

ESTIMATION OF ACHIEVEMENT GAPS ON A LARGE-SCALE ASSESSMENT IN HAWAI'I

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ABSTRACT

This study reports the achievement gaps in reading between Native Hawaiian students and their white peers, based on the 2011 Hawaii State Assessment. Two statistical methods were used to estimate the ethnicity-related achievement gaps. The first method is the traditional difference between means along with the effect size d . The other method is hierarchical linear modeling (HLM), which controls for student- and school-level confounding factors.

RESEARCH QUESTIONS

1. What would be the estimates of the disadvantage of Native Hawaiian students in comparison with their white counterparts at grades 3, 4, 5, 6, 7, 8, and 10, respectively, as calculated through the traditional effect size d based on mean differences?
2. What would be the estimates of the disadvantage of Native Hawaiian students in comparison with their white counterparts at grades 3, 4, 5, 6, 7, 8, and 10, respectively, as calculated through the multilevel approach that takes into account of confounding factors?

POPULATION

There were 94,572 students from grades 3 to 8 and in grade 10 in the 2011 cohort. Of the cohort, 25,982 (27.47%) were Native Hawaiians and 13,353 (14.12%) were white. The third- to fifth-graders were enrolled in 187 elementary schools, the sixth- to eighth-graders in 65 middle schools, and the tenth-graders in 54 high schools. Native Hawaiian students constitute the largest ethnic group in Hawai'i's public schools.

RESULTS

The mean difference between Native Hawaiian and white students seemed to be quite stable, ranging from **-21 to -26 points**. A statistically significant achievement gap was found at every grade level. The effect size for the ethnicity-related disadvantage ranged from **-0.61 to -0.82**, suggesting that on average Native Hawaiian students performed between 0.61 to 0.82 standard deviations below their white peers from grades 3 to 10. The higher the grade, the greater the disadvantage is for Native Hawaiian students.

Figure 1. Distribution of mean scaled scores on the Hawaii State Assessment Reading Test at grades 3 to 8 and in grade 10.

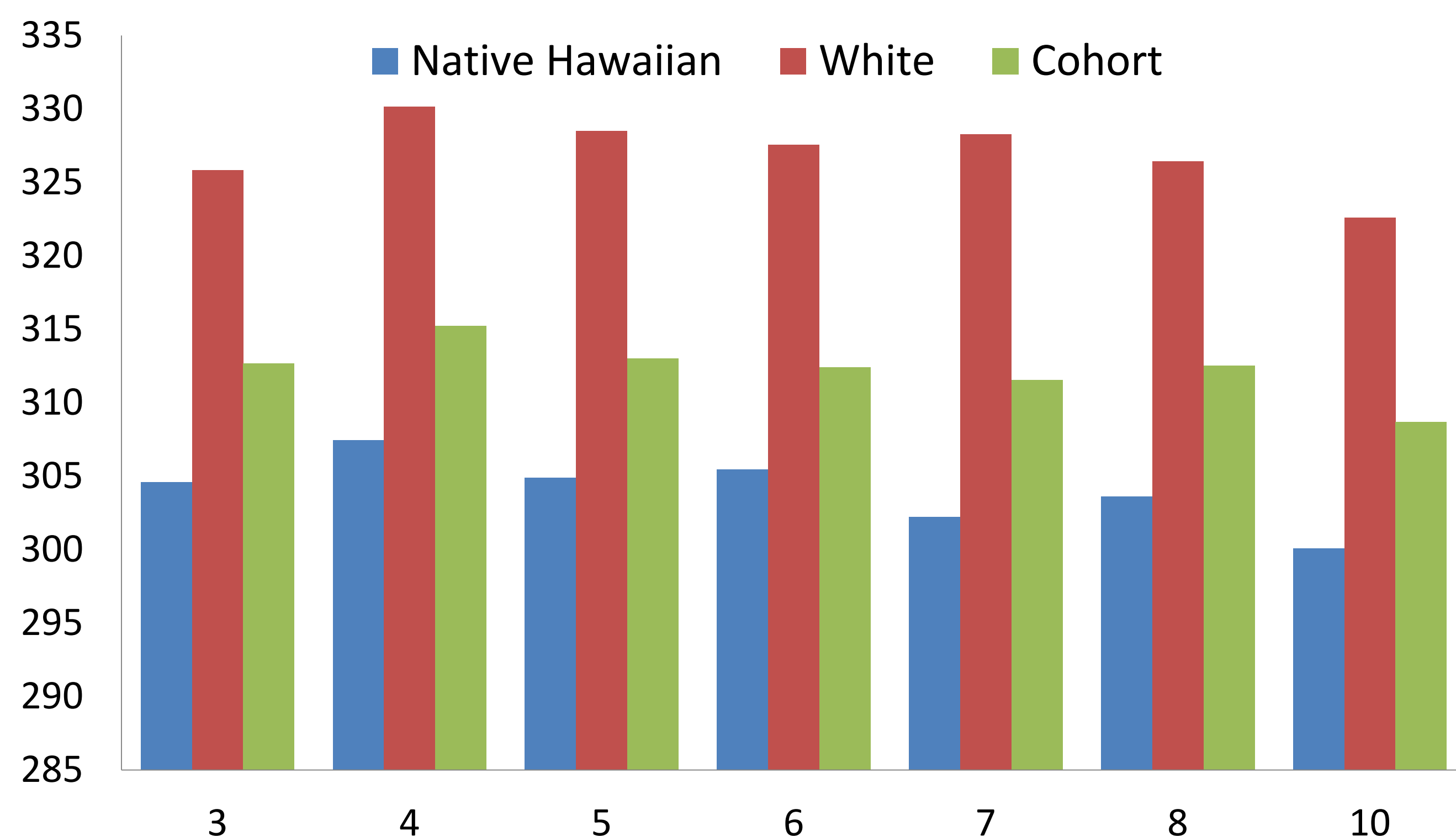


Table 1. T-test results and effect size (d)

Grade	Mean difference	95% confidence limits		t-value	p-value	df	SE	Effect size (d)
		Lower	Upper					
3	-21.26	19.5	23.02	-23.72	0.0001	6333	0.90	-0.61
4	-22.70	20.87	24.53	-24.36	0.0001	5747	0.92	-0.66
5	-23.60	21.90	25.3	-27.22	0.0001	6136	0.87	-0.72
6	-22.12	20.48	23.76	-26.58	0.0001	5719	0.83	-0.74
7	-26.02	24.18	27.86	-27.11	0.0001	5236	0.94	-0.80
8	-22.80	21.11	24.49	-26.52	0.0001	5006	0.86	-0.78
10	-22.52	20.96	24.08	-28.30	0.0001	5144	0.80	-0.82

df – degrees of freedom, and SE – standard error of difference. The negative sign shows the direction of the effect, i.e., a negative effect on Native Hawaiian students.

The estimates of the ethnicity-related disadvantage, however, may not be accurate because the Native Hawaiian group also tends to have a higher proportion of low SES and SPED students (figures 2 and 3). On average, approximately 60 percent of the Native Hawaiian students and 30 percent of white students qualified for free or reduced-price lunch. And, approximately 15 percent of the Native Hawaiian students and 11 percent of white students were designated for special education services.

Figure 2. Distribution of percentage of free/reduced price lunch students at grades 3 to 8 and in grade 10.

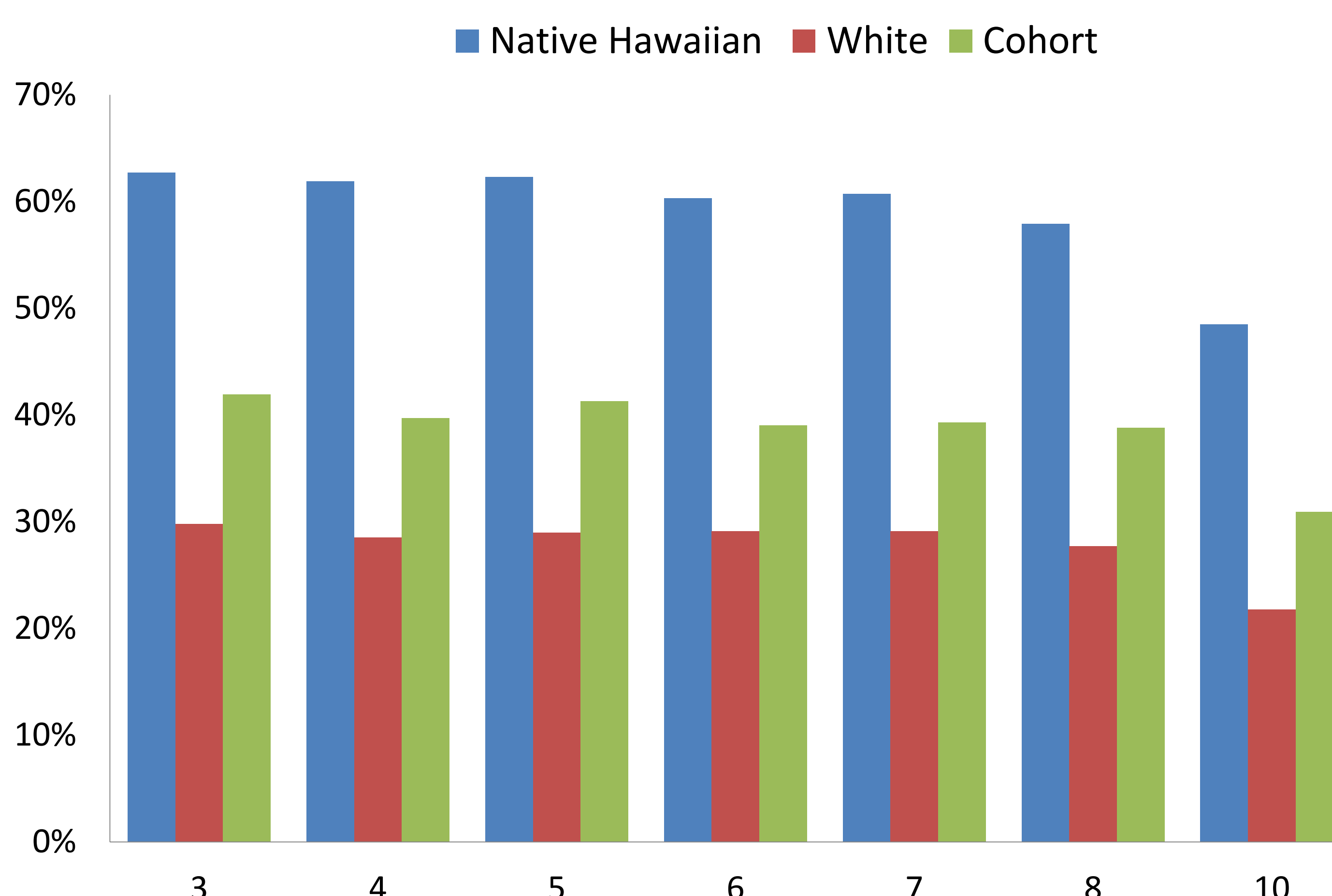
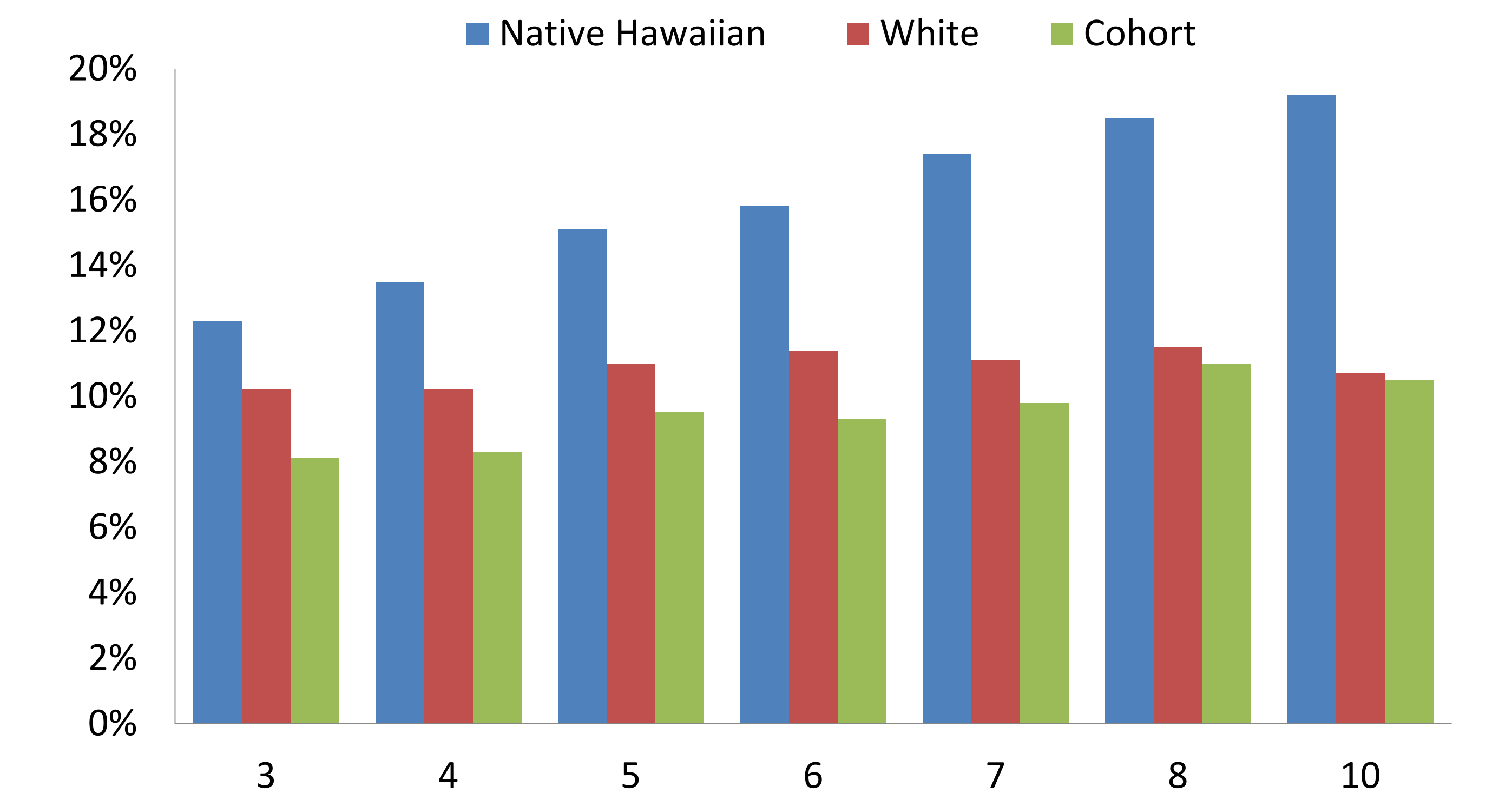


Figure 3. Distribution of percentage of SPED students at grades 3 to 8 and in grade 10.



There is a general trend of increasing number of students identified for special education services at later grades.

Table 2. HLM results showing standardized student-level effects

Predictors	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 10
Hawaiian	-0.43	-0.44	-0.44	-0.49	-0.59	-0.57	-0.58
Gender	-0.18	-0.09	-0.11	-0.17	-0.19	-0.13	-0.14
SES	-0.31	-0.31	-0.23	-0.25	-0.24	-0.17	-0.19
SPED	-1.13	-1.15	-1.16	-1.08	-1.12	-1.06	-1.00

The standardized weights in table 2 were calculated by dividing the weights/slopes by the corresponding cohort. The first method (table 1) overestimates the Hawaiian-white contrast by **36 to 64 percent**. Such overestimation has occurred partly because of the unequal proportions of low SES and SPED students in the two ethnic groups and partly because of the between-school differences independent of the ethnic difference at the student level.

CONCLUSION

This study has provided the rationale and statistical evidence in support of the recommendation that the NCLB-mandated reporting by subcategory be replaced by the HLM approach demonstrated in the paper. Ethnicity-related disadvantage seems to have been consistently inflated under NCLB due to statistical confounding. The multilevel approach, in contrast, seems to be able to overcome the statistical confounding and lends itself readily to large-scale assessments that typically require one model for all grade levels, districts, or subjects.