CSU The California State University

Redefining Historically Underserved Students in the CSU

Moving Beyond Race and Economic Status to Close Equity Gaps

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This study examines the development of a new *Historically Underserved Student Construct* that provides a more sophisticated understanding of equity gaps in the CSU and challenges us to provide the differential support needed to ensure that all students succeed.

California is one of the most diverse states in the nation, with a vibrant workforce comprised of people from ethnically and economically diverse backgrounds. This diversity is reflected in the students who comprise the 23 California State University campuses. For many of our students, who may be the first in their family to go to college, who come from backgrounds of poverty, or who face other challenges, receiving a quality CSU education and earning a college degree has the potential to change the trajectory of their lives. The impact of this achievement on these students is not limited to their lives, however, it also lifts their families and enriches our California communities.

The majority of California's future college-age population will come from groups that have been historically underrepresented in higher education. Research has shown that this demographic shift could be a major contributor to the state's future workforce skills gap. To avoid this gap, the state needs to increase the number of students from historically underserved communities who graduate from college.

The CSU is committed to decreasing time-to-degree and increasing graduation rates for all students. As part of Graduation Initiative 2025, a strong emphasis has been placed on closing equity gaps to provide CSU students from all backgrounds an equal opportunity to earn a college degree and enter the workforce.

There are many factors that influence college completion rates. We know that there are students, who for various reasons, have not been afforded the same educational opportunities as some of their peers, putting them at a significant disadvantage. For the purposes of this paper, we have termed these students "historically underserved." It is the goal of the CSU to ensure that all students have an equal opportunity to complete a college degree and eliminate gaps that may exist. To that end, we have identified several factors that research has shown to be related to college completion.

- First generation status. More than one-third of CSU students are the first in their family to attend college. Negotiating the collegiate environment can be difficult and these students are often far less familiar with the deadlines and requirements needed to move through their college experience.
- Economic and financial challenges. Many CSU students have to work while in college, often at more than one job. This can impact how much time and energy they are able to dedicate to navigating college.
- College readiness. Approximately 40 percent of students enter the CSU not ready for college-level work. This has a big impact on how long it takes them to earn their degree.
- Coming from underserved communities. Approximately half of our students identify as members of ethnic communities that have been historically underserved. The lack of access to opportunity over their lifetime has a variety of consequences that influences how long it takes them to earn their degree.

Our research has shown that all of these variables are related to student success and that considering some or all of them in combination can increase the accuracy in our understanding of which students may need additional support to help them on their way to degree completion. A student does not need to have all of these characteristics to be considered historically underserved. In fact it is possible that a student possessing only one may need assistance during their college career. Our goal is to better understand the complexity of our students and more importantly, identify and provide the support that they need to be successful.

According to the HUS Construct, approximately 35% of Asian students who are currently classified as "non-underrepresented" should be considered "underserved" and provided with additional support to facilitate their path to a college degree.

DEVELOPING THE HUS CONSTRUCT

Approach

The study focuses on the development of a new construct that allows for a more accurate classification of true equity gaps. The emphasis is on the relationship between variables, rather than on individual characteristics. By using confirmatory factor analysis we can examine a set of intercorrelated variables and create a multivariate construct that includes:

- Race/Ethnicity (using the URM/Non-URM dichotomy)
- Socioeconomic Status (using the Pell Grant recipient/Non-Pell Grand recipient dichotomy)
- College Readiness (proficiency status at entry)
- College-Going Generation

Further details about the methodology are provided in Appendix A.

Sample

Two different samples were used for analyses. Sample 1 included 55,465 first-time, full-time CSU freshman students who enrolled in 2012. The 2012 cohort was chosen because this is the group for which the most recent 4-year graduation rate outcomes are available. Sample 2 included 47,967 first-time, full-time CSU freshman students who enrolled in 2010. The 2010 cohort was chosen as an additional sample because this is the most recent group for whom 6-year graduation rate data are available.

Variables

The proposed construct is intended to improve upon the URM/Non-URM dichotomy that is currently used to understand which students are underserved and which are not. Race/ethnicity, college readiness, college-going generation, and financial variables were used. The traditional URM dichotomy was selected as the race variable (URM is defined as any student who has identified their race/ethnicity as African American, Hispanic, or American Indian). All other race categories are considered Non-URM, including Visa/Non US Citizens). Expected family contribution (EFC) was used as well as Pell status to account for financial information. Due to the high correlation between Pell and EFC, two separate models were run to compare the usefulness of Pell versus EFC in understanding who should truly be considered a Historically Underserved Student (HUS). EFC data were not available for the 2010 cohort and were therefore only assessed in models run on the 2012 cohort. Pell was the only income variable used in models for the 2010 cohort. College going/first generation was used as a dichotomy, comparing students who are the first in their family to attend college, versus all others (including students for which the first generation status was unknown, students where one parent attended some college and students whose parents graduated from college).

Modeling

Confirmatory Factor Analysis (CFA), a statistical modeling method that fits under the structural equation modeling (SEM) umbrella, was proposed as the method to test the theory of HUS as a construct. CFA is used to determine if a set of measured variables are representative of an unmeasured underlying construct[1].

[1] *McArdle, 1996; Kline, 2011*

Model Results

Two CFA models were assessed for the 2012 cohort. Both models had four indicator variables. Model 1 included underrepresented minority (URM) status, Pell status, first generation, and proficiency at entry (proficient in math and English versus not proficient in math, English, or both). The model fit the data well based on the fit indices. For Model 1, the variable that is most representative of HUS is first generation, followed by Pell, URM and proficiency at entry. Students who are Pell, first generation, URM, and not proficient at entry will have higher HUS factor scores, indicating they are historically underserved students.

Model 2 included URM, expected family contribution (EFC), first generation, and proficiency at entry. This model did not fit as well as Model 1, which included Pell. In terms of variable importance for Model 2, first generation has the highest loading on the HUS factor, followed by URM, proficiency, and EFC. Students whose families are contributing less to their education and who are first generation, URM, and not proficient at entry will have higher HUS factor scores, indicating they are historically underserved students. The better fit of model 1 is likely due to the fact that the Pell variable does not contain missing data while the EFC variable does. Because EFC has missing data, the variable's ability to classify students is diminished, resulting in a lower impact of the factor.

One additional CFA model was assessed for the 2010 cohort. It was identical to Model 1 for the 2012 cohort (4 variables including URM, first generation status, Pell status, and proficiency at entry). The outcome was very similar to the Model 1 outcomes for the 2012 cohort. First generation status was the best indicator, followed by Pell status, URM and proficiency at entry.

Model Implications

Comparing the HUS Construct with the URM/Non-URM Definition of Underserved

The HUS construct provides a way to identify additional students, who are in need of more support, and that are not identified with the URM/Non-URM dichotomy. Figures 1 and 2 show that URM students who are identified as not historically underserved based on HUS variables (Low-HUS; not a Pell recipient, not first generation, and fully proficient at entry) graduate at rates similar to Non-URM students as a whole (compare the 4th bar versus the 1st bar in these figures). In addition, Non-URM students who are identified as underserved based on HUS (High-HUS; Pell recipients, first generation, and not proficient at entry) graduate at rates similar to URM students as a whole (compare the 5th bar versus the 2nd bar in these figures). Figures 3 and 4 reveal a very similar pattern when isolating the Pell/not-Pell dichotomy.

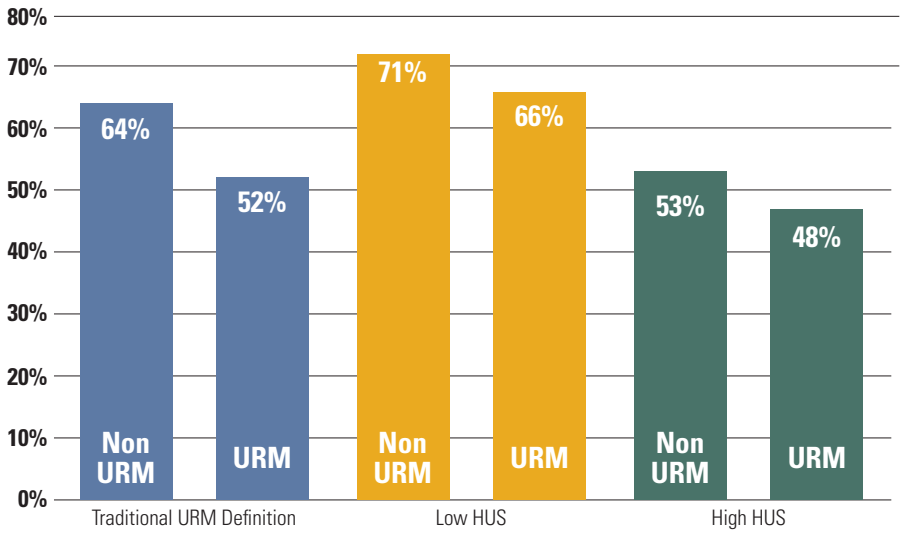

Figure 1: 2010 First-Time, Full-Time Freshman 6-Year Graduation Rates Using Traditional vs. Non Traditional Classifications to Identify Underserved Students: URM.

6-year graduation rate Achievement Gap differences historically reported for CSU students under the URM/Non- URM dichotomy are shown in the blue bars in Figure 1. Some (but not all) of this difference is likely attributable to other confounding factors. The 3rd through 6th bars in Figure 1 break out Low-HUS (yellow bars; not first generation, not receiving Pell, and proficient at entry) and High-HUS (green bars; first generation, receiving Pell, and not proficient at entry) groups further into URM and Non-URM groups. The focus of this figure is on students in the top and bottom of the distribution. Students falling in middle of the HUS distribution are not included here. Comparing Low-HUS-URM students (4th bar from the left) to the traditional Non-URM class of students (1st bar) reveals very little difference in graduation rates. High-HUS scoring students, whether URM (6th bar) or Non-URM (5th bar), show similar 6-year graduation rates to the historically reported URM group as a whole. Comparing URM and Non-URM students within a HUS class (e.g., Low-HUS- URM (4th Bar) versus Non-URM-Low-HUS (3rd bar)) reveals a 5% gap that may represent an aspect of the historically defined URM/Non-URM gap not captured by the other HUS factors.

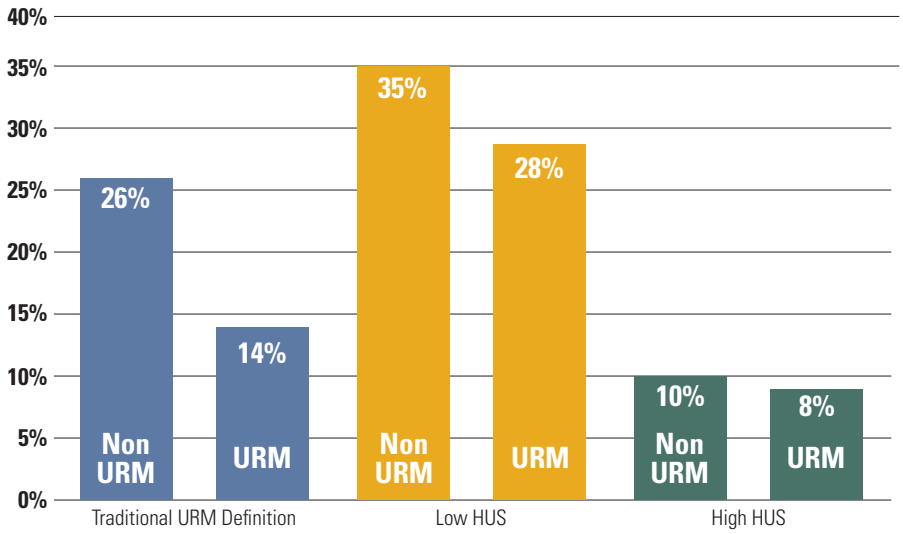

Figure 2: 2012 Cohort 4 Year Graduation Rates Using Traditional vs. Non Traditional Classifications to Identify Underserved Students: URM

4-year graduation rate Achievement Gap differences historically reported for CSU students under the URM/Non-URM dichotomy are shown in the blue bars in Figure 2. Some (but not all) of this difference is likely attributable to other confounding factors. The 3rd through 6th bars in Figure 2 break out Low-HUS (yellow bars; not first generation, not receiving Pell, and proficient at entry) and High-HUS (green bars; first generation, receiving Pell, and not proficient at entry) groups further into URM and Non-URM groups. The focus of this figure is on students in the top and bottom of the distribution. Students falling in middle of the HUS distribution are not included here. Comparing Low-HUS-URM students (4th bar from the left) to the traditional Non-URM class of students (1st bar) reveals very little difference in graduation rates. High-HUS scoring students, whether URM (6th bar) or Non-URM (5th bar), show 4-year graduation rates even lower than the historically reported URM group as a whole. Comparing Low-HUS-URM (4th Bar) versus Low-HUS-Non-URM (3rd bar) reveals a 7% gap that may represent an aspect of the historically defined URM/Non-URM gap not captured by the other HUS factors. However, High-HUS students experience a very low 4-year graduation rate that is almost equally low regardless of URM status (5th versus 6th bar).

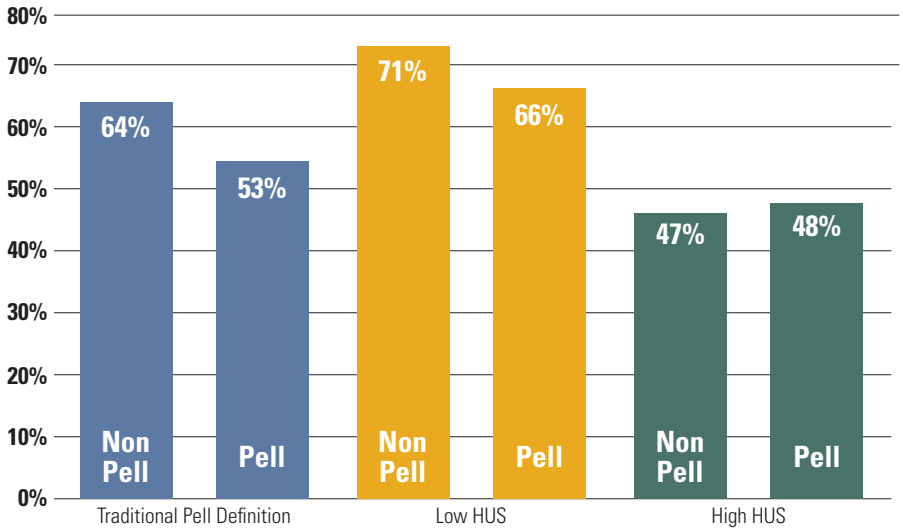

Figure 3: 2010 Cohort 6 Year Graduation Rates Using Traditional vs. Non Traditional Classifications to Identify Underserved Students: Pell Recipients

6-year graduation rate Achievement Gap differences historically reported for CSU students under the Pell/Non-Pell dichotomy are shown in the blue bars in Figure 3. Some (but not all) of this difference is likely attributable to other confounding factors. The 3rd through 6th bars in Figure 3 break out Low-HUS (yellow bars; not URM, not first generation, and proficient at entry) and High-HUS (green bars; URM, first generation, and not proficient at entry) groups further into Pell and Non-Pell groups. The focus of this figure is on students in the top and bottom of the distribution. Students falling in middle of the HUS distribution are not included here. Comparing Low-HUS-Pell students (4th bar from the left) to the traditional Non-Pell class of students (1st bar) reveals very little difference in graduation rates. High-HUS scoring students, whether Pell (6th bar) or Non-Pell (5th bar) show 6-year graduation rates even lower than the historically reported Pell group as a whole. Comparing Low-HUS-Pell (4th Bar) versus Low-HUS- Non-Pell (3rd bar) reveals a 5% gap that may represent an aspect of the historically defined Pell/ Non-Pell gap not captured by the other HUS factors. However, High-HUS students experience equally low 6-year graduation rate regardless of Pell status (5th versus 6th bar).

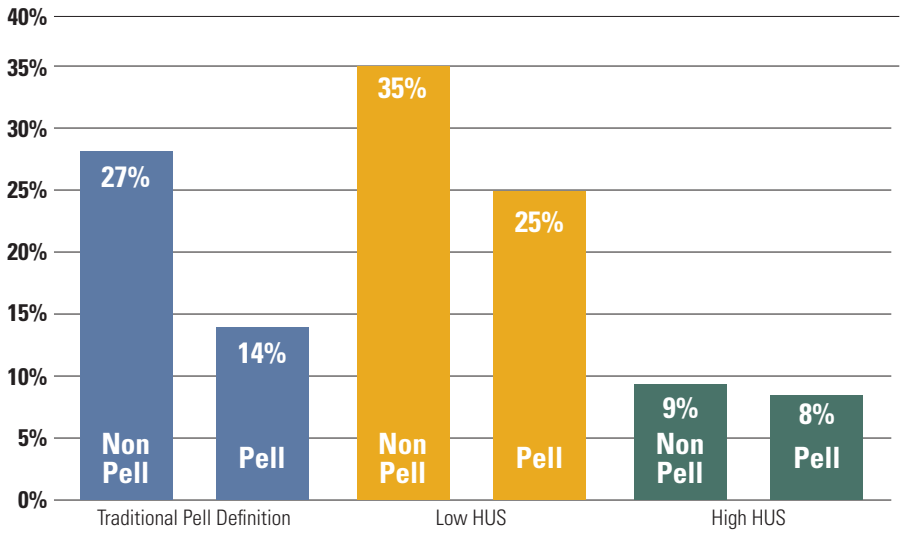

Figure 4: 2012 Cohort 4 Year Graduation Rates Using Traditional vs. Non Traditional Classifications to Identify Underserved Students: Pell Recipients

4-year graduation rate Achievement Gap differences historically reported for CSU students under the Pell/Non-Pell dichotomy are shown in the blue bars in Figure 4. Some (but not all) of this difference is likely attributable to other confounding factors. The 3rd through 6th bars in Figure 4 break out Low-HUS (yellow bars; Non-URM, not first generation, and proficient at entry) and High-HUS (green bars; URM, first generation, and not proficient at entry) groups further into Non-Pell and Pell groups. The focus of this figure is on students in the top and bottom of the distribution. Students falling in middle of the HUS distribution are not included here. Comparing Low-HUS-Pell students (4th bar from the left) to the traditional Non-Pell class of students (1st bar) reveals very little difference in graduation rates. High-HUS scoring students, whether Pell (6th bar) or Non-Pell (5th bar) show 4-year graduation rates even lower than the historically reported Pell group as a whole. Comparing Low-HUS-Pell (4th Bar) versus Low-HUS- Non-Pell (3rd bar) reveals a 10% gap that may represent an aspect of the historically defined Pell/ Non-Pell gap not captured by the other HUS factors. However, High-HUS students experience equally low 4-year graduation rate regardless of Pell status (5th versus 6th bar).

HUS Classification of Students

Additional analyses were performed to see how the HUS construct was able to classify students. Based on the initial four variable model, additional models were performed for three campuses separately: San Francisco, San Diego, and Los Angeles. Three campuses were selected to serve as a pilot test of applying the model at the campus level. These particular campuses were selected to capture some of the diversity we see across our campuses with regards to region, size, and diversity of student populations. The fit of the models, when done by campus, performed very similarly to the original all CSU model. Table 3 shows how the HUS construct performs when compared to the traditional URM/Non-URM dichotomy. This table shows the frequency of HUS factor scores in 4 quartiles (quartile 1 represents students with low HUS scores to quartile 4 which represents students highest on the HUS factor) broken down by ethnicity. Percentages are representative of the row data rather than column. When you look at the distribution of scores in the top 50%, you notice that there are a number of Asian and White students (in addition to other historically classified Non-URM students) represented. Across the CSU and within the 2012 cohort of First-time Full-time Freshmen, almost 35% of Asian students and approximately 10% of White students, who are historically represented as Non-URM, have factor scores in the top half of all HUS scores. However, as evidenced by the three campuses we explored, this pattern can vary substantial from campus to campus.

Table 3: HUS Factor Scores by Quartile and Ethnicity

Campus	Ethnicity	N	Quartile							
			0%-24%		25%-49%		50%-74%		75%-100%	
			Freq	%	Freq	%	Freq	%	Freq	%
CSU	African American	2,679	0	0.0%	515	19.22%	1,560	58.2%	601	22.4%
	American Indian	110	0	0.0%	38	34.55%	46	41.8%	26	23.6%
	Asian	9,702	3,222	33.2%	3,257	33.57%	2,869	29.6%	347	3.6%
	Hispanic	22,403	0	0.0%	3,921	17.50%	6,116	27.3%	12,321	55.0%
	Two or More	2,897	1,447	49.9%	1,085	37.45%	328	11.3%	33	1.1%
	Unknown	1,728	771	44.6%	581	33.62%	314	18.2%	57	3.3%
	Visa Non US	1,466	180	12.3%	701	47.82%	216	14.7%	369	25.2%
	White	14,480	8,264	57.1%	4,716	32.57%	1,383	9.6%	111	0.8%
San Francisco	African American	209	0	0.0%	72	34.45%	110	52.63%	27	12.92%
	American Indian	4	0	0.0%	1	25.00%	1	25.00%	2	50.00%
	Asian	1,070	453	42.3%	126	11.78%	207	19.35%	284	26.54%
	Hispanic	1,188	0	0.0%	322	27.10%	421	35.44%	445	37.46%
	Two or More	243	151	62.1%	40	16.46%	37	15.23%	15	6.17%
	Unknown	68	45	66.2%	8	11.76%	10	14.71%	5	7.35%
	Visa Non US	134	76	56.7%	25	18.66%	31	23.13%	2	1.49%
	White	840	582	69.3%	117	13.93%	102	12.14%	39	4.64%
San Diego	African American	138	0	0.0%	41	29.7%	60	43.5%	37	26.8%
	American Indian	2	0	0.0%	2	100.0%	0	0.0%	0	0.0%
	Asian	559	314	56.2%	14	2.5%	149	26.7%	82	14.7%
	Hispanic	1,134	0	0.0%	375	33.1%	279	24.6%	480	42.3%
	Two or More	279	197	70.6%	14	5.0%	56	20.1%	12	4.3%
	Unknown	128	83	64.8%	5	3.9%	31	24.2%	9	7.0%
	Visa Non US	107	14	13.1%	60	56.1%	17	15.9%	15	14.0%
	White	1,482	1,074	72.5%	62	4.2%	292	19.7%	54	3.6%
Los Angeles	African American	122	32	26.2%	58	47.5%	8	6.6%	24	19.7%
	American Indian	3	1	33.3%	0	0.0%	2	66.7%	0	0.0%
	Asian	414	287	69.3%	126	30.4%	0	0.0%	0	0.0%
	Hispanic	1,923	212	11.0%	451	23.5%	277	14.4%	983	51.1%
	Two or More	43	39	90.7%	4	9.3%	0	0.0%	0	0.0%
	Unknown	52	27	51.9%	25	48.1%	0	0.0%	0	0.0%
	Visa Non US	108	55	50.9%	14	13.0%	39	36.1%	0	0.0%
	White	100	74	74.0%	26	26.0%	0	0.0%	0	0.0%

The Role of Race/Ethnicity in the HUS Construct

To further examine the role of Race/Ethnicity in the HUS construct, race subcategories were examined. Table 4 shows the subcategories of race for students who reported their race/ethnicity as Asian at San Francisco State University. As can be seen, the majority of first time full time Asian students at San Francisco State report belonging to the Chinese or Filipino Asian sub-categories. A closer look at the data for Chinese and Filipino students shows that the majority of Filipino students are in the lower half of the HUS construct, while the majority of Chinese students are in the top half of the HUS construct. In addition, over half of the Vietnamese students are in the top half of the HUS construct.

Table 4: HUS Factor Scores by Quartile and Race at San Francisco State

Asian Race Sub Category	Quartile 1	Quartile 2	Quartile 3	Quartile 4	All
Asian Indian	31	1	9	6	47
Burmese	2	1	2	0	5
Cambodian	6	1	1	8	16
Chinese (except Taiwanese)	78	28	78	182	366
Filipino	224	37	68	17	346
Indonesian	0	1	1	0	2
Japanese	30	4	2	0	36
Korean	15	8	4	1	28
Laotian	1	2	2	0	5
Pakistani	3	2	3	2	10
Taiwanese	15	5	1	1	22
Thai	2	2	2	1	7
Vietnamese	22	23	20	40	105
Other Asian	16	2	8	14	40
Hmong	0	1	0	4	5
Malaysian	1	0	0	1	2
Nepalese	0	3	0	3	6
Sri Lankan	1	0	0	1	2
Missing	6	5	6	3	20

The tables above show the power and importance of using the HUS construct to create a more nuanced picture of who our underserved students are.

Conclusion

Based on the models presented above, a factor to understand Historically Underserved Students is well represented by a 4 factor model including Pell status, first generation, URM, and proficiency at entry. Moving from a dichotomous distinction to a factor score paradigm for understanding who the underserved students in the CSU are, adds flexibility and greater control over classification. The model produces a factor score for each student based on responses to the factor indicators and the model estimates. Factor scores for the all CSU model range from -1.066 to 1.328, with higher values indicating a more historically underserved student. Use of the student's factor score makes it possible to distinguish between different levels of being underserved. Some students may be extremely underserved while others are only marginally underserved compared to others. The factor scores should also pick up students who are not considered URM based on the current definition but who are higher on the HUS factor based on the other indicators. The importance of being able to better understand who the historically underserved students are is clear and the factor model presented provides a way to do just that.

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APPENDIX A: DETAILED METHODOLOGY

The study focuses on the development of a new construct that allows for a more accurate classification of true equity gaps. The emphasis will be on the relationship between variables, rather than on individual characteristics. By using confirmatory factor analysis it will be possible to examine a set of intercorrelated variables and create a multivariate construct that includes:

- Race/Ethnicity (using the URM/Non-URM dichotomy)
- Socioeconomic Status (using the Pell Grant recipient/Non-Pell Grand recipient dichotomy)
- College Readiness (proficiency status at entry)
- College-Going Generation

This methodology will be more inclusive in identifying student groups which truly constitute the achievement gap and will help to identify strategies in closing the gap.

Sample

Two different samples were used for analyses.

Sample 1 included 55,465 first time full time CSU freshman students who enrolled in 2012. The 2012 cohort was chosen because this is the group for which we have the most recent 4-year graduation rate outcomes. The sample slightly weighted towards females (57%; male=43%) and there was a fairly balanced proportion of Non-URM and URM students in the sample (54% and 46%, respectively).

Sample 2 included 47,967 first time full time CSU freshman students who enrolled in 2010. The 2010 cohort was chosen as an additional sample because this is the most recent group with 6 year graduation rate data. The sample was slightly weighted females (57%; male=43%) and Non-URM students (57%; URM=43%, respectively).

Variables

The proposed construct is intended to improve upon the URM/Non-URM dichotomy that is currently used to understand which students are underserved and which are not. Race/ethnicity, college readiness, college-going generation, and financial variables were used. The traditional URM dichotomy was selected as the race variable (URM is defined as any student who has identified their race/ethnicity as African American, Hispanic, or American Indian). All other race categories are considered Non-URM, including Visa/Non US Citizens). Expected family contribution (EFC) was used as well as Pell status to account for financial information. The original EFC variable ranged from $0 (indicating that the family is unable to contribute to the student's educational costs) to $99,999 (indicating that the family is able to contribute a considerable amount to the student's educational costs). Historically, income related variables tend to be very positively skewed (the tail on the right side of the distribution extends out further than the tail on the left side) when compared to a normal bell curve distribution. This happens because income, or EFC in this case, for the majority of the sample is anchored on the left at 0 with the majority of scores represented by values closer to 0. EFC for the remaining individuals in the sample is much higher, causing the right/positive tail to extend out and capture higher income levels. In this case, EFC extends out to $99,999, with over 75% of the sample falling in the $15k or lower EFC range. For this reason, the distribution of EFC was adjusted using a log transformation. Due to the high correlation between Pell and EFC, two separate models were run to compare the usefulness of Pell vs Expected Family Contribution in understanding who should truly be considered a Historically Underserved Student (HUS). Lastly, EFC was not available for the 2010 cohort and will only be assessed in models run on the 2012 cohort. Pell will be the only income variable used in models for the 2010 cohort. College going/first generation was used as a dichotomy, with 1 being students who are the first in their family to attend college, and 0 being all others (this includes students for which the first generation status was unknown, students where one parent attended some college and students whose parents graduated from college).

Modeling

Confirmatory Factor Analysis (CFA), a statistical modeling method that fits under the structural equation modeling (SEM) umbrella, was proposed as the method to test the theory of HUS as a construct. CFA is used to determine if a set of measured variables are representative of an unmeasured underlying construct[2]. The CFA models were run using Mplus statistical software[3] and model fit was assessed using the following fit indices, which were recommended by Begozzi and Ye (2012): Chi Square Likelihood Ratio (X^2), Root Mean Squared Error of Approximation (RMSEA), the Tucker-Lewis Index (TLI; also known as the non-normed fit index; NNFI), and The Comparative Fit Index (CFI). A robust weight least squares (WLSMV) estimator was used of the dichotomous indicators. Missing values in models using the WLSMV estimator are treated as a function of the model and are not estimated as they would be with maximum likelihood estimation (MLE) methods.

[2] *McArdle, 1996; Kline, 2011*
[3] *Muthén & Muthén, 2011*

Additional appendices are available upon request.

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