

Using Disproportionate Impact Methods to Identify Equity Gaps

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Introduction

What is Data Disaggregation?

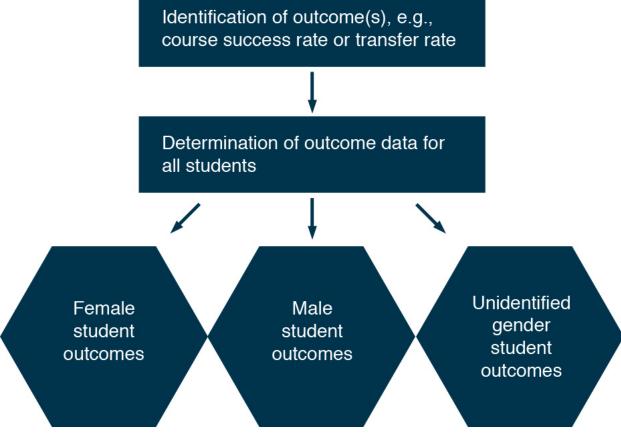
One of the most significant challenges that community colleges around the country face is how to achieve equity in educational outcomes, such as degree attainment or transfer to four-year universities, across various sub-populations of students (Bensimon, 2005). Indeed, a plethora of research studies point to gaps in educational outcomes, particularly among historically underrepresented groups, like African-American students (Harper, Patton, & Wooden, 2009; Lee, 2002; Ward, 2006).

When examining student data, one of the first things colleges may do is look at whether there are differences among particular student groups, such as males and females, with respect to one or more educational outcomes, such as degree completion rates. The process of examining outcomes separately by student groups is known as data disaggregation.

Figure 1 illustrates the data disaggregation process. The first step is identification of an outcome of interest, such as course success rates. In this case, the average course success rate for all students would then be calculated to provide a starting point for comparison. Then, average course success rates would be determined for specific subgroups of students, such as males and females. By comparing success rates for these subgroups to the success rates among all students, variations in achievement of this educational outcome can be identified.

Although Figure 1 offers a visual representation of the data disaggregation process as it pertains to examining differences between the educational outcomes of male and female students, this process can be used with respect to any subgroup of students, such as students of different ethnicities, ages, or other characteristics.

Figure 1. Example of the data disaggregation process



Outline of Figure 1. Example of data disaggregation process

- 1. Identification of outcome(s), e.g., course success rate or transfer rate
- 2. Determination of outcome data for all students
 - a. Female student outcomes
 - b. Male student outcomes
 - c. Unidentified gender student outcomes

When one subgroup of students attains an outcome such as degree completion at a rate that is substantially lower than the benchmark rate, that subgroup may be referred to as "disproportionately impacted." According to the California Community Colleges Chancellor's Office (CCCCO), "disproportionate impact is a condition where some students' access to key resources and supports and ultimately their academic success may be hampered by inequitable practices, policies and approaches to student support" (Harris, 2013). Therefore, differences in educational outcomes between subgroups of students may suggest that one group has less access to support services, is in need of relatively greater support, and/or must address certain obstacles in order to attain those outcomes at rates comparable to their peers.

When examining student data for evidence of disproportionate impact, one of the questions faced by colleges is how to measure that impact. There are three primary methods used to calculate the level of disproportionate impact: the 80% index, the proportionality index, and the point-gap index. This paper offers readers an overview of each method, as well as a variety of examples of actual data from colleges around the state.

Reader's Guide

The first step in addressing equity gaps is to identify them. How can we determine, with some degree of certainty, whether one or more student groups on our campus is in particular need of assistance in order to succeed?

This paper tackles this question by delving into the three methods typically used to identify equity gaps, comparing and contrasting the benefits of each approach, and then demonstrating how these methods can be utilized through examination of three case studies. While data and statistics are discussed, this review is intended for a general audience of educators and practitioners. The goal is to help readers garner the skills and knowledge that will facilitate dialogue, planning, and action concerning equity gaps.

Overview of Three Approaches to Measuring Disproportionate Impact

The 80% Rule Index

The 80% rule index helps answer the question, "Do any subgroups achieve a particular educational outcome less than 80% of the time that the highest achieving subgroup successfully attains that outcome?" The 80% criterion is drawn from the guidelines codified in the 1978 Uniform Guidelines on Employee Selection Procedures (U.S. Equal Opportunity Commission, 1979).

Table 1 on the following page illustrates course success rates across ethnic groups reported by Fullerton College as part of their 2014-2015 Student Equity Plan (Vurdien, DuBois, Nunez, Foster, & Greenhalgh, 2014). For each ethnic group, the total number of students in the cohort is identified (i.e., all students who took a graded class), along with the number of students who achieved a successful course outcome (grade C or better).

The success rates (successful outcomes divided by total cohort count) are then listed in the adjacent column.

Table 1. Course Success Rates by Ethnicity with 80% Rule Indices

Ethnic Group	Cohort Count	Outcome Count	Success Rate	80% Index
African American	2,547	1,388	54.5%	74.8%
American Indian	213	144	67.6%	92.8%
Asian	9,834	7,166	72.9%	100%
Hispanic	35,055	22,304	63.6%	87.3%
Multi Ethnic	2,261	1,468	64.9%	89.1%
Pacific Islander	286	153	53.5%	73.4%
White	16,696	11,878	71.1%	97.6%
Unknown	2,508	1,509	60.2%	82.6%
Total	69,400	46,010	66.3%	

Source: Vurdien, et al. (2014)

Utilization of the 80% rule index to assess disproportionate impact starts with the identification of the subgroup with the highest rate of success, referred to as the "reference" group. In this case, Asian students represent the reference group, with an average success rate of 73%. The next step is to divide the success rate of each ethnic group by that of the reference group. This method can be summarized as follows:

80% index = cohort group rate ÷ reference group rate

The term *cohort group rate* refers to the success rate of the particular subgroup being examined (e.g., African-American students), and the term *reference group rate* refers to that of the group earning the highest success rate (e.g., Asian students). As illustrated in the column in Table 1 labeled 80% Index, the majority of ethnic groups in this example achieved success rates that were within 80% of the rate achieved by Asian students. However, two groups—African-American students and Pacific Islander students—had success rates that were less than 80% of the reference group's success rate. This indicates that African-American and Pacific Islander students were disproportionately impacted. As a result, Fullerton College proceeded to identify

activities designed to address these gaps in educational success in their student equity plan.

The Proportionality Index (PI)

The proportionality index addresses the question, "If a subgroup of students represents 45% of the student body, does that subgroup also represent at least 45% of the students who achieve a specific educational outcome?" Theoretically, if educational achievement was equitable across all subgroups of students, the answer to this question would be "yes." However, when a group's representation with respect to one or more educational outcomes is found to be at a lower rate than its representation in the general student body, disproportionate impact may be indicated (depending on the size of the observed difference).

The calculation used to measure the PI can be described as follows:

Proportionality index = proportion in outcome group ÷ proportion in cohort

In the equation above, the proportion of students in a particular cohort reflects that subgroup's relative representation across an entire student body; the proportion of students in the outcome group reflects the representation of that same subgroup among all students achieving a certain educational outcome. A proportionality index of 1.00 indicates that a group's representation among those achieving an educational outcome is identical to that group's representation in the student population. In contrast, a PI value of less than 1.00 indicates that a group's representation among those achieving an educational outcome is lower compared to that same group's representation in the student population – it is this circumstance that reflects a possible instance of disproportionate impact.

While PI values less than 1.00 reflect possible instances of disproportionate impact, Bensimon and Malcolm-Piqueux (as cited by Harris, 2015) have recommended using values equal to or less than 0.85 as to identify instances of disproportionate impact. The author explored this further by reviewing 28 randomly selected student equity plans from community colleges around California. The author found that 14 of the 28 colleges utilized the PI index to help identify gaps in achievement between student demographic groups. Ten of these colleges (71%) employed a cut-off value between 0.80 and 0.89, and six of these colleges (43% of original sample of 14) employed cut-off values between 0.80 and 0.85. Taken together, such evidence corroborates the 0.85 value recommended by Bensimon and Malcolm-Piqueux.

Table 2 on the next page presents the same data from Fullerton College's student equity plan that was shown in Table 1. However, this table compares the percentage of

students in a particular subgroup found in the student population (i.e., cohort percentage) to the percentage of students in that subgroup who achieved a successful course outcome. A PI cut-off of 0.85 would identify the same groups as disproportionately impacted as the 80% rule did (see Table 1).

Table 2. Course Success Rates by Ethnicity and Proportionality Indices

Ethnicity	Proportion of Cohort		Proportion Grade Outo	Proportionalit y Index	
	Count	Percent	Count	Percent	
African American	2,547	3.67%	1,388	3.02%	0.82
American Indian	213	0.31%	144	0.31%	1.02
Asian	9,834	14.17%	7,166	15.57%	1.10
Hispanic	35,055	50.51%	22,304	48.48%	0.96
Multi Ethnic	2,261	3.26%	1,468	3.19%	0.98
Pacific Islander	286	0.41%	153	0.33%	0.81
White	16,696	24.06%	11,878	25.82%	1.07
Unknown	2,508	3.61%	1,509	3.28%	0.91
Total	69,400	100%	46,010	100%	1.00

Source: Vurdien, et al. (2014)

As illustrated in Table 2, proportionality indices are greater than 0.90 for all groups except two: African-American students (0.82) and Pacific Islander students (0.81). These PI results reflect, for example, that although African-American students make up 3.67% of the overall student population, they are successful in courses only 3.02% of the time. This suggests, as Fullerton College concluded, that these two groups may be considered to be disproportionately impacted.

The Percentage Point Gap Index

The percentage point gap approach to determining DI measures the difference in percentage points between a given demographic group's educational outcomes and the overall average (or mean) for those outcomes across all demographic groups (Harris, 2015). The larger the difference between these two figures, the more likely that such a difference is reflective of disproportionate impact. For instance, if 10% of one subgroup of students placed into transfer-level math, but 20% of all students placed into transfer-level math, then the point gap value for the subgroup in question would be negative ten (-10). This analysis can be expressed as follows:

Percentage point gap = % of outcome for all students – % of outcome for students in subgroup

As with the proportionality index, there is no consensus with regards to the magnitude of point gap values necessary to indicate disproportionate impact. In practice, point gap values of even three points may be considered to be indicative of disproportionate impact (Harris, 2015). Additionally, small point gap values may reflect meaningful differences in achievement when subgroup group values are tightly clustered around the mean. For instance, if all but one of the subgroups being examined is within two points of the overall average, yet that one subgroup is three points below the average, that outlier subgroup may be experiencing disproportionate impact. Similarly, larger cutoff values (such as seven or above) may be necessary to indicate disproportionate impact in cases where there is a great deal of variability among the subgroups; a three-point difference may not be indicative of significant disproportionate impact when the there is a 30-point range between the highest and lowest subgroup scores.

Table 3 below examines the same course success rate by ethnicity data from Fullerton College shown in the previous two tables. The second column from the right, labeled Success Rate (Overall), indicates the overall success rate observed for the entire student population (this is why it is the same value for each group). The final column on the right, Point Gap Value, reflects the difference between each group's specific course success rate and the overall course success rate. A positive sign in front of the point gap value indicates that a group's course success rate is higher than the overall success rate, while a negative sign reflects a lower success rate in the corresponding group.

Table 3. Course Success Rates by Ethnicity and Point Gap Value

Ethnic Group	Cohort Count	Outcome Count	Success Rate (Per Group)	Success Rate (Overall)	Point Gap Value
African American	2,547	1,388	54.50%	66.30%	-11.8
American Indian	213	144	67.61%	66.30%	+1.3
Asian	9,834	7,166	72.87%	66.30%	+6.6
Hispanic	35,055	22,304	63.63%	66.30%	-2.7
Multi Ethnic	2,261	1,468	64.93%	66.30%	+1.4
Pacific Islander	286	153	53.50%	66.30%	-12.8
White	16,696	11,878	71.14%	66.30%	+4.8
Unknown	2,508	1,509	60.17%	66.30%	-6.1
Total	69,400	100%	66.30%		

Source: Vurdien, et al. (2014)

Findings shown in Table 3 indicate point gap values exceeding negative ten for the two groups identified via the 80% rule, namely African-American students (-11.8 points) and Pacific Islander students (-12.8 points). Thus, findings stemming from the use of this approach point to those groups as being disproportionately impacted. As such, these are the student groups for which institutional strategies should be implemented to improve their chances for educational success.

Broad Considerations When Employing Disproportionate Impact Approaches

There are some considerations that should be taken into account when working with any of the disproportionate impact approaches (Harris, 2015). First, one should consider the number of students belonging to a subgroup identified as disproportionately impacted. Disproportionate impact findings based upon a small number of students (e.g., fewer than 50) should be examined with caution as such findings are subject to greater variability than seen with larger groups. In other words, the results observed for such small groups may fluctuate greatly when examined in the future, calling into

question the reliability of the findings. It is for this reason that colleges may want to establish a higher disproportionate impact threshold (e.g., a point gap greater than ten points) in order to accurately identify disproportionate impact among smaller groups. Correspondingly, a smaller threshold (e.g., a point gap value greater than five points) can be used to identify disproportionate impact in larger groups. Disproportionate impact findings stemming from fewer than 30 students should be viewed with great caution. Additional data collection or combining multiple years of data is recommended to increase confidence in the reliability of findings in these cases.

A second consideration applies specifically to the percentage point gap approach. The point gap approach is founded upon the notion of generating an overall benchmark value based upon outcomes data aggregated from all of the demographic groups. This means that demographic groups with the highest number of students will tend to show outcomes with values that are close to the overall average, resulting in relatively low point gap differences. These minimal differences, however, do not necessarily indicate a lack of disproportionate impact; rather, the large number of students in such subgroups may inadvertently obscure cases of disproportionate impact when using the percentage point gap approach. To address this issue, the CCCCO recommends that colleges consider comparing the performance of such groups to the same demographic groups at other similar colleges (Harris, 2015). In addition, it is recommended that colleges consider comparing larger demographic groups to an aggregate value that does not include the demographic group in question. For instance, if Hispanic students represent 50% of the student body at a particular campus, then a comparison of success rates using the percentage point gap method may yield a small point gap difference between Hispanic students and the student population as a whole. To address this potentially misleading result, one could calculate the aggregate success rate by including data only for non-Hispanic student groups. This approach would highlight any difference between Hispanic students (or any highly represented group at the college) and the remainder of the student population.

Table 4 on the following page lists the primary advantages and disadvantages of each of the three methods discussed for identifying disproportionate impact.

Table 4. Comparison of Disproportionate Impact Methods

	Advantages	Disadvantages
80% Rule Index	Clearly establishes cutoff value for determining DI Effective method for comparisons between subgroups	Rigid 80% cutoff can curtail discussion or further exploration May be subject to error if sample size is very small
Proportionality Index	Effective method for assessing equitable group representation Prompts rich discussion about disproportionate impact	No universally agreed-upon benchmark value for DI
Percentage Point Gap Index	Easy to calculate Prompts rich discussion about disproportionate impact	DI of most well-represented group(s) may be obscured No agreed-upon benchmark value for DI

The Use of DI Measurement Approaches in Three Case Studies

In the following section, the report offers three case studies to demonstrate the results of utilizing each of the previously described data disaggregation measurement methods with real-world California Community College data.

Case Study 1: Identifying Disproportionate Impact among Students Applying but not Partaking in Orientation

This first case study addresses potential disproportionate impact among students applying to a community college but not participating in the college's orientation. Are certain subgroups more likely than others to apply but not complete their orientation? If so, then which aspect of the matriculation process appears to present the largest obstacle? The data for this case study come from the fall 2016 semester at Crafton Hills College in Yucaipa, California. A key question the college sought to answer was

whether disproportionate impact existed with respect to the percentage of students that participated in the college's student orientation. Such findings would shed light on the demographic groups that might need additional outreach and education so as to complete a key step in the matriculation process.

Table 5 on the next page illustrates the orientation participation rates for students of various age groups among Crafton Hills College applicants that did not enroll in any classes. Additionally, the table presents findings on the basis of the three aforementioned disproportionate impact indices.

Table 5. Orientation Rates by Age Groups Among Students Applying but Not Participating in Orientation at Crafton Hills College

Age Group	Count	Outcome Count	Orientation Participati on Rate	80% Index	Point Gap Index	Proportio n Index
19 or younger	957	322	33.65%	100%	+6.66	1.25
20 – 24	562	130	23.13%	68.74%	-3.86	0.86
25+	574	113	19.69%	58.51%	-7.30	0.73
Total	2,093	565	26.99%			

Source: Sosa (2016)

80% Rule Index Analysis

The youngest age group (19 or younger) was identified as the reference group, as these students had the highest orientation participation rate. The participation rates of the two older age groups were then divided by that of the rate for students age 19 or younger. This approach revealed that the two older age groups were disproportionately impacted: 20-24 year olds (68.74%) and 25 or older (58.51%).

Percentage Point Gap Index Analysis

To analyze the above data using the percentage point gap approach, one measures the difference between the orientation participation rate for all 2,093 applicants and that of students in each individual age group. Given the orientation rate of 26.99% across all 2,093 students, and bearing in mind the recommendation that a three-point gap may

constitute a meaningful finding, this approach also suggests that both 20-24 year olds (-3.86) and those 25 or older (-7.30) were disproportionately impacted.

Proportionality Index Analysis

As described earlier, the proportionality index compares a demographic group's representation across the college to the same demographic group's representation among those achieving a particular educational outcome. To use the proportionality index in this case study, the number of individuals in a specific age group that participated in orientation is divided by the total number of individuals that participated in orientation. For instance, one could divide the number of students ages 25 and older who participated in orientation (113) by the total number of individuals participating in orientation (565), producing a result of .20. The second step in this process would be to divide the total number of individuals in that age group (574 total students over age 25) by the number of individuals in the entire cohort (2,093), which comes to .27. Finally, the PI is determined by dividing those resulting ratios (0.20 \div 0.27 = 0.73). On the basis of this finding, and using the 0.85 cutoff described earlier, only students ages 25 or older can be identified as disproportionately impacted.

Overall Data Disaggregation Determination

Given the evidence generated using the three disproportionate impact methods, it appears that two groups in this example are disproportionately impacted: applicants between the ages of 20 and 24 and those 25 or older. Such a finding suggests that the institution should prioritize developing and implementing strategies designed to mitigate (or eliminate) obstacles that older applicants might be experiencing by exploring, perhaps via survey or focus groups, why such applicants are not taking the next step in the matriculation process.

Case Study 2: Investigating Disproportionate Impact in the Context of Course Placements

This second case study addresses possible disproportionate impact among ethnic groups in the context of course placements. This case examines fall 2015 data submitted by Riverside Community College District as part of their participation in the California Acceleration Project.

Table 6 below displays data related to placement rates into transfer-level English courses, disaggregated by ethnic group. In addition, the table illustrates the findings stemming from the use of the three disproportionate impact indices. Due to the small

number of students within several ethnic groups at Riverside Community College, this analysis focuses on only four groups: (1) African American, (2) Asian, (3) Hispanic, and (4) white.

Table 6. Course Placement Rates in Transfer-Level English at Riverside Community College by Ethnicity and the Three Disproportionate Impact Indices

Ethnic Group	Cohort Count	Outcom e Count	Placement Rate	80% Index	Percentag e Point Gap	Proportionalit y Index
African-American	335	38	11.34%	39.94%	-6.46	0.64
Asian	141	30	21.28%	73.08%	3.48	1.20
Hispanic	2310	357	15.45%	53.06%	-2.35	0.87
White	625	182	29.12%	100.00	11.32	1.64
Total	3,411	607	17.80%			

Source: Riverside Community College (2015).

80% Rule Index Analysis

With white students serving as the reference group, the placement rates of the remaining groups were divided by those of white students. Using this approach, the three remaining groups appear to be disproportionately impacted: African-American (39.94%), Asian (73.08%), and Latino (53.06%) students.

Point Gap Index Analysis

The aim here is to take the difference between the placement rate for all 3,411 students in the cohort and that of each individual ethnic group. Given the overall placement rate of 17.80% across all students in the cohort, African-American students were found to be disproportionately impacted with a -6.46 percentage point gap. In addition, using a three-point cut-off threshold, Asian students were also disproportionately impacted with a -3.48 percentage point gap.

Looking at these data, one might ask why the point gap value for Hispanic students (-2.35) was much smaller than the value for the other groups. As noted earlier, one

drawback of using the percentage point gap method is that demographic groups with the highest number of students will often show outcomes that are highly correlated with the aggregate value, resulting in relatively low observed percentage point gap differences. This is certainly the case with Hispanic students here, since they represent 59% of all placements. It is not surprising, therefore, that there is little difference in the placement rate for Hispanic students and the overall placement rate. Removing Hispanic students from the computation of the overall placement rate results in a larger percentage point gap value (-7.25) that is consistent with disproportionate impact.

Proportionality Index Analysis

The proportionality index compares a demographic group's representation across the college to the same demographic group's representation among all students who achieve a particular outcome. In the current context, this method entails dividing a group's representation among students being placed into a course one level below transfer math by that same ethnic group's representation among all students being placed into transfer math courses. Using this approach, along with the aforementioned recommendation for identifying meaningful proportionality indices, African-American students were identified as being disproportionally impacted $(.062 \div .098 = 0.64)$.

Overall Disproportionate Impact Determination

Given the evidence generated using the three disproportionate impact methods, it appears that at least one group—African American students—is disproportionately impacted with respect to course placement in transfer-level English classes. Moreover, Asian students were found to be disproportionately impacted via two of the three methods, indicating that they too are disproportionately impacted. Such a finding suggests that the institution should prioritize developing and implementing strategies designed to ameliorate, if not eliminate, the disproportionate impact that African-American and Asian students are experiencing. Hispanic students, on balance, do not appear to be disproportionately impacted because only one of the three methods indicated disproportionate impact.

Conclusions

Data disaggregation is a key first step in identifying potential equity gaps across an array of academic outcomes. With disaggregated data, it is possible to complete the critical task of conducting disproportionate impact analyses. Disproportionate impact analyses help educators and education researchers better understand the extent to

which one or more student demographic groups is potentially disadvantaged in their quest for academic success.

There are various approaches to determining disproportionate impact, each of which offers certain advantages and disadvantages. As such, it is recommended that colleges consider using more than one method to identify disproportionate impact; in doing so, colleges can increase their certainty that the student groups they identify as disproportionately impacted are indeed in need of institutional intervention. One comprehensive approach, for instance, would be to apply all three disproportionate impact methods described in this paper and identify equity gaps only in cases for which at least two of the methods pointed to disproportionate impact.

Finally, while this paper has focused on methodological and statistical methods underlying the identification of disproportionate impact, readers are urged to consider that the most important step in this process comes *after* the numbers have been crunched: the resulting institutional dialogue which ideally leads to substantive change in students' educational outcomes. Upon the identification of likely equity gaps, it is incumbent upon colleges to develop and implement a plan for how to potentially ameliorate the obstacles faced by disproportionately impacted groups. Objective evidence that does not lead to informed dialogue, planning, and ultimately action will do little to close equity gaps.

Research and Planning Group for California Community Colleges

The RP Group strengthens the ability of California community colleges to discover and undertake high-quality research, planning, and assessments that improve evidence-based decision-making, institutional effectiveness, and success for *all* students.

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