Table 2. Differences in means between full sample and survey respondents*

	Full Sample		Respondents	
	N	Mean	N	Mean
Age [a]	4,845	19.7	351	20.0
High School GPA [b] *	4,235	3.36	306	3.45
Transfer GPA [c]	1,109	2.93	83	3.01
Fall Semester GPA*	4,748	2.80	350	3.03

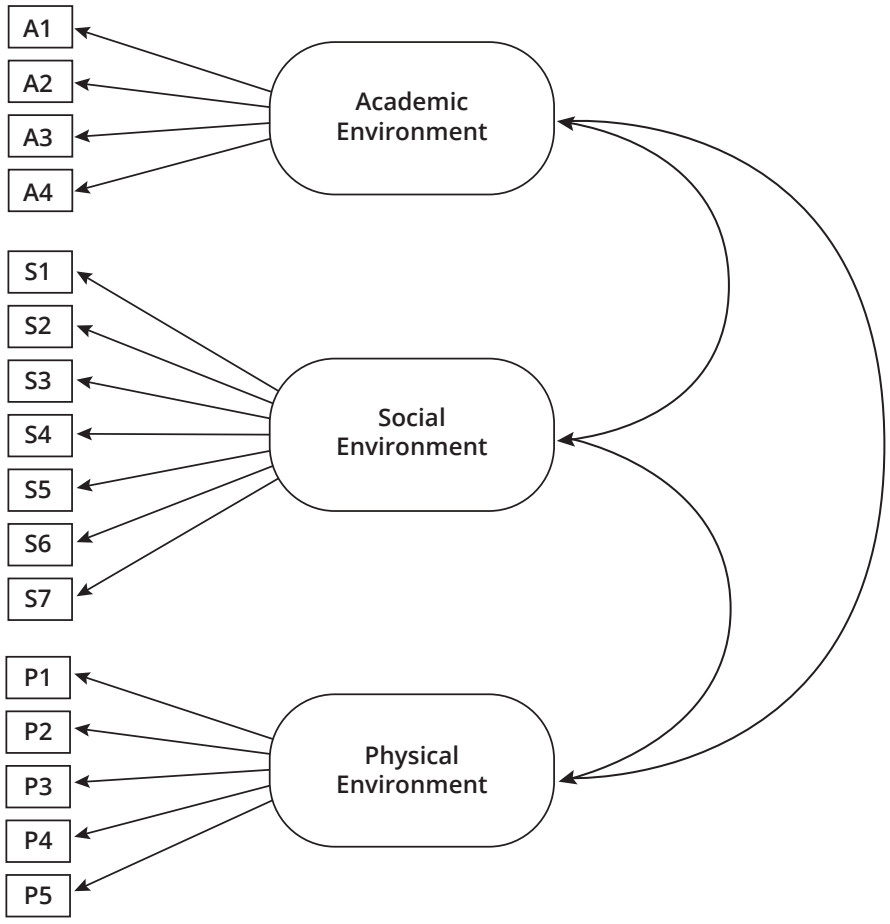
Source: All data were obtained from Indiana University Student Information System student enrollment and financial aid records.

Note: [a] As of August 31, 2015.
[b] Of students for whom high school GPA is available. External transfer students are not required to submit high school GPA for admission to Indiana University–Purdue University Indianapolis (IUPUI).
[c] Transfer students only, based on courses from previous institutions that had been reviewed and processed as of March 1, 2017. Additional transfer credits may have been processed since.
* Independent samples t-test revealed statistically significant difference between respondents and total population at $\alpha < 0.05$.

CFA you start with an underlying structure and see if it fits, whereas in EFA you begin with no underlying structure and try to find one. Gilbreath et al. (2011) used principal axis factor analysis, an EFA procedure that uses shared variance along the correlation matrix, to specify a three-factor model for their data. Gilbreath et al. do not provide much detail on their exploratory model, however. For example, they fail to specify which, if any, rotational method was used to determine appropriate factor loadings for each of the three factors. Examining the underlying three-factor structure proposed by Gilbreath et al. first would be crucial to determine if this structure provides an appropriate fit for data obtained from another institution.

Figure 1 displays the relationships between variables on the student–institution fit instrument as they were initially proposed by Gilbreath et al. (2011). This model formed the basis for the CFA procedure. The three-factor structure consists of a four-item Academic Environment factor, a seven-item Social Environment factor, and a five-item Physical Environment factor. Correspondence between

Figure 1. Proposed Model of Institutional Fit for Question 1



Source: Adapted from Gilbreath et al., 2011.

specific items from the student–institution fit instrument and labels can be found in Appendix A. One factor loading in each model was set to 1.0 so that the model would be appropriately scaled. The proposed model has 16 observed variables and 32 freely estimated parameters. The model therefore is identified as it meets both the t-rule (32 < (16) (16 + 1)) and the three-factor rule for identification (Bollen, 1989).

Three fit indices were used to determine if the proposed model is appropriate for the data. The chi-square test for model fit examines the extent to which the observed sample covariance matrix differs from the restricted covariance matrix (Byrne, 2012). A small value for the chi-square statistic indicates a more perfect match between the two matrices. Therefore, a low value for the chi-square statistic means both that we will accept the null hypothesis and that the model fits the data. Although it is an appropriate statistical test, the chi-square statistic may be easily influenced by sample size and may be overly sensitive to misspecification in the model (Bollen, 1989). The sensitivity of the chi-square statistic is not the only issue. Specifically, the American Statistical Association issued a series of principles regarding the use of p-values, such as those produced by the chi-square goodness-of-fit test (Wasserstein & Lazar, 2016). Among the principles is that conclusions should not be based solely on p-values, and that p-values alone may not be sufficient evidence to reject or accept a null hypothesis. The Mplus statistical package offers additional fit indices to supplement the chi-square test, thus making it an appropriate software to use for these analyses (Byrne, 2012). The standardized root mean squared residual (SRMR) and root mean square error of approximation (RMSEA) were also considered. Different cutoff criteria are recommended for different fit indices based on sample size or estimation methods (Hu & Bentler, 1995). Per the recommendations of Hu and Bentler (1999), a cutoff value of less than 0.08 for SRMR and less than 0.06 for RMSEA would suggest good model fit.

When results from the CFA did not meet the cutoff criteria, modification indices were used to determine if changes in model specification could lead to a better-fitting model. The modification indices, also referred to as the univariate Lagrangian Multiplier test, assesses which specific changes to the specification of the model will lead to the largest decrease in the chi-square statistic (Bollen, 1989). This study generally used the technique described as most common by Bollen, in which the researcher selects the changes that will lead to the greatest reduction in the chi-square statistic. This process is repeated until the model meets the predefined fit criteria.

In addition, the definitions provided by respondents through open-ended survey items yielded additional contextual information that was helpful in justifying modifications. Specifically, students were asked to describe how they would define each item. Each individual comment was collected from the survey instrument and coded for specific emergent themes, using the procedure for examining qualitative data described by Creswell (2014, chap. 9). When results from modification indices suggested potential changes, individual comments were used to determine if suggested modifications were consistent with students' definitions of the items. No further modifications were made after the model demonstrated an adequate level of fit, which reduced the chances of over-specification resulting from nuances in sample data (MacCallum et al., 1992). Cronbach's alpha was also calculated for reconfigured scales in the path analysis model

sample to provide further evidence that changes in the structure of the model were not overly influenced by chance from the limited sample size (MacCallum et al., 1992).

RESULTS

To conduct the following analyses, fit scores were calculated based on the absolute value of the difference between needs and supplies. Means therefore represent the difference between respondents' ideal university and their perceptions of their current university. A total of 175 responses were used to conduct a CFA to assess whether the factor structure described by Gilbreath et al. (2011) matches the survey data obtained from the collected sample. The model assessed in the first analysis is detailed in Figure 1. Table 3 provides all fit statistics used in this analysis. The chi-square test was statistically significant ($\chi 2 = 212.70$, df = 101, $p < 0.01$), suggesting that the data did not fit the specified model. The RMSEA estimate of 0.079 was above the advised cut point of 0.06, which also hinted at a low level of model fit. The SRMR result (0.070), however, was below the advised cut point of 0.08.

The comprehensive results did not provide sufficient evidence that the factor structure proposed by Gilbreath et al. (2011) is an appropriate fit for the data obtained. Modification indices suggest four changes that would be consistent with theoretical assumptions: The largest assumption would be to move Great Support Services fit from the Gilbreath et al. suggested loading with Social Environment fit to Academic Environment fit. Illustrative responses to the open-ended item asking students to indicate their personal meaning of Great Support Services can be found in Table 4. Several respondents

Table 3. Fit statistics for models using the survey

		Value
Gilbreath et al. (2011) model	Chi-square test of model fit	212.70 Df = 101
	RMSEA	0.079 90% CI: 0.065 – 0.094
	SRMR	0.070
Revised Model	Chi-square test of model fit	156.56 Df = 98
	RMSEA	0.058 90% CI: 0.041 – 0.075
	SRMR	0.064

Table 4. Selected comments illustrating students' definitions of Great Support Services

"Knowledgeable staff, and a good Tutor–Student ratio."

"Staff members who are always there when a student is in need."

"You have someone to turn to for help"

"Having resources if you need help with college or personal life"

"Easy access to help over any topic a student is struggling with that can help the student efficiently"

"MAC, programs"

"any type of mentors available"

"Talking with my advisor"

"available and well knowledge tutors"

"I thought of things specific to the transfer process"

"Accessible tutoring, counselling, etc."

"Effective counseling for students struggling in classes or coping with mental illnesses"

"academic counseling"

"Disability Services"

"Multiple free support services that are helpful to any and all students."

"helpful counseling, tutoring, health care, social services"

"advising sessions"

"the fact that i wasn't even assigned a specific counselor nor do i ever hear from any of the advisors about my major and/or classes really irritates me because i have no idea who to email when i have questions"

"There are plenty of opportunities to get help with your studies or classes"

"MAC, consolers [*sic*], etc."

"there is a good writing center to help international students or even local students with english writing"

"Great. Many resources (tutors, learning center, etc.) however needs more for engineering programming classes."

"Helpful study centers/tutors"

[a] Question worded as follows: "Please indicate how you would define the following: Great Support Services."

defined Great Support Services by referring to tutoring services, such as the Math Assistance Center (MAC), and the University Writing Center. Other comments mentioned academic advisors, tutoring, mentoring, or other services that provided academic support. These comments provided additional justification for moving Great Support Services to the Academic Environment fit scale.

Two additional modification indices suggest that correlated error terms between items within two scales would produce noteworthy reduction in the chi-square statistic. These would include specifying a cross-loading between Great Support Services and "A scholarly/intellectual campus climate" (both within Academic Environment fit) and a cross-loading between "Sport and recreational opportunities" and "A diverse student body" (both within Social Environment fit). The largest reduction from correlated error terms would arise from an assumed cross loading between "State-of-the-art classrooms, labs, library" (Academic Environment fit) and "Great geographic location" (Physical Environment fit). This modification seems appropriate, given that

Table 5. Factor loadings and standardized coefficients for revised model

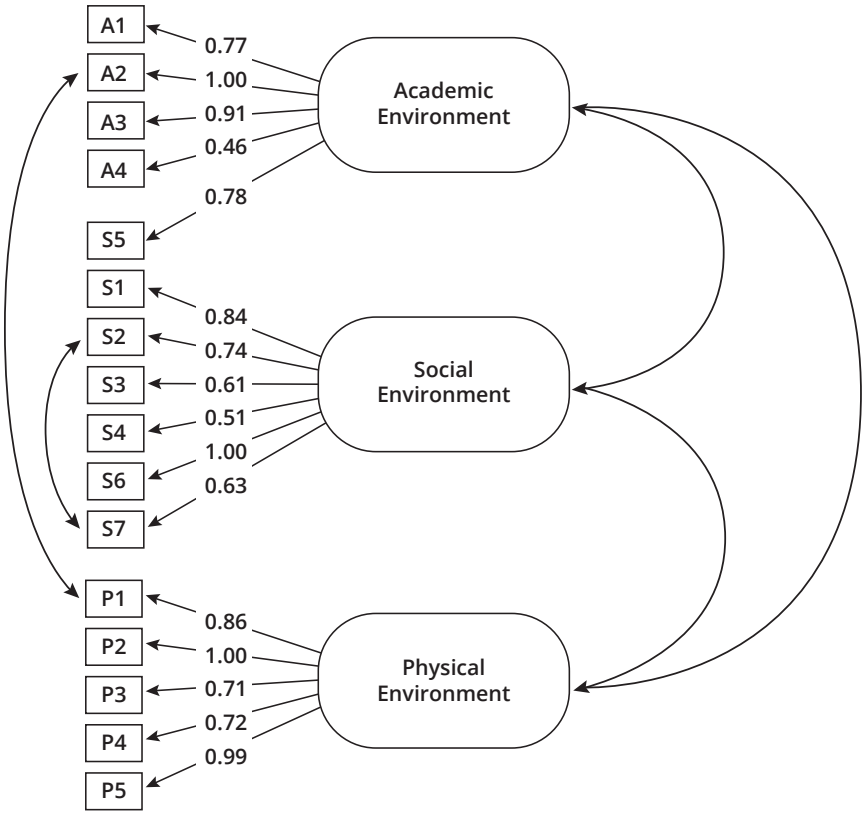
Item		Factor loadings in second CFA	Standardized coefficients
Academic Environment fit			
A3	A highly regarded academic reputation	0.91	0.76
A1	A scholarly/intellectual campus climate	0.77	0.69
S5	Great Support Services (e.g., academic counseling, health care, and placement center)	0.78	0.59
A2	State-of-the-art classrooms, labs, library	1.00	0.56
A4	Great school size	0.46	0.34
Social Environment fit			
S6	Great nonacademic facilities (e.g., gyms, dining room, and game room)	1.00	0.69
S1	Enjoyable social life	0.84	0.61
S3	Great student body	0.61	0.59
S2	Sports and recreational opportunities	0.74	0.53
S7	A diverse student body	0.63	0.41
S4	A highly regarded athletic reputation	0.51	0.31
Physical Environment fit			
P2	A safe environment	1.00	0.59
P5	Great affordability	0.99	0.52
P1	Great geographic location	0.86	0.51
P4	Convenient campus layout	0.72	0.50
P3	A pleasing physical environment (aesthetics)	0.71	0.42

"Great geographic location" had a moderate factor loading with Academic Environment fit in the original Gilbreath et al. (2011) study (0.25), while "State-of-the-art classrooms, labs, library" had a similarly moderate factor loading with the Physical Environment fit scale (0.26).

Fit statistics for the revised model can be found in Table 3. The chi-square test was statistically significant ($\chi 2 = 156.56$, df = 98, $p < 0.01$), suggesting lack of model fit. However, RMSEA (0.058) was below the predetermined cut point of 0.06 and SRMR (0.064) was below the predetermined cut point of 0.08. These measures seem to recommend that model fit was appropriate. Analysis conducted by Hu and Bentler (1999) suggests that a combination of RMSEA below 0.06 and SRMR below 0.08 yielded the lowest combination of Type I and Type II error rates when N was less than or equal to 250 cases. Using these criteria, the respecified model was determined to be adequate for subsequent analyses.

The results described in Table 3 suggest mixed evidence of model fit. The overall weight of the evidence suggests that the proposed model does explain the relationship between the observed and latent variables, however. Because of the correlated

Figure 2. Final Model of Institutional Fit with Factor Loadings



Source: Original model adapted from Gilbreath et al., 2011.

errors between "state-of-the-art classrooms, labs, library" and "great geographic location," the interfactor correlation between Academic Environment fit and Physical Environment fit would likely be somewhat inflated (Asparouhov & Muthén, 2009).

The final factor structure model to be used in all subsequent analyses, including coefficients, can be seen in Table 5 and Figure 2. Factor loadings were sufficiently high to assert convergent validity with each factor (Huck, 2012). Table 5 also includes standardized coefficients to assist in the interpretation of each factor. For CFA, standardized coefficients can be interpreted in the same way as standardized coefficients in ordinary least squares (OLS) regression, in that a one-standard-deviation increase in the variable would yield a one-standard-deviation increase in the latent variable. These standardized coefficients can be discussed broadly with colleagues and other users to understand the impact of each item on each fit factor. However, it should be noted that, because these are latent factors, using standardized coefficients to calculate factor scores will include a greater degree of measurement error than a calculation of a predicted value using an OLS regression formula (Bollen, 1989). For subsequent research, fit on each factor was calculated as the absolute difference between needs and supplies summed for each factor (Graunke, 2018).

Interfactor correlations for both split samples can be viewed in Table 6. The correlation between Academic Environment fit and Physical Environment fit was the largest correlation using both the sample for the CFA and the validation sample, as was expected given the shared variance between "great geographic location" on the Physical Environment fit factor and "state-of-the-art classrooms, labs, library" on the Academic Environment factor. In both samples, all correlations between factors were statistically significant and positive at the $\alpha < 0.05$ level. These results suggest that factors may not be independent, or that a second-order factor may be present. Gilbreath et al. (2011) did not propose a second-order overall fit. Future researchers attempting to replicate these results may collect

Table 6. Interfactor correlations using CFA and path model samples

		Academic Environment fit	Social Environment fit	Physical Environment fit
CFA Sample	Academic Environment fit	–		
	Social Environment fit	0.57*	–	
	Physical Environment fit	0.58*	0.56*	–
Validation Sample	Academic Environment fit	–		
	Social Environment fit	0.46*	–	
	Physical Environment fit	0.59*	0.50*	–

Note: * Statistically significant correlation at $\alpha \leq 0.05$.

additional data to determine if a second-order fit factor is appropriate, however.

Cronbach's alpha calculations for each scale can be found in Table 7. Analysis of Cronbach's alpha using the CFA sample proposes that reliability would be improved on the Academic Environment fit scale if "great school size" were deleted. Cronbach's alpha was therefore calculated for Academic Environment fit with "great school size" both included and excluded. The only fit factor that demonstrated acceptable reliability using both the CFA sample and the path model sample was Social Environment fit ($\alpha = 0.71$ in CFA sample, $\alpha = 0.72$ in path model sample). Academic Environment fit demonstrated adequate fit after dropping "great school size" when using the CFA sample. These results were not replicated using the validation sample, however, either with or without "great school size" included. Physical Environment fit did not demonstrate adequate levels of reliability with either sample.

DISCUSSION

The results from these analyses provide evidence that some modifications to the original model proposed by Gilbreath et al. (2011) were necessary before using data from this survey. The most noteworthy change would be to move Great Support Services from Social Environment fit to Academic Environment fit. However, that modification is not consistent with the original principal axis factor analysis results obtained in Gilbreath et al.'s initial study, on which Great Support Services loaded alongside other items pertaining to nonacademic aspects of the institution on the Social Environment fit scale. Unlike other items on this scale, however, students at the target institution believed Great Support Services referred directly to services provided by the university that might be related to the academic experience, while the remaining Social Environment fit items are explicitly nonacademic in nature. Other measures of student–institution fit, such and Bowman and Denson's (2014) student–institution fit model and Anthoney's (2011) factors of Academic Environment press, generally do not explore the role of support services in facilitating student–institution fit. Nonetheless, it is clear that some academic support services play some role in facilitating student retention and other positive outcomes. Tinto (2012) mentions that support services can help not only by enhancing students' academic skills, but also by enhancing connections to their institutions' academic and social context. Likewise, Strayhorn (2012) advocated for the importance of "mattering," which is defined as a

Table 7. Cronbach's alpha for factors in CFA and path model samples

	CFA sample	Validation sample
Academic Environment fit: With great school size fit	0.70	0.60
Academic Environment fit: Without great school size fit	0.73	0.55
Social Environment fit	0.71	0.72
Physical Environment fit	0.62	0.65

sense that an individual is appreciated by someone at their institution. This feeling of mattering could come from a variety of sources, including faculty or academic support staff. Neither Tinto nor Strayhorn was explicitly speaking of student–institution fit, though the types of support each mentioned would typically come from an academic rather than from an explicitly social context. The results from the present study do seem to indicate that the support received from support services is part of the academic environment rather than being part of the more explicitly social environment.

Though the model obtained through these analyses presented an acceptable match for the data obtained, it is noteworthy that only the Social Environment fit scale demonstrated adequate reliability using both the sample for the CFA analysis and the sample for the path models. The findings of low reliability for the Physical Environment fit factor are ultimately not surprising. In the original Gilbreath et al. (2011) study, neither Physical Environment need nor Physical Environment supply reached an acceptable level of reliability ($\alpha = 0.54$ for Physical Environment need and 0.59 for Physical Environment supply). Gilbreath et al. continued to use this scale in subsequent analyses because high scores obtained from students completing the Physical Environment need scale suggest that the physical environment was extremely important to students. Similarly, Denson and Bowman (2015) found that the reliability of their Physical Environment fit scale was inadequate for future analysis and removed it from their final instrument in the Australian study. When using an American sample, Bowman and Denson (2014) obtained a Cronbach's alpha estimate of 0.65 for their Physical Environment fit scale. This estimate is lower than might be deemed acceptable in most research, but it was deemed acceptable by Bowman and Denson because the items used in the fit scale included measurement error from two survey items rather than from only one item. The weight of the evidence suggests that an adequate scale measuring higher education students' perceptions of fit with their physical environment has not yet been developed. This scale was not used at subsequent studies at this institution, and it is recommended that other institutions hoping to explore fit develop their own measure of Physical Environment fit.

Of more pragmatic value to institutional researchers are the techniques used to validate the instrument for an individual institutional context. The final fit measure developed from the analyses described were used in a comprehensive study of the effect of fit on Fall-to-Fall retention net the effect of external commitments and socioeconomic status (SES) (Graunke, 2018). Graunke found that fit with the social environment had a significant and positive effect on retention, but this effect disappeared when SES variables were entered into the model. While this model was particularly effective for one institution, IR professionals should consider conducting CFA analysis and assessing qualitative information when bringing external instruments to their institution.

Supplementing CFA results with qualitative data proved especially useful in this study. Student comments on the Great Support Services item highlighted that this item was viewed as referring to academic resources. Taken together with the modification indices, these qualitative data provided triangulation that supported the change of this item to the Academic Environment subscale. Qualitative data analysis is designed to illuminate participants' personal meaning about a specific question (Creswell, 2014, chap. 9). Adding students' definitions to quantitative data provides a holistic

view of students' experiences. Incorporating this kind of student feedback with CFA results will enable researchers to modify a survey in ways to make it more valid for the student population at different institutions.

As institutional researchers continue to incorporate predictive modeling into their work, the collection of reliable and valid data from students becomes even more critical. It is therefore important that institutional researchers use all the appropriate quantitative and qualitative research tools to make sure surveys developed at one institution are appropriate for another. Conducting CFA analysis along with the collection and analysis of qualitative feedback could help institutional researchers refine instruments to collect better data and improve student success.

APPENDIX A. STUDENT–INSTITUTION FIT SCALE

Item		Need Reliability[1]	Supply Reliability[1]
Academic Environment fit		**0.59**	**0.72**
A1	A scholarly/intellectual campus climate		
A2	State-of-the-art classrooms, labs, library		
A3	A highly regarded academic reputation		
A4	Great school size		
Social Environment fit		**0.80**	**0.79**
S1	Enjoyable social life		
S2	Sports and recreational opportunities		
S3	Great student body		
S4	A highly regarded athletic reputation		
S5	Great Support Services (e.g., academic counseling, health care, and placement center)		
S6	Great nonacademic facilities (e.g., gyms, dining, and game room)		
S7	A diverse student body		
Physical Environment fit		**0.54**	**0.62**
P1	Great geographic location		
P2	A safe environment		
P3	A pleasing physical environment (aesthetics)		
P4	Convenient campus layout		
P5	Great affordability		

Source: Adapted from Gilbreath et al. 2011.

Note: [1] Cronbach alpha estimates obtained from Gilbreath et al. 2011.

REFERENCES

Anthoney, S. F. (2011). *Students in context: Effects of psychological needs and environmental press on academic and life satisfaction* (Doctoral dissertation). ProQuest Dissertations and Theses database (UMI No. 3472989).

Asparouhov, T., & Muthén, B. (2009). Exploratory structural equation modeling. *Structural Equation Modeling, 16,* 397–438. doi:10.1080/10705510903008204

Association for Institutional Research (AIR). (2016). *Statement of aspirational practice for institutional research*. https://www.airweb.org/docs/default-source/documents-for-pages/statement-of-aspirational-practice-for-ir-report.pdf?sfvrsn=1d468d84_2

Bean, J., & Eaton, S. (2000). A psychological model of college student retention. In J. M. Braxton (Ed.), *Reworking the student departure puzzle* (pp. 48–61). Vanderbilt University Press.

Bean, J., & Eaton, S. B. (2001). The psychology underlying successful retention practices. *Journal of College Student Retention, 3*(1), 73–89. doi:10.2190/6R55-4B30-28XG-L8U0

Bollen, K. A. (1989). *Structural equations with latent variables*. John Wiley and Sons.

Borden, V. M. H., & Jin, S. (2022). An evidence-based framework for transforming higher education programs and processes. In B. Broucker, R. Pritchard, C. Milson, & R. Krempkow (Eds.), *Transformation fast and slow: Digitalisation, quality and trust in higher education* (pp. 117–134). Brill. doi:10.1163/9789004520912_007

Borden, V. M. H., Wakhungu, P. W., Jin. S. (2021). The insight engine: Integrating big data, thick data, and subject expertise into IR. Showcase (featured) presentation, May 26, 2021, 2021 Forum of the Association for Institution Research. Virtual.

Bowman, N. A., & Denson, N. (2014). A missing piece of the departure puzzle: Student–institution fit and intent to persist. *Research in Higher Education, 55*, 123–142. doi:10.1007/s11162-013-9320-9

Button, K. S., Ioannidis, J. P. A., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S. J., & Munafo, M. R. (2013). Power failure: Why small sample size undermines the reliability of neuroscience. *Nature Reviews Neuroscience, 14,* 365–376. doi:10.1038/nrn3475

Byrne, B. M. (2012). *Structural equation modeling with Mplus*. Routledge.

Conyne, R. K. (1975). Environmental assessment: Mapping for counselor action. *Personnel and Guidance Journal, 54,* 151–154. doi:10.1002/j.2164-4918.1975.tb04206.x

Conyne, R. K. (1978). An analysis of student–environment mismatches. *Journal of College Student Personnel, 19,* 461–465.

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology, 78,* 98–104. doi:10.1037/0021-9010.78.1.98

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches.* Sage.

Denson, N., & Bowman, N. A. (2015). The development and validation of an instrument assessing student–institution fit. *Assessment and Evaluation in Higher Education, 40,* 1104–1122. doi:10.1080/02602938.2014.970513

Edwards, J. R., & Shipp, A. J. (2007). The relationship between person–environment fit and outcomes: An integrative theoretical framework. In C. Ostroff & T. A. Judge (Eds.). *Perspectives on organizational fit* (pp. 209–258). Taylor & Francis Group.

Gardner, A. (June 2022). *Persistence and retention Fall 2020 beginning postsecondary cohort*. National Student Clearinghouse Research Center. https://nscresearchcenter.org/wp-content/uploads/PersistenceRetention2022.pdf

Gilbreath, B., Kim, T. Y., & Nichols, B. (2011). Person–environment fit and its effects on university students: A response surface methodology study. *Research in Higher Education, 52*, 47–62. doi:10.1007/s11162-010-9182-3

Graunke, S. S. (2018). *Student–institution fit, external commitments, and persistence* (Doctoral dissertation). https://hdl.handle.net/2022/22427

Howard, R. H. & Borland, K. W. (2007). The role of mixed method approaches in institutional research. In R. D. Howard (Ed.). *Using mixed methods in institutional research.* (pp. 2–7). Association for Institutional Research.

Hu, L., & Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 76–99). Sage.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–31. doi:10.1080/10705519909540118

Huck, S. W. (2012). *Reading statistics and research* (6th ed.). Pearson.

Institutional Research and Decision Support. (2015, September 8). *Indianapolis campus enrollment summary.* Institutional Research and Decision Support website. https://irds.iupui.edu/_documents/enrollment-management/census-report/2015%20IUPUI%20Fall%20Census%20Summary.pdf

MacCallum, R. C., Roznowski, M., & Necowitz, L. B. (1992). Model modifications in covariance structure analysis: The problem of capitalization on chance. *Psychological Bulletin, 111,* 490–504. http://dx.doi.org/10.1037/0033-2909.111.3.490

Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American Psychologist, 50,* 741–749. doi:10.1037/0003-066X.50.9.741

O'Neil, C. (2016). *Weapons of math destruction: How big data increases inequality and threatens democracy.* Crown.

Ostroff, C., & Schulte, M. (2007). Multiple perspectives of fit in organizations across levels of analysis. In C. Ostroff & T. A. Judge (Eds.), *Perspectives on organizational fit* (pp. 3–69). Taylor and Francis Group.

Renick, T. M. (2020). Predictive analytics, academic advising, early alerts, and student success. In K. L. Weber and H. Y. Zheng (Eds.), *Big data on campus: Data analytics and decision making in higher education* (pp. 177–197). Johns Hopkins University Press.

Strayhorn, T. (2012). *College students' sense of belonging: A key to educational success for all students*. Taylor and Francis Group.

Summerskill, J. (1962). Dropouts from college. In N. Sanford (Ed.), *The American college: A psychological and social interpretation of the higher learning* (pp. 627–657). John Wiley and Sons.

Suskie, L. A. (1996). *Questionnaire survey research: What works* (2nd ed). Association for Institutional Research.

Swing, R. L. & Ross, L. E. (2016). *Statement of aspirational practice for institutional research. Association for Institutional Research*. https://www.airweb.org/ir-data-professional-overview/a-statement-of-aspirational-practice-for-institutional-research

Tanaka, J. S. (1987). "How big is big enough?": Sample size and goodness of fit in structural equation models with latent variables. *Child Development, 58*, 134–146. doi:10.2307/1130296

Tinto, V. (2012). *Completing college: Rethinking institutional action*. University of Chicago Press.

Wasserstein, R. L., & Lazar, N. A. (2016). The ASA statement on p-values: Context, process, and purpose. *American Statistician, 70*, 129–133. doi:10.1080/00031305.2016.1154108

Woosley, S. A., & Miller, A. L. (2009). Integration and institutional commitment as predictors of college student transition: Are third week indicators significant? *College Student Journal, 43,* 1260–1271. https://go.gale.com/ps/i.do?id=GALE%7CA217511787&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=01463934&p=AONE&sw=w&userGroupName=anon~bf8976e5&aty=open-web-entry

Zheng, H. Y. and Zhou, Y. (2020). Predictive analytics and its uses in higher education. In K.L. Weber and H.Y. Zheng (Eds.), *Big data on campus: Data analytics and decision making in higher education* (pp. 50–76). Johns Hopkins University Press.

THANK YOU

Authors who submit materials to AIR Publications receive feedback from members of the AIR community. AIR expresses sincere appreciation for the individuals who serve as peer reviewers.

The following individuals reviewed manuscripts recently submitted to *The AIR Professional File*.

Eric Atchison

Suhua Dong

Stefano Fiorini

Nora Galambos

George Guajardo

Soohong Kim

Deytia Lima-Rojas

Laura Palucki Blake

Kelly Smith

Lissette Tolentino

Mike Urmeneta

Melinda Whitford

Hui-Jeong Woo

Xilin Zhang

ABOUT *THE AIR PROFESSIONAL FILE*

The AIR Professional File features journal-length articles grounded in relevant literature that synthesize current issues, present new processes or models, or share practical applications related to institutional research. All submissions are peer-reviewed. For more information about AIR Publications, including *The AIR Professional File* and instructions for authors, visit www.airweb.org/publications.

ABOUT AIR

The Association for Institutional Research (AIR) empowers higher education professionals to leverage data, analytics, information, and evidence to make decisions and take actions that benefit students and institutions and improve higher education. For over 50 years, AIR has been committed to building and sustaining strong data-informed decision cultures within higher education institutions.

Association for Institutional Research
Christine M. Keller, Executive Director and CEO
www.airweb.org
ISSN 2155-7535