

The Ripple Effect: The True Cause of Declining SAT Scores

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Running head: The Ripple Effect

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Abstract

SAT scores are declining. This fact is supported and graphically demonstrated. Through the use of sophisticated statistical techniques, the root cause of the decline (both mathematics and verbal scores) is determined and amply demonstrated.

## The Ripple Effect: The True Cause of Declining SAT Scores

It is grave indeed when one of the most pressing issues of the day should cause so much whining among educators. For some time the issue has been bottled up inside academia, but was recently uncorked and brought to the public view by publication of a report "On Further Examination" written by the Advisory Panel on the Scholastic Aptitude Test Score Decline (Willard Wirtz, chairman), published by the College Entrance Examination Board, (Advisory Panel 1977).

The august Panel was quick to point out the problem: SAT Test Scores Are Declining. As the Panel succinctly states "Every year, for 14 years now, there has been a drop in the average scores more than a million high school juniors and seniors get on the Scholastic Aptitude Test (SAT) they take in seeking admission to college." (Advisory Panel, 1977, p. 1). The panel was able to pinpoint several causes they felt were of major importance. Among the causes were: too much television (TV) was being watched by school children, the mix of students taking the test included a higher percentage of minority groups and low income groups, grammar schools and high schools are not teaching the proper material, parents are not teaching their children, and finally, social unrest and The Military Draft/Vietnam War. Not to be left out are mentions of religions of the East, drug-related religions, astrology, an increased number of married

female teachers, the "soft pedagogical left", forced bussing and that pervasive nemesis "NEW MATH".

In a recent issue of Science, Walsh pointed out that high school grades have been inflated over the past years (Walsh, 1979); this could definitely contribute to the decline. At least thirty of the States, such as New York, are instituting minimum competency levels for high school graduation, and New Jersey is testing college freshman for competency in mathematics and English. All these are related to the decline.

Unfortunately these learned bodies have missed the root cause of the decline of SAT scores: it all stems from increased wine consumption by Americans. I will demonstrate, beyond any credible doubt, that all statistical evidence indicates increased wine consumption must be the root cause of the lowering of SAT scores in our American youth. I have named this perfidious relationship The Ripple Effect.

### The Data

There is no doubt that SAT scores are declining. The College Board Report indicates that during the years 1963 to 1977 there was a 49 point drop on the verbal section of the SAT and a 32 point drop on the mathematical portion, commenting that "a decline of this magnitude continuing over a 14 year period ... is clearly serious business." (Advisory Panel, 1977, p 5). A glance

at Table 1 or Figure 1 graphically demonstrates the magnitude of the decline. The concomitant rise in wine consumption is equally well documented by the Wine Advisory Board who bases its results on data from the US Government, these data are also detailed in Table 1 and Figure 1.

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Insert Table 1 about here.

Insert Figure 1 about here.  
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Since Americans are consuming more wine, and Americans have a finite capacity for liquids, consumption of some other liquid must be on the wane. As the Dyonesian must be balanced by the Spartan, it was natural to gather data on coffee consumption (again provided by the Wine Advisory Board).

#### Data Analysis

Data were subjected to a Pearson Product Moment Correlation analysis (Waugh, 1938 p.216). Correlations among the aforementioned variables, also with year, including means and standard deviations, are presented in Table 2. Graphs depicting several aspects of the relationships between the variables are presented in Figures 1 and 2.

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Insert Table 2 about here.

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### Interpretation

The correlation between United States per capita wine consumption and SAT verbal score is very strong ( $-0.9778$ ). Using Fisher's natural log transformation (Waugh, 1938 p.256), the correlation is significant beyond 0.000001 ( $z=-10.7658$ ). This clearly proves that increased wine consumption leads to falling SAT verbal score. A regression estimate predicts a staggering drop of 30.9913 verbal SAT points for each gallon of per capita wine consumption.

It is noteworthy that the correlation between SAT mathematics score and wine consumption is not as strong ( $-0.9316$ ), with a predicted drop of only 17.2601 math SAT points per gallon. This might be interpreted as an indication that wine, in small quantities as the average US consumption is approximately one glass of wine per week, tends to affect verbal facilities more than computational ones.

As was suspected, the rise in wine consumption was signifi-

cantly related to the decline of coffee consumption ( $r=-0.8995$ ). What was not expected was that the correlation between coffee consumption and SAT verbal scores, partialing out (Waugh, 1938 p.332) for wine consumption, was 0.4999, indicating another significant, but weaker, factor in the decline of SAT scores.

### Conclusion

Declining SAT scores are a fact; but, as this paper has shown, the trend can be reversed by decreasing per capita consumption of wine. It is not advocated that the US reinstitute prohibition, but less drastic measures are definitely called for. It is suggested that domestic production and importation of wines be limited, or a maximum per capita quota be set, or the US population be increased. The latter suggestion would be simply accomplished by granting citizenship to non-wine drinking aliens, and if the US population is thusly increased by 88.3576%, it would result in a per capita consumption drop to 1.46 gallons per person, and a rise in SAT scores to the 1958 level.

## References

- Advisory Panel on the Scholastic Aptitude Test Score Decline.  
On further examination. New York: College Entrance Examination Board, 1977.
- Walsh, J. "Does high school grade inflation mask a more alarming trend?". Science, 1979, 203, 982.
- Wine Advisory Board. 1966 Wine industry statistical report: Part II distribution and consumption. San Francisco: Wine Advisory Board, 1966.
- Wine Advisory Board. 1975 Wine industry statistical report: Part II distribution and consumption. San Francisco: Wine Advisory Board, 1975.
- Wine Advisory Board. 1977 Wine industry statistical report: Part II distribution and consumption. San Francisco: Wine Advisory Board, 1977.
- Waugh, A.E., Elements of Statistical Method. New York: McGraw Hill, 1938.



TABLE 1

## US POPULATION DATA

YEAR	VERBAL SAT	MATH SAT	CONSUMPTION	
			WINE gal/ person	COFFEE lb/ person
1951	476	494	1.28	25.89
1952	476	495	1.38	26.52
1953	472	490	1.40	26.66
1954	475	496	1.40	23.41
1955	479	501	1.41	24.51
1956	473	496	1.45	25.50
1957	472	496	1.45	25.55
1958	475	498	1.46	25.44
1959	477	498	1.456	26.3
1960	474	495	1.508	26.3
1961	473	498	1.568	26.5
1962	478	502	1.521	26.8
1963	475	498	1.575	26.6
1964	473	496	1.639	25.9
1965	471	496	1.655	25.1
1966	467	495	1.650	24.5
1967	466	494	1.738	25.0
1968	462	491	1.793	25.0
1969	460	488	1.946	23.7
1970	454	487	2.169	22.9
1971	450	482	2.432	21.8
1972	443	481	2.638	22.7
1973	440	478	2.676	22.0
1974	437	473	2.647	20.5
1975	429	470	2.735	19.5
1976	429	471	2.750	20.1

1. SAT data from data provided by Educational Testing Service, Princeton, NJ. Each value represents the mean value of all tests taken during the academic year beginning with the year listed. A candidate is counted as many times as he or she takes the test.

2. Wine consumption and coffee consumption data provided by The Wine Advisory Board Economic Research Department. For wine consumption, the data is based on the US population as of July 1 of the year listed, the population includes all persons of age 21 or older, including persons living in areas where sales of alcoholic beverages are prohibited and includes military services personnel stationed in the United States. Coffee consumption data is based on the green-been equivalent, including instant and regular. The population is the same as the wine data population with respect to age, but military services personnel are not included.

TABLE 2  
 US Population Statistics: Correlations, means and standard deviations  
 YEARS 1951-1976

	YEAR	VERBAL SAT	MATH SAT	WINE gal/ person	COFFEE lb/ person
YEAR	1.0000				
VERBAL SAT	-0.8669	1.0000			
MATH SAT	-0.7706	0.9760	1.0000		
WINE	0.9109	-0.9778	-0.9316	1.0000	
COFFEE	-0.7689	0.9253	0.9037	-0.8995	1.0000
MEANS	1963.5000	463.6923	490.7308	1.8204	24.4108
STD DEV	7.6485	15.8538	9.2674	0.5002	2.1724

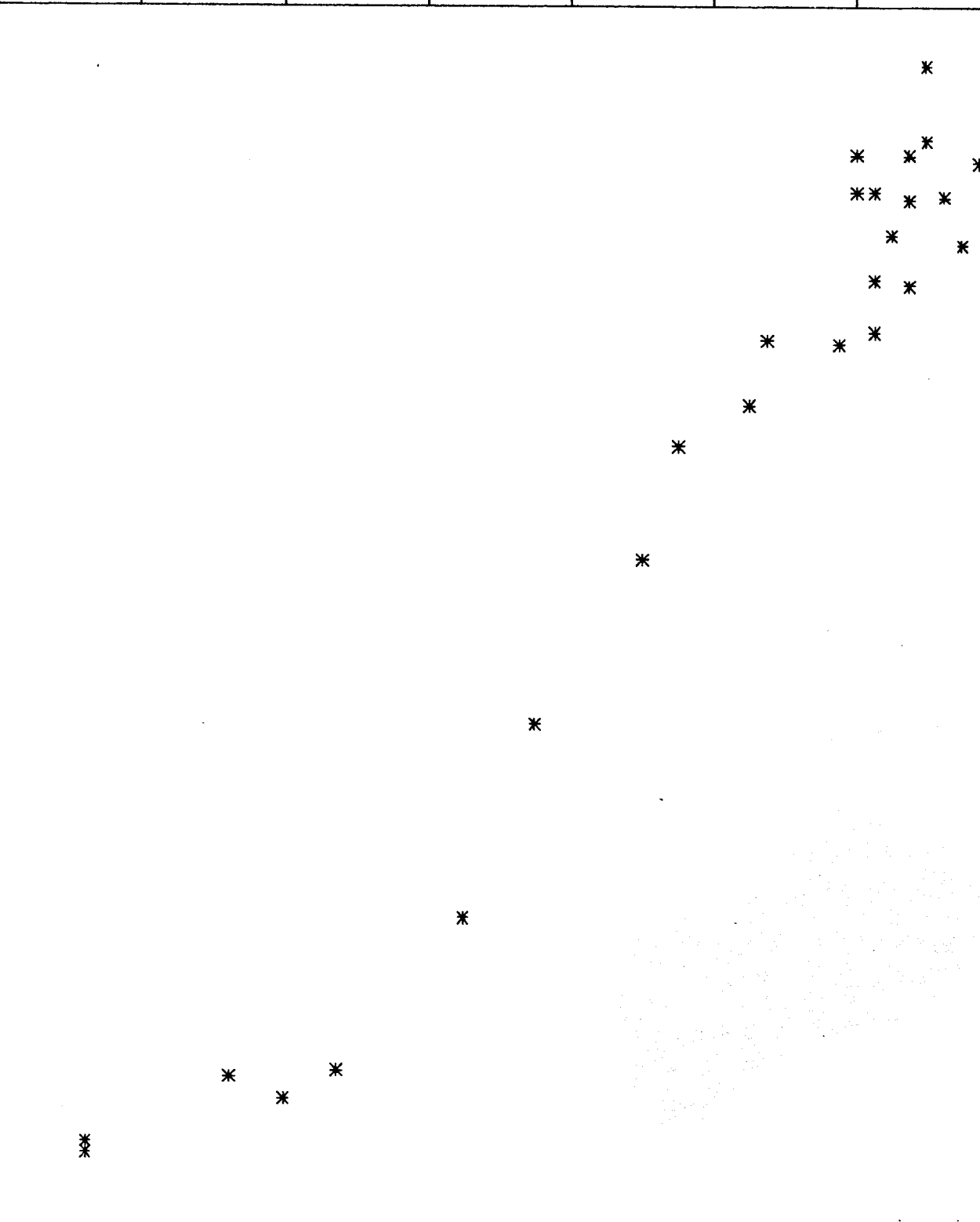
Data source and interpretation as in Table 1.

ANNUAL SAT VERBAL SCORE

424.00 432.00 440.00 448.00 456.00 464.00 472.00

ANNUAL US WINE CONSUMPTION, GAL/PERSON

1.20  
1.40  
1.60  
1.80  
2.00  
2.20  
2.40  
2.60  
2.80



ANNUAL SAT VERBAL SCORE

