FOCUS

on poverty research

NATURE-NURTURE NONSENSE

Arthur R. Jensen, the author of that famous *Harvard Educational Review* article[1] in the winter of 1969, may be the most discussed and least read essayist since Karl Marx. Everybody knows, or thinks they know, what he said in that article: Blacks perform less well than whites on standard IQ tests. Compensatory education has not been able to narrow the gap. One reason for the failure is that IQ differences among individuals arise mostly from genetic causes. Black children are on average less intellectually able than whites. And this state of affairs is immutable.

Everyone also knows of the strident personal attacks on Jensen. Fewer people, unfortunately, are acquainted with the serious critiques of Jensen's approach to data and methodology, or with the actual evidence on the heritability of IQ. Arthur S. Goldberger is one of the critics.

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This is the first issue of a newsletter that will have three issues a year: Spring-Summer, Fall, Winter. Its purpose is to acquaint a wide audience with the work of the Institute for Research on Poverty, by means of short essays on selected pieces of research. The articles are written by Felicity Skidmore, Coordinator of Special Projects at the Institute.

The material in any one issue is, of course, just a small sample of what is being done at the Institute. It is our hope that these summaries will whet the appetite of the reader to learn more about the research itself, and more about other research on poverty—an area of vital social concern—by Institute staff.

The views expressed are those of individual members of the Institute; they do not represent the position of the Institute for Research on Poverty, the University of Wisconsin, the Department of Health, Education, and Welfare, or other funding agencies.

Starting out as an econometrician interested in learning something about hereditary factors in models of socioeconomic achievement, he found himself in the role of a sleuth,[2] as his recent research papers on the subject show.[3]

Jensen's Approach to Evidence

To investigate the heritability of a trait—the proportion of the total variation in a trait that is due to heredity—one must separate the effect of genes from the effect of environment. In humans this means investigating data concerning differences and similarities among various blood relatives. But relatives tend to have environments with many common features. Because of this, the main data bases that have been used to pursue the study of IQ heritability have contrasted identical twins with fraternal twins, twins separated at birth *vs.* twins raised together, adopted children *vs.* own children.

Two collections of data have been relied upon extensively by Jensen. Goldberger's independent assessment of those data and of Jensen's use of them makes intriguing reading.

The first collection consists of IQ data for numerous categories of relatives accumulated by the late Sir Cyril Burt over his long career. Jensen used a full set of these correlations to derive his well-known estimates of IQ heritability published in *Genetics and Education.*[4] The most famous portion of Burt's data relate to identical twins, some of whom were reared apart and some reared together.

There are good grounds for believing that Burt's IQ correlations are bogus (as Leon Kamin documents in detail). Burt provided virtually no documentation of the tests used, of the sampling frame, of the age and sex of the subjects; nor are the summary statistics for his sample (the usual means and variances) published. Moreover, his figures for various kinship correlations contain numerous inconsistencies from one publication to another.

Burt never published the raw data on which his results were based. A table of them was, however, published by

Jensen. There is evidence that the social class assigned to these twins was changed in at least six cases *after* the data had been used by Burt as the basis for numerous published results. There is also evidence that Burt's sample size changed—not only up (which could be explained by discovering more pairs of twins) but also, on occasion, *down.*

But all this is overshadowed by what came next. Burt adjusted the IQ scores of the twins—*and said so explictly* in the following fascinating passages culled by Goldberger from Burt's writings:

- It will be unwise to rely exclusively on formal [intelligence] tests of the usual type . . . the only way to be sure that no distorting influences have affected the results is to submit the marks to some competent observer who has enjoyed a first-hand knowledge of the testees.
- The interview, the use of non-verbal tests, and the information available about the child's home circumstances usually made it practicable to allow for the influence of an exceptionally favorable or unfavorable cultural environment.
- By these means we can reduce the disturbing effects of environment to relatively slight proportions.
- Nor were we concerned with a specific *observable* trait, but with differences in a hypothetical innate general factor.
- What I was discussing was not "intelligence" in the popular sense (which usually includes acquired knowledge and skill . . .), but rather the psychologist's attempts to assess the individual's "innate general ability"— a purely "hypothetical factor."

The last is the best: Burt's numbers were even described by their creator as estimated correlations of the genetic component of IQ test scores. His adjustments were directed toward eliminating "unusually" strong environmental effects on his measure of IQ. And then Jensen used the adjusted numbers to measure the relative contributions to IQ of heredity and environment!

The second collection of data comes from a 1928 study of adopted children by Barbara Burks.[5] She, unlike Burt, did provide adequate information of the details of her study. Her data consisted of one sample of 214 families with adopted children placed before 12 months of age and a second (control) sample of 105 families rearing their own children. The samples were matched with respect to age and sex of child, occupation of father, and type of neighborhood. The IQ of parents and children was judged on the basis of the Stanford-Binet test. The home environment of the family was measured in considerable detail.

Jensen uses the Burks study to support his contention that heredity, rather than environment, plays the predominant role in the determination of intelligence. In this instance, it is not the quality of the original research itself that disturbed Goldberger, but rather Jensen's description and use of the study.

Some quotations from Jensen, along with Goldberger's summary of the relevant part of the Burks study, follow.

1. JENSEN: *[Burks's study was] representative of a broad cross-section of the U.S. Caucasian population with respect to education, occupation, and socioeconomic level. It is probably safe to say that not more than 5 percent of the U.S. Caucasian population falls outside the range of environmental variation represented in the samples.* GOLDBERGER: Burks's adopted children and control group children were confined to English-speaking couples residing in the San Francisco, Los Angeles, and San Diego areas. All of Burks's families were intact; that is, both parents were alive and living together. More than one-third of the adoptive children had private tutoring in music, dancing, drawing. Burks's own guess was that the environments provided by the adoptive families averaged between one-half and one standard deviation higher than the general population. For example, 7 percent of U.S. families were headed by a professional in 1930, compared with 17 percent for the Burks foster homes and 20 percent for the Burks control families.
2. JENSEN: *[Burks's measure of the environment] included such factors as the amount of time the parents spent helping the children with their school work, the amount of time spent reading to the children, and so on. The multiple correlation (corrected for unreliability) between Burks's various environmental ratings and the adopted children's Stanford-Binet IQ was 0.42.* GOLDBERGER: Burks's interviewers did ask about home instruction or attention received by the child; she tabulated the means and standard deviations for the total number of hours spent in this way; and she reported the correlation of this variable with child's IQ. She did NOT use this variable in the multiple correlations.
3. JENSEN: *Even in the case of the adopted children, the single most important environmental factor contributing to variance in children's IQ was the foster mother's intelligence.* GOLDBERGER: This is simply not true. Burks tabulated the simple correlations of some twenty environmental variables with adopted child's IQ. Among the entries are mother's vocabulary, .23; home-quality index, .21; culture index, .25; income, .23; home-ownership, .25; number of books in child's library, .32. For mother's IQ the entry is .19.
4. JENSEN: *Sewall Wright (1931) performed a heritability analysis on these parent-child and IQ-environment correlations and obtained a heritability coefficient of 0.81.* GOLDBERGER: With

one set of assumptions (in which all effects that cannot be attributed to measured environment are attributed to heredity) Wright estimated that 81 percent of the variation in IQ is attributable to variation in heredity. So far, so good. But he clearly states that this is intended as an upper bound. With a different set of assumptions (in which some effects not attributable to measured environment are allocated to genetic-environmental interactions along with unmeasured environmental influences) Wright derived, from the same Burks data, what he describes as his lower bound of heritability, .49. Throughout, environment was measured by a single index.

Jensen's characterization of the Burks study has since acquired a life of its own, as noted by Goldberger. Strikingly similar descriptions of it have been written by both Eysenck and Herrnstein.[6] But Herrnstein adds a new twist.

> HERRNSTEIN: *The foster children's IQ's correlated with their natural parents' IQ's more than with their foster parents.* GOLDBERGER: The Burks study contains no information on the IQs of the natural parents of the foster children. Burks's research group did not meet these parents and did not test them, nor was their intelligence tested by anyone else.

Jensen's Approach to Statistical Methodology

In the literature on the heritability of intelligence it is usually assumed that genes and environment are independent. Many researchers have questioned the appropriateness of this assumption. Jensen, therefore, has recently extended the classical twin method—a methodology that exploits the fact that identical twins have identical genes, whereas fraternal twins are no more similar genetically than ordinary siblings. His extension allows for the possibility that genes and environment are correlated.[7] Two things about this work should be noted:

In one paper he claims to obtain unique estimates of the variances, and covariance, of genes and environment. He sets up a model that involves (a) the genetic correlations for fraternal twins, (b) the environmental correlations for identical twins, and (c) the environmental correlation for fraternal twins. He then tells us that he solved his system for sixty combinations of values for the three correlations. He further tells us that there was only one admissible solution—which attributed 65 percent of the variance to genetic factors, 28 percent to environmental factors, and 7 percent to the covariance between the two. Goldberger finds a counterexample (which is an admissible solution by all Jensen's stated criteria) which attributes 15 percent of the variance to genes, 84 percent to the environment, and 1 percent to the covariance. He goes on to find that a wide range of estimates is admissible. As Goldberger asks, "Does Jensen's computer have a hereditarian bias? If so, is that an innate, or an acquired, trait?"

In a second piece of work with the twin method, Jensen's calculations purport to show that for a wide range of assumptions, the twin data yield estimates of heritability in the range of .50-.75. Here Goldberger points out an unstated assumption of Jensen's that must be made explicit before we can judge how relevant his conclusions are. One measure, called "the correlation between genotype and environment," in fact denotes (a) the correlation between an individual's genes and his own environment, (b) the correlation between an individual's genes and his identical twin's environment, and (c) the correlation between an individual's genes and his fraternal twin's environment—implying that Jensen assumes they are all equal. Taking (a) and (b) to be equal may be reasonable, but why should anyone assume that the correlation of an individual's genes and his fraternal twin's environment is as high as it would be for an identical twin?

To test how sensitive Jensen's results are to this implied equality, Goldberger tries relaxing it while keeping other assumptions unchanged. If the ratio of (c) to (a) is 1.0, as Jensen chooses to assume, heredity alone accounts for 72 percent of the IQ variation and environment alone for 3 percent (the rest accounted for by measurement error and covariance). If the ratio of (c) to (a) is reduced slightly, to 0.8, the variation attributable to heredity drops to 61 percent and to environment rises slightly, to 9 percent. If the ratio drops to .5—that is, the correlation of an individual's genes with his fraternal twin's environment is assumed to be half as great as for identical twins—the variation attributable to heredity alone drops to 24 percent, and that attributable to environment rises to 42 percent!

More generally, Goldberger remarks on how fruitless it must be to search for meaningful estimates of heritability by the twin method, which uses *two* pieces of data—the observed correlation of identical twins' IQ and the observed correlation of fraternal twins' IQ—to solve for seven unknowns:

1. Genetic correlation for fraternal twins
2. Environmental correlation for identical twins
3. Environmental correlation for fraternal twins
4. Correlation between an individual's genetic makeup and his own environment
5. Correlation between an individual's genetic makeup and his identical twin's environment
6. Correlation between an individual's genetic makeup and his fraternal twin's environment
7. Heritability

Some good has come out of all this. In 1970 responsible scholars could say, and did, that the weight of the evidence from a variety of correlations among relatives put the heritability of IQ in various human populations between .6 and .8. As a result of investigations by Goldberger, Kamin, Lewontin, and others, stimulated largely (it must be said)

by Jensen, it is becoming increasingly recognized that we have, in fact, *very little idea* what the heritability of IQ, either for whites or for blacks, is.

"What If" IQ Is Highly Heritable?

Perhaps the strangest thing about the whole debate is its persistence in the face of the fact that heritability is not a concept that can be attributed to a trait as such—only to a trait in a particular population in a particular set of environments.

Jensen's argument has led to widespread confusion between heritability within a population and heritability between populations. The latter concept—heritability of the average difference between populations with respect to a trait—is meaningless, as the following simple example will show.

Height has been proven to be a highly heritable trait in many human populations. The variation in height among Americans, for instance, that can be attributed to environment is almost nil. The variation in height among the Japanese that can be attributed to environment is also almost nil. The current difference in average height between Americans and Japanese is substantial.

But changes in diet (i.e., a single and obvious aspect of environment) have contributed importantly to making each succeeding generation of Americans and each succeeding generation of Japanese taller. The Japanese seem to be growing taller faster. The difference between them may well disappear or even tip the other way. And, within each population, height will have remained just as heritable throughout.

The heritability of IQ for both blacks and whites could thus be known, and we would still have nothing that we could say about whether the observed black-white difference is due to genetic causes, or whether environmental change can influence it.

Let us take another example. The dreadful effects on brain functioning of PKU, an inborn error of metabolism, used to be considered inevitable because their origin was genetic. Since it was discovered that those effects were produced by an impaired ability to absorb certain proteins, however, dietary restriction has been able to prevent them—even though the basic error lies in the genes.

Despite his assertions to the contrary, Jensen has not provided reliable scientific evidence to conclude that differences in performance on IQ tests between blacks and whites are attributable to hereditary factors. Thus, on the 200th anniversary of the publication of Adam Smith's great work, there is no compelling evidence to reject the opinion expressed in the *The Wealth of Nations:*

> The very different genius which appears to distinguish men of different professions, when grown up to maturity, is not upon many occasions so much the cause, as the effect of the division of labour. The difference between the most dissimilar characters, between a philosopher and a common street porter, for example, seems to arise not so much from nature as from habit, custom, and education.[8]

NOTES

1. Arthur R. Jensen, "How Much Can We Boost I.Q. and Scholastic Achievement?", *Harvard Educational Review* **38** (Winter 1969).

2. Other important sleuths are R.C. Lewontin; see, for example, his "Race and Intelligence," *Bulletin of the Atomic Scientists* **26** (March 1970); and Leon J. Kamin; see his *The Science and Politics of I.Q.* (New York: John Wiley & Sons, 1974).

3. This article does not deal with well-founded arguments that IQ is not the same as intelligence, or that standard IQ tests are culture-bound to an extent that precludes their use as "objective" tests for different populations.

4. Arthur R. Jensen, *Genetics and Education* (New York: Harper and Row, 1972).

5. B.S. Burks, "The Relative Influence of Nature and Nurture upon Mental Development: A Comparative Study of Foster Parent-Foster Child Resemblance and True Parent-True Child Resemblance," *Twenty-Seventh Yearbook of the National Society for the Study of Education,* Part I, (Bloomington, Ill.: Public School Publisher Co., 1928).

6. H.J. Eysenck, *Race, Intelligence, and Education* (London: Temple Smith, 1971); and R.J. Herrnstein, *I.Q. in the Meritocracy* (Boston: Little, Brown, 1973).

7. Arthur R. Jensen, "The Problem of Genotype-Environment Correlation in the Estimation of Heritability from Monozygotic and Dizygotic Twins," paper presented at the First International Congress of Twin Studies, Rome, Italy, October 28-November 2, 1974; and "The Meaning of Heritability in the Behavioral Sciences," *Educational Psychologist* **11** (1975).

8. Adam Smith, *The Wealth of Nations* (New York: Random House, 1937), p. 15.

ARTHUR S. GOLDBERGER

"Statistical Inference in the Great I.Q. Debate," paper presented at the Third World Congress of the Econometric Society, Toronto, August 1975.

"Mysteries of the Meritocracy," in N.J. Block and G. Dworkin (eds), *The IQ Controversy: Critical Readings* (New York: Pantheon, 1976).

"Jensen on Burks," *Educational Psychologist* **12**, no. 1 (1976).

"On Jensen's Method for Twins," *Educational Psychologist* **12**, no. 1 (1976).

"Jensen's Twin Fantasy" (with R.C. Lewontin), and other unpublished notes.

The papers listed here are also available as Institute for Research on Poverty Discussion Papers and may be ordered using the form on page 14.