

## Revisiting basic notions of human intelligence:

*Intelligence is substantially determined by the environment, disproportionately constraining the disadvantaged. With this awareness powerful sociological opportunities become apparent.*

### ABSTRACT

Herrnstein & Murray (1994) claim that intelligence is largely inherited and can hardly be altered. They are wrong. Everyone's intelligence is greatly affected by nutrition, health, experiences, and other environmental factors. People who have limited environmental advantages tend to score low on intelligence tests, and tend to participate disproportionately in many of society's problems. Enhancing environmental factors raises intelligence scores, increases access to the fruits of society, and thus reduces social problems. Such changes modify the shape of the bell curve of measured intelligence by shifting the lower tail toward the right, and reducing the proportion of people categorized by Herrnstein & Murray as a permanent underclass.

While many psychologists, geneticists, educators and neuroscientists view differences in intelligence among humans as largely genetically determined (e.g., Jensen, 1969, 1998; Herrnstein and Murray, 1994; Scarr, 1998). many others feel that these differences are largely environmental (e.g., Lewontin, Rose, and Kamin, 1984). Regardless of the outcome of this long-standing debate, there is now widespread awareness that measured intelligence is highly sensitive to nutrition, health, experience, motivation, formal and informal learning, and other environmental conditions. Though these effects of the environment are not in dispute, their significance is inadequately appreciated. Impoverished environments disproportionately constrain the disadvantaged—about 20% of the population in the developed world and half or more of the population of the planet.

As Sandra Scarr (1981) states, we can only know intelligence as behavior. This behavior is determined by both genetic and environmental factors, and IQ tests do not distinguish between these. Also, IQ tests do not measure the full spectrum of intelligence including, for example, creativity. However, IQ tests are the best operational measure of some aspects of intelligent behavior available and much of the literature uses them to measure intelligence, and, therefore, for consistency, we will also.

### *To what extent is human intelligence influenced by the environment?*

Many writers view intelligence as essentially stable. This is based in large part on correlations showing that, for example, intelligence quotients (IQs) of 6 and 7 year-old children correlate about 0.7 with their IQs at age seventeen (e.g., Jensen, 1969, 1998; Herrnstein and Murray, 1994). That is, people judged as smart or dull when they are children also tend to be judged as smart or dull when they are older, which implies that intelligence is essentially fixed.

However, this supposition is not warranted because the data are severely confounded with environmental factors. For example, if nutrition, just one environmental factor, is weak during one part of one's life and strong in another, then intelligence scores, taken over time, will not appear consistent or stable. When disadvantaged, pregnant mothers are given vitamin and mineral supplements, the IQs of their offspring increase by an average of 8 points compared to controls (Harrell, Woodyard, & Gates, 1955). Similarly, giving mineral and vitamin supplements to disadvantaged high school students raises their IQs by about this same amount (Herrnstein and Murray, 1994, p.392). Giving mother's milk to infants, as compared to giving them formula, also results in an 8-point gain in IQ (Quinn et al., 2001), and giving mother's milk

to low-birth-weight babies via a tube, as compared to giving them formula, increases their IQ by 10.2 points (Johnson, 2001). These differences are not trivial; each reflects about half a standard deviation on the IQ function, and they are only some of many effects of only nutrition.

Many intelligence studies have used twins because they seemed to avoid confounding environmental effects on IQ measures. Specifically, monozygotic (identical) twins score, on average, 5.5 IQ points lower than singletons, and the lighter twin scores 6 points lower than the heavier one (Jensen, 1969, p.66-67). The average IQ scores of triplets are four points lower than those of twins (Bodmer, 1972). These differences are not explainable by genetic differences, but by prenatal and postnatal environmental factors.

Low-birth-weight fraternal-twin babies have a 13-point lower IQ than their normal-birth-weight siblings (Scarr, 1981 p.52). Too, the first born in families have 2.3 point higher IQs than the second born, and the third and fourth born have successively lower IQs than these (Sulloway, 2007). Consistent with these findings, the second-born child of births in close succession shows a similar IQ detriment to twins, but not if the family has help rearing their children (Hunt, 1961, p.362).

Concerning the physical and social environment, placing a child for adoption at 6 months of age rather than at 24 months of age increases its IQ by a substantial 13.5 points (Scarr and Weinberg, 1976), nearly a full standard deviation. Possibly this is because adoptive homes tend to provide better health and nutrition, and, perhaps, provide more supportive environments. This is consistent with early-training studies that show IQ increases of 24 points (Milwaukee Project, 1971), 12.78 points (Skodak & Skeels, 1949), 7.8 points (Abecedarian Early Intervention Project), and 7 to 21 points (Bronfenbrenner, 1974). Head Start, while denigrated by many, including Jensen (1969), produces IQ increments of 7 points, as compared to similar children who did not experience Head Start. However, this gain diminishes to 3 points by the third grade, possibly because the children were returned to their original environments. But, an average of three points is not trivial across large populations.

For each year of high school that is not completed there is a loss of 1.8 IQ points (Harnquist, 1968), and a “small but reliable decrement in IQ occurs during the summer vacation (Ceci, 1990, pp.73-74), especially among low-income youngsters, whose summer activities are least likely to resemble those found in school (Jencks, et al., 1972).” Baltes and Reinert (1969) report a substantial correlation between length of schooling and intellectual performance among same-aged, same-socio-economic-status children. Wahlsten (2002, pp.257-258) wrote “Large improvements in the early childhood environment, whether caused by adoption into superior homes or random assignment to enriched preschool education, can increase intelligence by as much as one standard deviation or 15 IQ points.”

The complete data shows ranges in scores, not merely averages. It is these ranges that convey the real extent of the potential. For example, when high school students are given mineral and vitamin supplements, the average improvement in IQ is 4 points, with a range of from 0 to 15 points (Herrnstein and Murray, 1994). Well-nourished students realized little or no gain in IQ whereas poorly nourished students often gained 15 points. This is one standard deviation. So, enhancing nutrition disproportionately affects the disadvantaged, people who more likely experience inadequate diets.

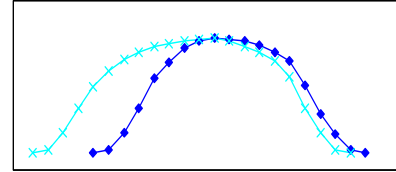
Experiential enhancements, learning, are significantly distinct from health and nutritional enhancements, which are also significantly distinct from enhancements based on motivation and self confidence, all of which influence IQ scores. While there is little evidence about interactions among environmental factors, there is reason to believe that general well-being, learning, motivation, and attention, have some cumulative affects on intelligence. Therefore, it seems reasonable to suggest that if all babies were carried to full term, fed mothers' milk, given mineral and vitamin supplements, provided rich experiences, and given early schooling, then the mean intelligence could well be increased from 100 to 110 or 115 while the middle 95% of the IQ

score distribution could narrow from its current range of 60 points (70 to 130), to perhaps 45 points (90 to 135).

### *Shifting the Intelligence Bell Curve*

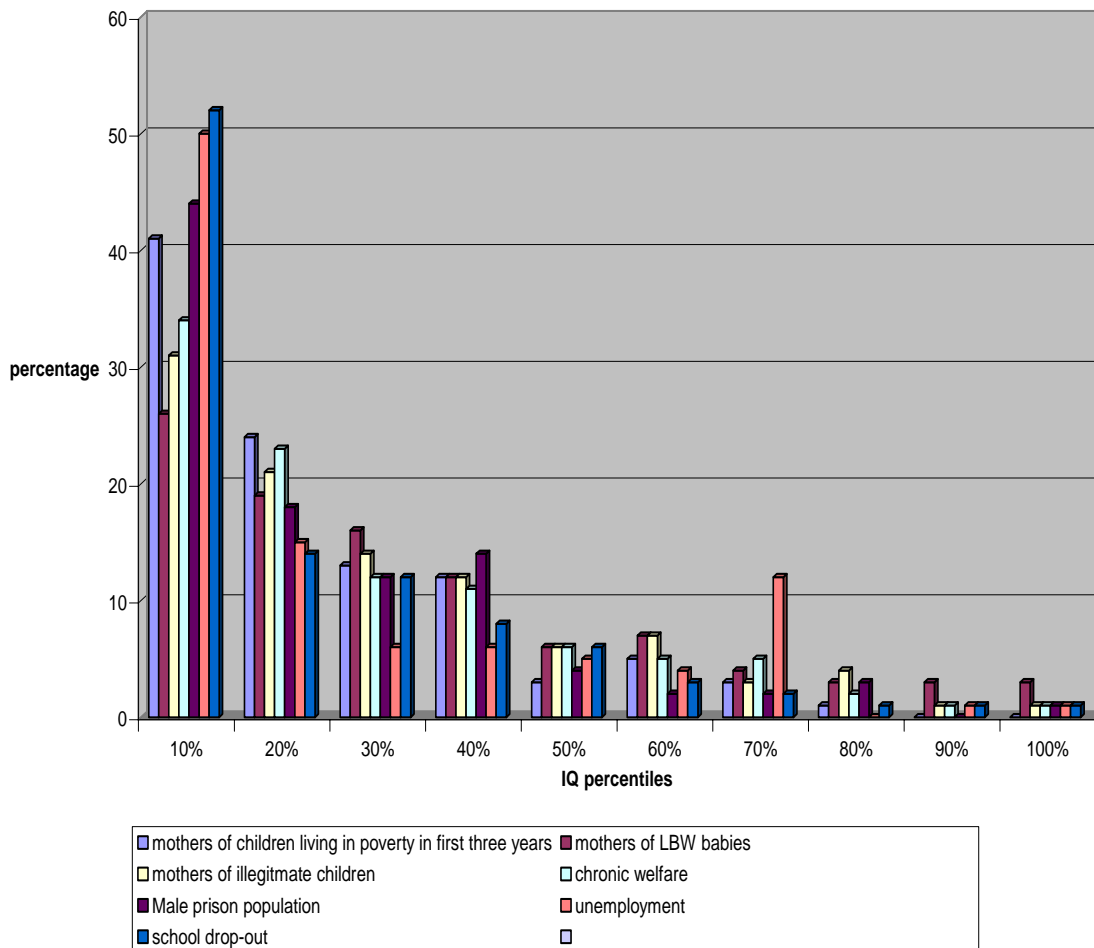
This outcome is expected because we know how to raise average IQs and we particularly know how to raise the IQs of those people towards the low end of the IQ spectrum, people with measures below, say, 90.

While the specific magnitude of achievable changes is not known, these estimates are consistent with the literature, for example, Scarr's report of Smilansky's studies (Scarr, 1981, p.51). The measured intelligence of people towards the low end of the intelligence spectrum increases disproportionately through environmental enhancements.



### *Implications for society*

Many societal problems are disproportionately associated with people having low intelligence scores. Herrnstein and Murray (1994, Pp.371, 372) report that 66% of school dropouts are in the lowest 20 percent of IQ scores (IQs below 87), and 52 percent are in the lowest 10 percent (IQs below 80). These percentages decrease geometrically as intelligence increases. This is similarly true for unemployment, prison populations, health issues, and other problems of society. Many of these findings reported by Herrnstein and Murray (1994, pp.369-386) are summarized in the following chart.



The chart shows that problems of society disproportionately involve people in the lowest 20 percent of intelligence scores. Because we know how to raise these scores, perhaps we also know how to significantly reduce problems in society. For example, raising IQ scores of the lowest achievers in high school by 10 points or more would likely raise interest and success in school, and, as suggested by these charts, lower the rate at which students drop out of school. Indirectly, this might also reduce unemployment, prison population, welfare roles, and health issues.

This conclusion is in direct contradiction to Herrnstein and Murray (1994). They hold that intelligence is largely heritable and stable, that it can hardly be altered, and that a two-tiered society consisting of the IQ haves and the IQ have-nots is evolving. They wrote (p.523) “Over the next decades it will become broadly accepted by the cognitive elite that the people we now refer to as the underclass are in that condition through no fault of their own but because of inherent shortcomings about which little can be done....The cognitive elite, with its commanding social position, will implement an expanded welfare state for the underclass that also keeps them from underfoot.” They add (p.526) “Our label for this outcome is the custodial state... a high tech and more lavish version of the Indian reservation for some substantial minority of the nation's citizens, while the rest of America tries to go about its business.”

We do not believe it. Much can be done about shortcomings in intelligence. It is not genetically fixed and immutable. Situations of birth, social environment, nutrition, learning experiences, and health all affect intelligence, which can be markedly enhanced. Accomplishing this might well translate to lowered school dropout rates, fewer imprisonments, increased employment, and reduced welfare roles.

While environmental factors constrain everyone's potential intelligence, they disproportionately affect people who are disadvantaged. It is here where intelligence can be increased most substantially. Currently, many minorities are disproportionately disadvantaged in the Western world. Accordingly, there is reason to suggest, for example, that the Black/White IQ gap in the United States might be reduced or eliminated by such interventions as encouraging mothers to provide babies with mother's milk; 25% of Black mothers in the U.S. breastfeed compared to 61% of White mothers, and Blacks do so for a much shorter period of time.

Other considerations include discouraging teen births, which occur nearly twice as frequently among Blacks than Whites, and often result in LBW babies—which occur 2.4 times more frequently among Black than White mothers and lead to lower average IQs; providing prenatal and postnatal care among the disadvantaged, especially for twin births (DZ twins are 1.3 times more likely among Blacks); attending to the fact that disadvantaged children adopted into middle-upper class homes at six months versus 24 months of age have IQs increased by 13.5 points; provide mineral and vitamin supplements to disadvantaged pregnant mothers and to disadvantaged children of all ages, plus, other interventions not reviewed here but documented elsewhere, such as enhanced dental care for pregnant mothers, extended preschool care and training of mothers of preschool children, extended after-school programs, including snacks adjusted for the fact that Blacks are 5 times more lactose intolerant than Whites which probably affects their intake of protein—all these may help to eliminate existing black-white IQ differences, and thereby likely also affect social differences.

Providing such environmental modifications is not necessarily costly. Vitamin and mineral supplements, given to the disadvantaged, could result in large change for trivial expense. Of course, pills are only part of the story. Better nutrition, in general, is needed within a supportive encouraging and motivating social environment. The costs of such environmental enrichments when compared with the reduction of problems in society, such as unemployment, prison populations, and welfare-cost prove to be a bargain, not to mention the raised self-satisfaction of the many people involved.

With this awareness, perhaps society will be more willing to establish and maintain the environmental foundation for each individual to more nearly achieve his or her potential intelligence. Furthermore, individuals, having this awareness themselves, might be more likely to strive to attain their own potential.

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