Percentage Point Gap Method

Introduction

This document presents an overview of the percentage point gap (PPG) method to measure disproportionate impact, with guidelines to better understand the disaggregated subgroups that are significantly impacted. This method can be applied to assess disproportionate impact for the following success indicators: access, course completion, ESL & basic skills completion, degree and certificate completion, and transfer.

Disproportionate impact occurs when a subset of students based on student characteristic such as age, race, and gender are unjustifiably experiencing lower outcomes compared to the total student population. The Chancellor's Office cares about this issue as we want to ensure policies and practices are not designed to impede student success for a given student population. Over the past few years, colleges were allowed to use various methods to measure disproportionate impact; but due to the passage of AB 504, we are legislatively mandated to use at least one common methodology across all colleges and districts. Additionally, using one method will make it easier to measure the magnitude of issue systemwide and track it as we close the equity gap.

The Chancellor's Office chose the percentage point gap (PPG) method because of its popularity and ease of use. Examples on how to use this method will be shown in this document, as well as graphs in visualizing the disproportionate impact. However, specific metrics and other characteristics (e.g., access, foster youth, veterans, and other special populations) will not be discussed in this document in order to focus on the methodology.

What is the Percentage Point Gap Method?

The PPG is considered the simplest way to determine inequities in outcomes between student populations (Center for Urban Education, 2015). The formula compares the percentage in a particular outcome (e.g., course completion rate) for a disaggregated subgroup to the percentage for all students. For example, the percentage point gap for the course completion rate can be calculated as follows:

Figure 1. Percentage Point Gap Formula (Center for Urban Education, 2015)

The percentage point gap (PPG) method subtracts the overall percentage (p) from the percentage of the disaggregated subgroup ($\hat{p}$).

$$PPG = (\%\ of\ subgroup) - (overall\ \%)$$

$$PPG = \hat{p} - p$$

where: $\hat{p}$ = percentage (%) of subgroup or "sample" proportion ("p-hat")

p = overall percentage (%) or "population" proportion

In this context, the sample proportion ("p-hat") is the percentage for a disaggregated subgroup, which is a subset of the population; while the population proportion (p) is the overall percentage. Note that the percentage point gap can have positive (+) or negative values (-). A negative PPG means that the disaggregated subgroup has a lower success rate compared to the rate of all students, and might be experiencing significant disproportionate impact. A positive PPG means that the subgroup has a higher success rate, and is not experiencing disproportionate impact.

The detection of disproportionate impact in the point gap method uses a threshold or margin of error (E) that is adjusted by the sample size (n) or cohort size of the subgroup. The standard margin of error is 3% if the sample size of the subgroup is at least 800 (n ≥ 800). The margin of error decreases as the sample size increases, which is outlined in Appendix A.

If the two proportions are the same ($\hat{p}$ versus p), then the difference is zero or close to zero, and the PPG should be within +/- 3 percentage points (no disparity), or corresponding margin of error based on the sample size. If their rate is outside of the lower end of the margin of error, then the student group is considered to be disproportionately impacted for that outcome. Table 1 provides the thresholds, adjusted by the sample size to determine the presence of disproportionate impact for cohorts examined; otherwise, anything outside the range of values can be considered disproportionate. The table below provides the thresholds, adjusted by the sample size to determine the presence of disproportionate impact for cohorts examined.

Table 1. Margin of Error (E) or Thresholds in Identifying Disproportionate Impact

PPG ≤ -E%	*Disproportionately lower than the overall population*
-E% < PPG < E%	*No disproportionate impact*
PPG ≥ E%	*Disproportionately higher than the overall population (or no adverse disproportionate impact)*

- *For n ≥ 800, use E = 3% margin of error for large samples.*
- *For n < 800, use E = margin of error in **Appendix A***

Where did the margin of error (E) come from?

The margin of error can be calculated based on a 95% confidence level, and the given sample size (n). As the sample size gets smaller, the margin of error increases. Below is the formula used in calculating the thresholds in the previous page. Note that:

$\hat{q} = 1 - \hat{p}$ and so, $\hat{p}\hat{q} = \hat{p}(1 - \hat{p}) = \hat{p} - \hat{p}^2$ is a quadratic bounded by 0.25; or $0 \leq \hat{p}\hat{q} \leq 0.25$.

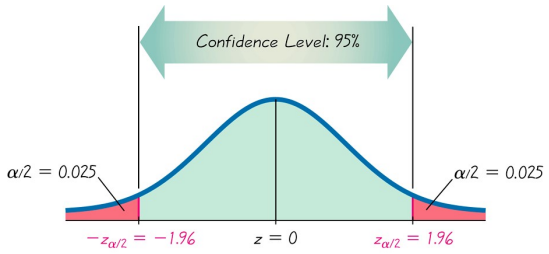

Figure 2. Critical Values for a 95% Confidence Interval (Triola, 2010)

Margin of Error Formula:

$$E = Z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$$

Margin of Error Formula for a 95% Confidence Interval and sample proportion of .50:

$$E = 1.96\sqrt{\frac{(.25)}{n}}$$

Table 2 demonstrates the PPG for completion rate by ethnicity. The overall completion rate for the college is 51.9%, which is the percentage subtracted from the percentage of the subgroup. For example, the African American subgroup has a completion rate of 46%, and so the gap is calculated:

$$PPG = 46\% - 51.9\% = -5.9\%$$

Without looking at the sample size, we would assume African Americans are disproportionately impacted, as well as American Indian/Alaska Native, Hispanic, and Pacific Islander because their PPGs are below -3%. However, if we adjust the margin of error (E) based on the sample size (see Appendix A), then the Hispanic subgroup is the only group with disproportionate impact because the percentage point gap of -5% is below -4%. The remaining subgroups have percentage point gaps that are either:

- within the limits of the margin of error: $-E < PPG < E$
- greater than or equal to the threshold (E): $PPG \geq E$, in other words, PPG is at least E.

In either case, this shows no adverse disproportionate impact. Disproportionate impact happens when the PPG ≤ -E, this is when the percentage point gap is equal to or below the threshold (-E); or at most -E.

Table 2. Percentage Point Gap of Completion Rate by Ethnicity

	Cohort Size	Cohort Rate	PPG	E	Comparison of threshold (E) and PPG
African American	63	46.0%	-5.9%	12%	-12% < -5.9% < 12%
American Indian/Alaska Native	17	29.4%	-22.5%	24%	-24% <-22.5% < 24%
Asian	112	68.8%	16.9%	9%	16.9% > 9%
Filipino	36	77.8%	25.9%	16%	25.9% > 16%
Hispanic	761	46.9%	-5.0%	4%	-5% < -4%
Pacific Islander	13	38.5%	-13.4%	27%	-27% <-13.4% <27%
White	1978	53.3%	1.4%	3%	-3% < 1.4% < 3%
All	3182	51.9%	0%		

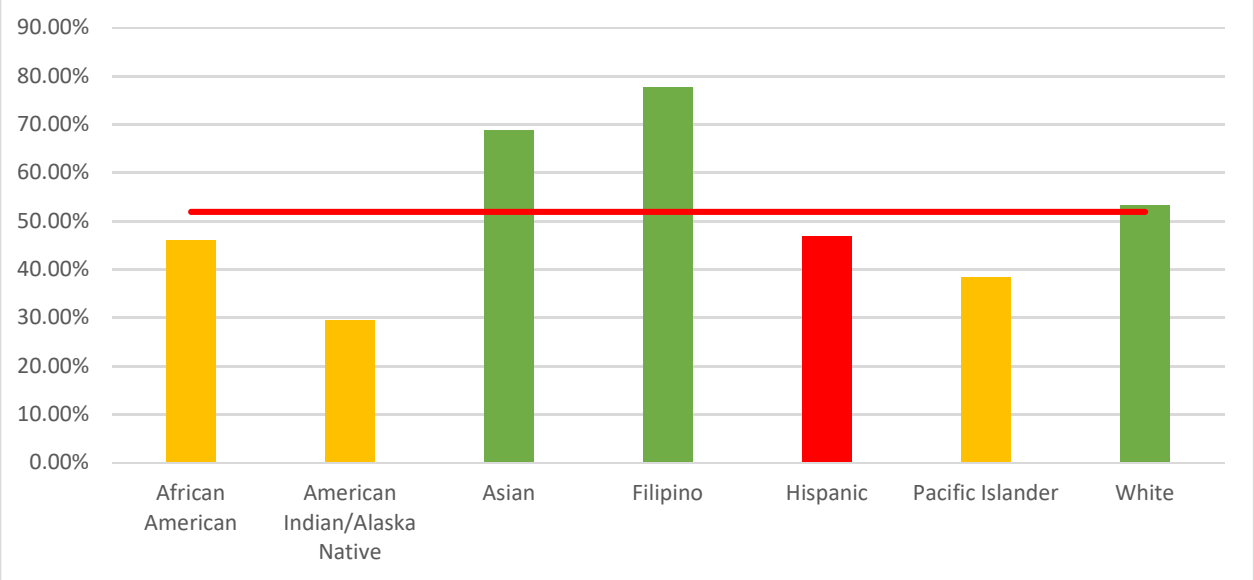

Figure 3. Completion Rates by Ethnicity/Race

An easy way to create a visualization on disproportionate impact at your college is through a bar graph. Figure 2 is a bar graph on the completion rate by ethnicity, with the horizontal red line representing the overall completion rate (51.9%). However, the limitation of this graph is that it does not capture the sample size, and therefore can be misleading on impact. Figure 3 shows the location of the percentage point gap (PPG) in comparison to the margin of error (E) based on the sample size. If the PPG is below the interval, then there is adverse disproportionate impact, as in the case of the Hispanic subgroup (circled for emphasis).

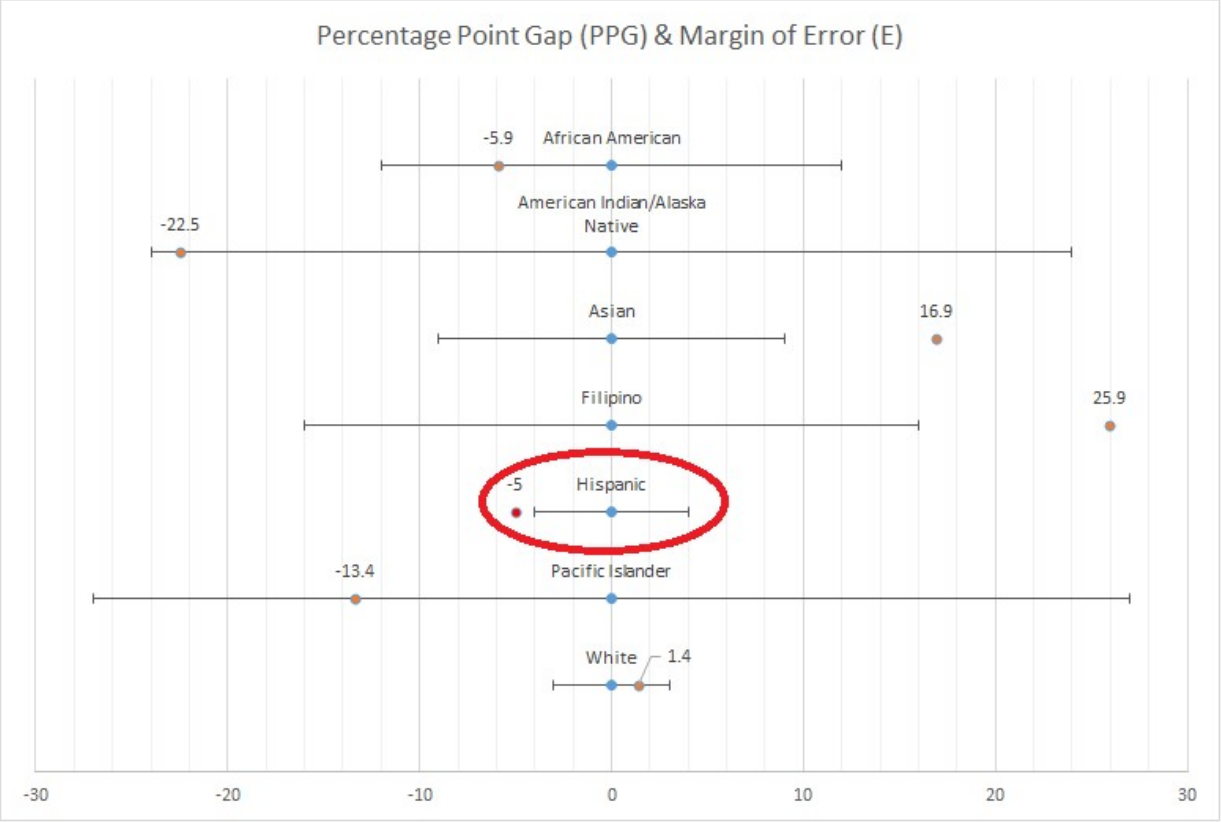

Figure 4. Percentage Point Gap and the Error Bar

Number of Students "Lost" or Needed to Close the Equity Gap:

The advantage of using the percentage point gap method is that it allows us to estimate the number of students "lost" due to the equity gap, or the number of students needed to close the equity gap. In the previous example, we saw that the Hispanic subgroup was disproportionately impacted. How many Hispanic students would we need to close the equity gap? Table 3 shows how to calculate this number by taking the absolute value of the percentage point gap (removing the negative sign), and multiplying its decimal equivalent with the cohort size (or sample size). Remember to round the number of students to the nearest whole number. For example, 0.05 x 761 is 38 Hispanic students "lost," which is considerably more than the other subgroups (ranging from 2 to 4 students "lost"). Note that this is not a quota, rather, an estimate of the number of students needed to fill the equity gap.

Table 3. Number of Students "Lost" or Needed to Close the Equity Gap

	Absolute value of PPG	Decimal Equivalent	Multiply	Cohort Size	Number of Students "Lost"
African American	5.90%	0.059	x	63	4
American Indian/Alaska Native	22.50%	0.225	x	17	4
Hispanic	5.00%	0.05	x	761	38
Pacific Islander	13.40%	0.134	x	13	2

Steps in Using the Percentage Point Gap:

- Identify the overall percentage (p) for a particular outcome or student equity indicator (e.g., access, course completion or retention, ESL and basic skills completion, degree and certificate completion, or transfer rate).
- Obtain the disaggregated data to identify the percentage for the subgroups $(\hat{p})$: gender, age, ethnicity/race, foster youth, veterans, low-income or disabled.
- Subtract the overall percentage (p) from the percentage of the subgroup $(\hat{p})$: PPG = $\hat{p} - p$
- If the subgroup has a cohort size of at least 800, then use a 3% margin of error as the threshold in identifying disproportionate impact.
- If the subgroup has a cohort size below 800, then use the appropriate margin of error from the table in **Appendix A.**
- Remember that disproportionate impact happens when PPG ≤ -E, this is when the percentage point gap is equal to or below the threshold (-E), in other words, PPG is at most -E.
- No adverse disproportionate impact happens when the percentage point gaps are either:
    - within the limits of the margin of error: *-E < PPG < E*
    - greater than or equal to the threshold (E): *PPG ≥ E,* in other words, PPG is at least E.

- For very small subgroups or cohort size (n ≤ 10), data is usually suppressed to ensure confidentiality and privacy, so it is not advisable to calculate the percentage point gap. Furthermore, the margin of error will be too wide—greater than 30% when the sample size is less than 10.
- The Center for Urban Education (2015) recommends that when the college's largest demographic group is disproportionately impacted, consider using the highest performing subgroup in place of the overall proportion (p).
- To calculate the number of students "lost" due to the equity gap, or the number of students needed to close the gap:
    - change the percentage point gap into its decimal equivalent
    - turn the negative into positive numbers (absolute value)
    - multiply the decimal number to the sample size or cohort size
    - round up the answer to the nearest whole number
    - remember that this is only an estimate, not a quota.

Works Cited:

A.B. 504, Medina, Community Colleges: Student Success and Support Program Funding. (2017). Sacramento, CA: Legislative Assembly.

Center for Urban Education. (2015). Equity Academy Participant Workbook, AAC&U Committing to Equity and Inclusive Excellence: Campus-based strategies for student success. Los Angeles, CA: Rossier School of Education, University of Southern California.

Triola, M. (2010). Elementary Statistics, 11th Ed. Pearson Publishing.

Appendix A: Margin of Error – Thresholds for the Percentage Point Gap (based on 95% CI).

n	E(95%CI)	n	E(95%CI)	n	E(95%CI)	n	E(95%CI)
11	30%	51	14%	91	10%	410	5%
12	28%	52	14%	92	10%	420	5%
13	27%	53	13%	93	10%	430	5%
14	26%	54	13%	94	10%	440	5%
15	25%	55	13%	95	10%	450	5%
16	25%	56	13%	96	10%	460	5%
17	24%	57	13%	97	10%	470	5%
18	23%	58	13%	98	10%	480	4%
19	22%	59	13%	99	10%	490	4%
20	22%	60	13%	100	10%	500	4%
21	21%	61	13%	110	9%	510	4%
22	21%	62	12%	120	9%	520	4%
23	20%	63	12%	130	9%	530	4%
24	20%	64	12%	140	8%	540	4%
25	20%	65	12%	150	8%	550	4%
26	19%	66	12%	160	8%	560	4%
27	19%	67	12%	170	8%	570	4%
28	19%	68	12%	180	7%	580	4%
29	18%	69	12%	190	7%	590	4%
30	18%	70	12%	200	7%	600	4%
31	18%	71	12%	210	7%	610	4%
32	17%	72	12%	220	7%	620	4%
33	17%	73	11%	230	6%	630	4%
34	17%	74	11%	240	6%	640	4%
35	17%	75	11%	250	6%	650	4%
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38	16%	78	11%	280	6%	680	4%
39	16%	79	11%	290	6%	690	4%
40	15%	80	11%	300	6%	700	4%
41	15%	81	11%	310	6%	710	4%
42	15%	82	11%	320	5%	720	4%
43	15%	83	11%	330	5%	730	4%
44	15%	84	11%	340	5%	740	4%
45	15%	85	11%	350	5%	750	4%
46	14%	86	11%	360	5%	760	4%
47	14%	87	11%	370	5%	770	4%
48	14%	88	10%	380	5%	780	4%
49	14%	89	10%	390	5%	790	3%
50	14%	90	10%	400	5%	800	3%