Intelligence and Dysgenic Fertility: Re-specification and Reanalysis

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There has been a long-standing debate concerning "nature vs. nurture," which questions whether intelligence is primarily determined genetically or develops through socialization. Proponents of the "nature" side in the debate cite recent evidence such as the popular book *The Bell Curve: Intelligence and Class Structure in American Life* (Herrnstein and Murray, 1994) and research by Richard Lynn (2000) concerning adult intelligence and number of children, or fertility.

In *The Bell Curve*, Herrnstein and Murray argue that there is a genotypic deterioration of intelligence in the modern population due to a divergence in reproductive trends between individuals of higher intelligence and those of lower intelligence. Herrnstein and Murray propose that the more intelligent reproduce less while the less intelligent reproduce more, creating a "demographic headwind" known as *dysgenesis* or dysgenic fertility (Herrnstein and Murray, 1994).

A recent article by Lynn (2000) argues that the negative association between number of siblings and intelligence, the negative association between educational level and number of children, the negative association between socioeconomic status and number of children, and the negative association between the intelligence of adults and number of children are evidence of dysgenic fertility. From his research, Lynn concludes that the last, the negative association between the intelligence of adults and number of children, is evidence of dysgenic fertility in the first two generations born in the United States during the twentieth century.

In contrast to Lynn's study, however, other researchers have found

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that, despite the negative association between IQ and fertility, the IQ of modern populations is in fact rising; this is known as the "Cattell paradox" (Cattell, 1951). Also, Williams and Ceci have concluded that the gaps between achievement scores, taken as proxies for intelligence, are slowly decreasing over time by race, socioeconomic status and ability. Other evidence points to educational attainment as a better indicator of fertility, or to number of children, as a result of increased use of contraceptives, and reveals that there is little variation between the numbers of children considered ideal by individuals of varying educational attainment (Blake, 1967; Martin, 1995).

Therefore, a complete review of past research suggests that the association between intelligence and fertility is not as complete as Lynn suggests. Rather than being proxies for intelligence, as Lynn presumes, socioeconomic status and education are also important in determining number of children (a.k.a. fertility) and intelligence. The failure to account for the effects of other indicators of fertility, such as socioeconomic status and education, casts doubt on Lynn's conclusion regarding the intelligence of adults and fertility. In addition, the age of the respondent at the time of their childrens' birth must be taken into account when looking at a relationship between IQ and fertility.[1]

Literature Review

Intelligence and Number of Siblings

Past research has shown a negative association between educational outcome, taken as a proxy for intelligence, and number of siblings (Steelman, 1983). However, recent research has shown, under a resource dilution model, that sibling density is an important determinant of educational outcome. Powell and Stephen (1990) suggest that siblings born farther apart achieve higher educational outcomes. They argue that siblings spaced farther apart are more likely to receive individual educational attention and greater resources, both educational and monetarily, than siblings who are not. Therefore, sibling density, not number of siblings, may explain the negative association between IQ and number of siblings.

Other researchers propose that the inverse relationship between intelligence and number of siblings only exists with measures of verbal intelligence (Guo and VanWey, 1999; Steelman and Doby, 1983; Bahr and Leigh, 1978). Steelman and Doby believe this can be explained by parental attention, sibling density, and values associated with socioeconomic status. Guo and VanWey propose that intellectual environment has a greater influence on intellect than number of siblings, while Bahr and Leigh propose that educational encouragement is a better determinant of intellectual ability.

Education and Number of Children

A substantial body of evidence exists which reinforces the argument that higher educational attainment among women reduces family size and improves the quality of education for children born to these smaller families (Knodel, Havanon and Sittitrai, 1990; Weinberger, 1987). Other research has shown that, despite the negative association between educational attainment and number of children or family size, there is very little difference among women, when compared by educational attainment, between ideals in family size (Blake, 1967).

Blake suggests that this may be due to the fact that women with less education tend to regard children as having a higher social investment value than their more educated counterparts; education might have a cynical effect on a women's interpretation of the social value of having children (Blake, 1979). On the other hand, Blake found that men with higher levels of education believed that more children were ideal than their less educated counterparts. Prior research also modifies the education-fertility relationship by showing that the negative association between educational attainment and number of children exists most strongly for older women, and that this negative association disappears when one removes the "high-fertility" groups such as Catholics and farm residents (Blake, 1967).

In addition, women who have higher levels of education generally have higher rates of contraceptive use and more reproductive choices (Martin, 1995). Martin proposes that women with a higher education rely on more effective methods of contraceptive use than non-educated women, and thus have increased control over reproductive choices.

Socioeconomic Status, Intelligence and Number of Children

Recent research concerned with socioeconomic status and intelligence has shown that improved access to educational resources reduces the negative association between socioeconomic status and intelligence and reduces the intelligence gap between the upper and lower third of the socioeconomic strata despite differences in fertility (Guo and Stearns, 2002; Williams and Ceci, 1997; Weakliem, McQuallin and Schauer, 1995). Guo and Stearns argue that social environment is important in helping children realize their full genetic potential for intelligence. Therefore, children with poor social environments who lack intellectual resources never realize their full genetic potential for intelligence.

In addition, Williams and Ceci show that there is little evidence of a dysgenic trend in the United States and that there appears to be a convergence of intelligence scores by race, class, and achievement, while Weakliem et al. have shown that class differences in intelligence have narrowed for those born after 1945.

Other research has shown that social class is as good a predictor of over- or under-achievement on intelligence tests as race. Gordon (1976) reports that after controlling for race, individuals from a higher social class generally have higher results on intelligence tests. This is a result of values associated with social class, such as over- or under-achievement, which influence intelligence test scores.

Blake concludes that the inverse relationship between socioeconomic status and number of children is due to individuals of low socioeconomic status perceiving children as having a higher social investment value than persons of a high socioeconomic status. In other words, persons of low socioeconomic status perceive the social gain associated with having children, such as providing meaning in life and cementing marriage, as being more important than the costs of having additional children (Blake, 1979).

Although informative, Lynn's argument — that the negative association between the intelligence of adults and number of children is evidence of dysgenic fertility — conflicts with much recent and past research examining the evidence associated with dysgenesis. Recent research has shown that education and socioeconomic status are better indicators of fertility and suggests that the relationship between intelligence and number of children may be spurious.

This analysis seeks to replicate Lynn's study of dysgenic fertility in the United States and determine the importance of socioeconomic status and education in explaining the relationship between IQ and fertility. The analysis will test five hypotheses:

H_1: Controlling for education and socioeconomic status, there is no association between intelligence and number of children, intelligence and number of siblings, and intelligence and ideal number of children.

H_2: Education is a more important determinant of fertility than intelligence.

H_3: There will be a significant difference between the lowest (0-2) and highest (15-16) intelligence scores for numbers of children.

H_4: There will be no significant difference between intelligence scores for ideal numbers of children.

H_5: There will be no significant difference between intelligence scores for age of respondent when respondent's first child was born.

Methods

Data

The data were obtained from the 1994 General Social Survey (GSS) for the United States as carried out by the National Opinion Research Center (NORC). The 1994 GSS is a representative national sample consisting of 2,992 English-speaking individuals aged 18 and up. Controlling for those aged 40 and up, in accordance with Lynn (2000), reduced the sample to 1661 individuals. Those aged 40 and up consist of individuals born from 1930-1954.

Independent Variable(s)

The independent variable, intelligence, is measured by a verbal reasoning intelligence test administered in the 1994 GSS. All scores were recoded according to the specifications in Lynn, where 2 points were awarded for a correct answer, 1 point for a partially correct answer, and zero points for an incorrect answer or a failure to answer. The independent variable, education, is a measure of the respondent's highest year of education completed. The independent variable, socioeconomic status (SES), is a measure of the individual's socioeconomic index based on the 1998 GSS study of occupational prestige.

Dependent Variable(s)

The dependent variables (number of siblings, ideal number of children, age of respondent when first child was born, and number of children) are all ratio level measurements.

Control Variable(s)

Control variables include respondent's sex, race and age. Statistical tests used for this analysis were correlations, partial correlations, ANOVA and multiple regression analysis.

Table 1: Correlations Between Intelligence and Number of Children, Number of Siblings, Ideal Number of Children, Education and Socioeconomic Status

(** $p < .001$ for bivariate correlations; * $p < .05$ for bivariate correlations)

Control	Sample	No.	No. Child	No.	No. Sibs	No.	No. Ideal
NONE	Total	1616	-.14**	1614	-.21**	1032	-.08*
	Male	668	-.14**	667	-.19**	408	-.06
	Female	948	-.14**	947	-.22**	624	-.09*
	White	1424	-.12**	1423	-.20**	912	-.02
	White male	595	-.10*	595	-.18**	362	-.01
	White female	829	-.12**	828	-.22**	550	-.03
	Black	192	-.16*	191	-.02	120	-.20*
	Black male	73	-.16	72	-.08	46	-.09
	Black female	119	-.17	119	.01	74	-.28*

Analysis and Discussion

Correlations between intelligence and number of children, number of siblings, ideal number of children, and socioeconomic status are tabulated in Table 1. These results are similar to the findings of Lynn.

In addition, significant negative associations were found between the intelligence of males and number of children, the intelligence of white males and number of children, and intelligence and ideal number of children, providing more evidence for dysgenesis. However, compared to whites, fertility for blacks was found to be slightly eugenic, and the correlations for blacks were not as strong as those for whites. This data is in agreement with Williams and Ceci, who found that gaps between IQ by race were decreasing over time.

Table 2: Partial Correlations Between Intelligence and Number of Children, Number of Siblings, Ideal Number of Children, Education and Socio-economic Status, Controlling for Education and Socioeconomic Status (SES)

(** $p < .001$ for bivariate correlations; $p < .00016$ for partial correlations
* $p < .05$ for bivariate correlations; $p < .008$ for partial correlations)

Control	Sample	No.	No. Child	No.	No. Sibs	No.	No. Ideal
EDU-CATI-ON	Total	1022	-.05	1022	-.09*	1021	-.06
	Males	404	-.06	404	-.08	404	-.01
	Female	618	-.03	618	-.09	618	-.09
	White	904	-.02	904	-.07	904	-.03
	White male	358	-.05	358	-.06	358	.01
	White female	546	.00	546	-.07	546	-.06
	Black	115	-.12	115	.01	115	-.14
	Black male	44	-.02	44	-.11	44	-.03
	Black female	70	-.19	70	.09	70	-.24

Control	Sample	No.	No. Child	No.	No. Sibs	No.	No. Ideal
SES	Total	968	-.12*	967	-.20*	967	-.09*
	Male	379	-.19*	377	-.18*	377	-.08
	Female	589	-.12*	587	-.20*	587	-.09
	White	852	-.12*	851	-.19*	851	-.03
	White male	334	-.14	332	-.18*	332	-.04
	White female	518	-.10	518	-.20*	518	-.03
	Black	113	-.21	113	.00	113	-.22
	Black male	43	-.21	43	-.07	43	-.09
	Black female	70	-.21	70	.04	70	-.33*
Control	Sample	No.	No. Child	No.	No. Sibs	No.	No. Ideal
EDU-CATI-ON	Total	965	-.05	965	-.09*	965	-.07
AND	Males	377	-.07	377	-.11	377	-.05
SES	Female	588	-.03	588	-.08	588	-.08
	White	850	-.02	850	-.08	850	-.03
	White male	333	-.06	333	-.09	333	-.02
	White female	517	.01	517	-.05	517	-.05
	Black	111	-.13	111	.01	111	-.16
	Black male	42	-.04	42	-.11	42	-.05
	Black female	69	-.19	69	.07	69	-.28

For Hypothesis 1 it was found that, controlling for education and socioeconomic status, the relationship between intelligence and number of children, intelligence and number of siblings, and intelligence and ideal number of children reduces, to statistical insignificance ($p < .008$, Bonferroni approach to control for Type I errors), all but one of the correlations, the correlation between intelligence and number of siblings. Controlling for education and socioeconomic status alone reveals that education by itself effectively reduces all but one of the correlations, intelligence and numbers of siblings, to insignificance ($p < .008$, Bonferroni approach to control for Type I errors). This reveals that the relationship between intelligence and number of children is spurious at best. Education appears to act as a mediating variable, but it cannot explain away the relationship between intelligence and number of siblings.

Table 3: Multiple Regression Analysis of Number of Children by Intelligence, Education, SES, Sex, Age and Race

**Results significant at the $p < .001$

-Standardized coefficients are in [ ] below the unstandardized coefficients in *italics*.

Variables	Model 1	Model 2	Model 3	Model 4
Constant	2.951**	3.940**	3.867**	2.340**
Intelligence	-.071[.144]	-.020[-.040]	-.020[-.040]	-.002[-.005]
Education		-.107** [-.200]	-.108** [-.200]	-.084** [-.156]
SES			.002[.017]	.001[.008]
Race				.761**[.140]
Sex				-.035[-.010]
Age				.018**[.135]
Adjusted R2	.020	.048	.048	.077
Sig.	.000	.000	.000	.000

For Hypothesis 2, it was found that of the three independent variables, education (standardized beta = -.200, $p < .001$) is a better indicator of the dependent variable, number of children, than intelligence or socioeconomic status. Alone, education explains 2.8% (R^2 change = .028) of the variance associated with number of children while socioeconomic status remains insignificant. Therefore, the higher a person's educational attainment, the fewer children they tend to have. Regression with the three control variables reveals that age, sex and race, along with education and socioeconomic status, still only account for 7.7% (R^2 = .077, p < .00) of the variance in number of children.

Table 4: Univariate Analysis of Distribution of Intelligence and Number of Children with ANOVA

	Males	Males	Females	Females
Intelligence Scores	No. Subject	No. Child	No. Subject	No. Child
0-2	49	2.05	91	2.18
3-4	84	1.72	93	2.10
5-6	106	1.92	153	1.87
7-8	137	1.79	204	1.65
9-10	136	1.51	181	1.61
11-12	88	1.52	149	1.54
13-14	56	1.58	63	1.50
15-16	12	1.31	14	1.90
	F(7,661) = 2.351, p=.02		F(7,940) = 4.078, p=.00	
n^2		.024		.029

* 95% Confidence Interval

Post-hoc analysis with Scheffe's test revealed no significant differences for number of children by intelligence scores at the 95% confidence interval (CI) for males, but there was a significant difference for females. Females with intelligence scores of 0-2, 3-4, 5-6 had children at significantly younger ages than those with intelligence scores of 11-12.

For Hypothesis 3, univariate analysis revealed males (F(7,661) = 2.351, p = .02) and females have significant differences in mean numbers of children by intelligence scores (F(7,940) = 4.078, p < .00). For males (h^2 = .024, p < .02) distribution of intelligence accounts for 2.4% of the variance in number of children, whereas for females (h^2 = .029, p < .00) distribution of intelligence accounts for 2.9% of the variance in number of children. Using Scheffe's test, a stringent statistical test, post-hoc analysis revealed that the lowest (0-2) and highest (15-16) intelligence scores did not differ significantly by numbers of children. In fact, post-hoc analysis revealed that only females with intelligence scores of 0-2, 3-4 and 5-6 had children at significantly younger ages than females with intelligence scores of 11-12.[2]

Table 5: Univariate Analysis of Distribution of Intelligence and Ideal Number of Children with ANOVA

	Males	Males	Females	Females
Intelligence Scores	No. Subject	No. Ideal	No. Subject	No. Ideal
0-2	29	1.81	59	2.18
3-4	55	1.69	66	2.10
5-6	62	1.56	96	1.87
7-8	79	1.87	143	1.65
9-10	87	1.88	108	1.61
11-12	51	1.72	99	1.54
13-14	38	1.45	40	1.50
15-16	7	2.93	13	1.90
	F(7,400) = .640, p=.72		F(7,616) = 1.512, p=.16	
n^2		.011		.017

* 95% Confidence Interval

Post-hoc analysis with Scheffe's test revealed no significant differences for ideal number of children by intelligence scores at the 95% confidence interval (CI) for males and females.

In addition, univariate analysis of mean ideal numbers of children by intelligence scores revealed that there was no significant difference among males (F(7,400) = .640, p = .72) or females (F(7,616) = 1.512, p = .16). Therefore, there is no significant difference between intelligence scores and the ideal number of children. However, it is interesting to note that males of the highest intelligence score (15-16) tend to have a higher mean value (Mean = 2.93) for ideal number of children than males with lower intelligence scores, or females of a similar intelligence score (Mean = 1.90). This is consistent with Blake (1967) and Martin (1995), who found that males of high intelligence scores tend to have higher ideal numbers of children, although the difference is insignificant.

Table 6: Univariate Analysis Distribution of Intelligence and Age of Respondent when First Child Was Born with ANOVA

	Males	Males	Females	Females
Intelligence Scores	No. Subject	Age of Respondent when 1st Child was Born	No. Subject	Age of Respondent when 1st Child was Born
0-2	27	25.96	55	21.51
3-4	55	25.45	58	21.50
5-6	62	25.39	103	22.24
7-8	78	26.21	140	21.88
9-10	89	25.6	115	23.50
11-12	56	25.98	88	24.65
13-14	31	26.19	29	24.28
15-16	6	26.19	8	24.75
	F(7,396) = .222, p=..98	25.33	F(7,588) = 5.229, p=.00	
n^2		.004		.059

* 95% Confidence Interval

Post-hoc analysis with Scheffe's test revealed no significant differences for age of respondent when 1st child was born by intelligence scores at the 95% confidence interval (CI) for males but there was a significant difference (p< .05) for females. Females with intelligence scores of 0-2, 3-4, and 7-8 were significantly higher than females with intelligence scores of 11-12.

Finally, univariate analysis of mean age of respondent when first child was born by intelligence score revealed there was no significant difference for males (F(7,396) = .222, p = .98) and a significant difference for females (F(7, 588) = 5.229, p = .00). For females (h^2 = .059, p < .00) distribution of intelligence scores accounts for 5.9% of the variance in age of respondent when first child was born. Post-hoc analysis using Scheffe's test, revealed that the females with intelligence scores of 0-2, 3-4, and 7-8 had children at significantly younger ages than women with intelligence scores of 11-12.[2]

Conclusion

Lynn argues that his analysis provides evidence of dysgenic fertility for the first two generations in the twentieth century in the United States (Lynn). However, a substantial body of evidence exists to refute such claims. The re-specification and reanalysis reveals that the lack of control for other variables which influence fertility reveals that education and socioeconomic status are not merely proxies for intelligence, but play an important, spurious role in relating intelligence and fertility. Controlling for education reduced all but one correlation between intelligence and number of children, intelligence and number of siblings, and intelligence and ideal number of children (see Tables 1 and 2).

In addition, multiple regression analysis reveals that, as indicated by the standardized regression coefficients, education plays a more important role in determining number of children, before race, age, sex, socioeconomic status and intelligence (see Table 3). This finding is consistent with other research findings which suggest that education may play an important role in exposing individuals to alternative forms of contraception, but this was not examined in the study (Martin).[3]

In addition, this research found, in accordance with Lynn's research, that there was a significant difference between the intelligence scores of females and number of children. However, there was no significant difference between females of the lowest intelligence score (0-2) and the highest intelligence score (15-16) as was suggested by Lynn. The lack of a significant difference for both males and females by intelligence scores for numbers of children is in direct opposition to Lynn's conclusion that women of higher intelligence tend to prefer less children.

The lack of substantial significant differences by intelligence scores and age of respondent when first child was born does not add much weight to the argument for dysgenic fertility in the United States. Therefore, although this re-analysis and re-specification of the existence of dysgenic fertility in the first two generations born in the

United States during the twentieth century is not entirely refuted, it does throw some light on the inconsistencies in Lynn's argument.

Further exploration and additional research needs to be done concerning intelligence and fertility. Future research should focus on attitudes toward contraceptives, religiosity, the social value of children, and values associated with socioeconomic status and their influences on fertility and intelligence.

Notes

[1]Lynn (2000) noted that the 1994 GSS data set did not contain information about the age at which women had their children. However, our review of the data indicates that, indeed, the data do have information pertaining to the age at which women had their first child, and subsequent information pertaining to the year in which other children were born, which is beyond the scope of this re-analysis.

[2] Small sample size for individuals with high intelligence scores (15-16) may account for the lack of a significant difference by univariate analysis (One-Way ANOVA) between individuals with low intelligence scores (0-2) and individuals with high intelligence scores (15-16).

[3] Although information on attitudes concerning birth control were present in the 1994 GSS data set, this topic was beyond the scope of this paper.

Works Cited

Bahr, Stephen and Geoffrey K. Leigh. "Family Size, Intelligence, and Expected Education." *Journal of Marriage and the Family* 40 (1978), pp. 331-335.

Blake, Judith. "Reproductive Ideals and Educational Attainment among White Americans, 1943-1960." *Population Studies* 21(1967), pp. 159-174.

Blake, Judith. "Is Zero Preferred? American Attitudes toward Childlessness in the 1970s." *Journal of Marriage and the Family* 41 (1979), pp. 245-257.

Cattell, P. "The Fate of National Intelligence: Test of a Thirteen

Year Prediction." *Eugenics Review* 42 (1951), pp. 138-148.

Guo, Guang, and Leah K. VanWey. "Sibship Size and Intellectual Development: Is the Relationship Casual?" *American Sociological Review* 64 (1999), pp. 169-187.

Guo, Guang and Elizabeth Stearns. "The Social Influences on the Realization of Genetic Potential for Intellectual Development." *Social Forces* 80 (2002), pp. 881-910.

Gordon, Margeret T. "A Different View of the IQ-Acheivement Gap." *Sociology of Education* 49 (1976), pp. 4-11.

Herrnstein, Richard J., and Charles Murray. *The Bell Curve: Intelligence and Class Structure in American Life* (Free Press Paperbacks, 1994).

Knodel, John, Napaporn Havanon and Werasit Sittitrai. "Family Size and the Education of Children in the Context of Rapid Fertility Decline." *Population and Development Review* 16 (1990), pp. 31-62.

Lynn, Richard. "New Evidence for Dysgenic Fertility for Intelligence in the United States." *Social Biology* 6 (2000), pp. 146-149.

Martin, Teresa C. "Women's Education and Fertility: Results from 26 Demographic and Health Surveys." *Studies in Family Planning* 26 (1995), pp. 187-202.

Powell, Brian and Lala C. Steelman. "Beyond Sibship Size: Sibling Density, Sex Composition, and Educational Outcomes." *Social Forces* 69 (1990), pp. 181-206.

Steelman, Lala C. and John T. Doby. "Family Size and Birth Order as Factors on the IQ Performance of Black and White Children." *Sociology of Education* 56 (1983), pp. 101-109.

Weakliem, David, Julia McQuillan and Tracy Schauer. "Toward Meritocracy? Changing Social-Class Differences in Intellectual Ability." *Sociology of Education* 68 (1995), pp. 271-286.

Weinberger, Mary B. "The Relationship Between Women's Education and Fertility: Selected Findings From the World Fertility Surveys." *International Family Planning Perspectives* 13 (1987), pp. 35-46.

Williams, Wendy M. and Stephen J. Ceci. "Are Americans Becoming More or Less Alike? Trends in Race, Class, and Ability Differences in Intelligence." *American Psychologist* 52 (1997), pp. 1226-1235.