The Coefficient of Determination: Family Wealth and Student Achievement Scores*

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Abstract

The author demonstrates and provides evidence that there is a strong correlation between family wealth and student standardized achivement test scores.

NOTE: This module has been peer-reviewed, accepted, and sanctioned by the National Council of Professors of Educational Administration (NCPEA) as a scholarly contribution to the knowledge base in educational administration.

The "coefficient of determination" is equal to the correlation squared. When multiplied by 100, the coefficient of determination becomes the percentage of the variance that is associated with, determined by, or accounted for by the variance.

For example, if the correlation between two variables (X and Y) is .5, and if a causal relationship between the two variables can be established, then the percentage of the variance in Y that is accounted for by the variance in X is 25, or one-fourth.

Application:

The "No Child Left Behind" Act requires an annual review of each school served. If adequate yearly progress by a school is not made for two consecutive years, the school is designated for "school improvement." A school that continues to fail to achieve adequate yearly progress for two years after being designated for school improvement must be identified by the local education agency for "corrective action." If after being designated for "corrective action" a school fails to make adequate yearly progress, the school is to be designated for "restructuring."

Teaching or administering a school designated for "school improvement," "corrective action," or "restructuring" is professionally embarrassing. However, since both James Coleman (1966) and Christopher Jenks

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(1972) found that there is often a strong correlation between family wealth and student standardized achievement test scores, punishing low-achieving schools in economically poor neighborhoods is questionable at best.

Coleman collected data on 600,000 children in all fifty states. He noticed that there were large differences in school quality, and believed that this was because schools in the affluent suburbs were well financed, whereas schools in the inner cities were deteriorating. The Civil Rights Act of 1964 ordered the Commissioner of Education to investigate, and Coleman was asked to head that investigation. He predicted that it was the difference in the quality of schools that accounted for the difference in the academic achievement of the poor and minorities.

To his surprise, he found that non-school factors, particularly family background, accounted for the difference:

One implication stands out above all: That schools bring little influence to bear on a child's achievement that is independent of his background and general social context; and that this very lack of an independent effect means that the inequalities imposed on children by their home, neighborhood, and peer environment are carried along to become the inequalities with which they confront adult life at the end of school. (Coleman, 1966)

A subsequent large three-year study by Christopher Jenks confirmed Coleman's findings. (Jenks, 1972)

Additional Evidence:

Given the findings of Coleman and Jenks, here is additional evidence, utilizing data from high schools in Kern County (California):

High School	2006 California AcademicPerformance Index	2006 Percentage of Students Qualifying for Free and Reduced Meals
Stockdale High	770	12.2
Burroughs High	746	24.5
Desert High	736	10.7
Liberty High	710	9.1
Tehachapi High	708	25.9
Frazier Mountain High	699	37.3
Kern Valley High	698	46.2
Centennial High	694	22.6
Bakersfield High	672	43.1
Boron High	668	39.4
Delano High	667	79.3
Ridgeview High	664	39.0

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Chavez High	663	76.0
North High	658	45.6
Rosamond High	657	47.4
Mojave High	653	54.8
Shafter High	650	68.8
Taft High	650	50.3
Highland High	636	51.5
West High	634	53.5
McFarland High	617	79.3
Golden Valley High	614	82.2
Wasco High	600	73.9
Arvin High	600	82.2
Foothill High	596	62.3
East Bakersfield High	592	55.7

Table 1

The correlation between these two variables is -.812 (Notice that this inverse relationship is not perfect, in which case the correlation would have been -1.00, but very close.) Squaring this correlation coefficient allows one to compute the coefficient of determination. In this case the coefficient of determination is .6592 Multiplying by 100 (and rounding), this suggests that about 66% of the variability in the achievement test scores is strongly related to family wealth. High scoring schools have a low percentage of students qualifying for free and reduced price meals, whereas low scoring schools have a high percentage of students qualifying for free and reduced price meals.

This implies that family wealth—a variable not controlled by educators—is having a large impact on student achievement test scores. It suggests that improving student academic achievement in impoverished areas is, and will be, very difficult.

References

Coleman, James et al. (1966). Equality of Educational Opportunity. Washington, D.C.: U.S. Government Printing Office, 235.

Jenks, Christopher (1972). Inequality. New York: Harper & Row.