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Cognitive Development and Social Policy

The contribution of parental occupation and education to mental performance in 11-year-olds in Warsaw.

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In this study we asked what effect directed social change has had on the distribution of mental performance among school children. We made our observations in a society committed a generation ago to a new political system and a defined social policy.

The question posed was broad. We sought to make the data more specific by differentiating among domains of childhood environment that may influence cognitive development and, thereby, the distribution of mental performance in school children. Certain factors intrinsic to family social structure and position are separated from factors extrinsic to family social structure and position. Factors here termed intrinsic reside in the personal attributes of family members; children experience them primarily within the family milieu. Although such factors also determine experiences outside that milieu, they can exert a direct influence on cognitive development through the mediation of the family socialization process. Parental occupation and education, as well as birth order, family size, and other determinants of family microculture belong in this class (*1*). Factors we term extrinsic reside in the environment external to family social life; children experience them primarily outside the family milieu. Although such factors may influence that milieu, they can exert a direct influence on cognitive development through extrafamilial experience. Schools, housing, health and welfare services, recreation, and criminality and employment rates belong in this class.

The separation of intrinsic from extrinsic factors could be accomplished by research design together with analysis because of the special situation in Warsaw. In that city there had been, it was believed, redress of inequalities of habitat among its people. We aimed to test whether this equalization of extrinsic factors in the wider environment had altered or reduced the gradients in mental performance typically found with social class in other environments.

In Western societies numerous studies have demonstrated the association of social class with mental performance and mild mental retardation. Although defined by occupation, education, income, or social status criteria inherent in family members that we have classed as intrinsic, social class is composed of a complex of factors without and within the family. Families of manual and unskilled laborers, in comparison with those of nonmanual and better educated workers, have generally been poorly housed and poorly schooled, have had inferior health care, and have often suffered from discrimination in social and public life. Given this complex in observed associations of social class with mental performance, extrinsic factors are readily confounded with such intrinsic factors as parental occupation and education.

The family milieu and socialization process is influential in cognitive development. This one may infer from studies of adoptees (*2*), of family types (*3*), of birth order and family size (*4*), and also from the average mental performance of surviving singletons of twin pairs compared with the below-average performance of surviving pairs (*5*). While by now this influence is hardly in doubt, the size of the contribution of intrinsic factors relative to extrinsic factors must remain an open question as long as they have not been clearly separated from each other. Attempts have been made to separate them by multivariate analytical techniques (*6–9*). Such studies are inherently limited by the intimate covariation of the social class complex. Families of the upper social classes who are exposed to the environment of poverty are few and, by

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0036-8075/78/0623-1357$01.50/0

this very situation, deviant. Families of the poorest social classes who are exposed to a favorable environment are likewise few and can hardly be free of the influence of a special family milieu.

The situation in Warsaw seemed to present an opportunity to accomplish the separation of extrinsic from intrinsic factors because the city is essentially a planned creation of the post-World War II period. The ecology of most cities with a history, whether in socialist or capitalist societies, contains the residue of the past. They must adapt this accumulated ecology as best they can to the needs of contemporary social structure. The ecology of modern Warsaw has little of such an historical residue.

Some 70 percent of Warsaw was physically destroyed during World War II. The destruction was not entirely even; central areas were totally destroyed, and peripheral areas were less affected (*10*). The city was rebuilt under the conditions of a new political system. Buildings were constructed and housing was distributed on egalitarian principles. Consequently, residential districts lost their usual and manifest significance as indicators of class affiliation. The consolidated working-class character of the prewar slums did not persist; where they were not razed, nonmanual workers and "intelligentsia" were scattered among them. In the large sections of the city built anew, a far-reaching equalization of housing and living standards was effected.

In Warsaw today, people of all levels of education and all types of occupations live in apartments that closely resemble each other, shop in identical stores that contain the same goods, and share similar catering and cultural centers. Schools and health facilities are equipped in the same way and uniformly accessible. It is thus quite natural for families of varied occupation and culture to live side by side in the same districts, to occupy buildings and homes of similar standard, and to attend the same schools and medical facilities.

It seemed probable that the apparently random distribution of all these circumstances in Warsaw would permit the neutralization of many extrinsic factors and their clear separation from intrinsic factors. By contrast, there was every reason to think that variation in intrinsic factors had persisted in Warsaw; as elsewhere, education and occupation are differentiated in the population. From the literature and from our own previous studies we had concluded that family-mediated factors account for a great part of the social class gradients in mental performance. Such gradients are universally found in the West (*11*). And, it is fair to assume, existed in prewar Poland. We expected, therefore, that ecological equalization brought about by social policy over a 30-year period would have reduced but not eliminated the social class gradient in mental performance. Others might have had different expectations: of either a markedly shallower gradient or, on the contrary, no change. An estimate made from data on twins in prewar Soviet Russia pointed to an effect of family environment on mental performance much the same as in the contemporary United States (*12*). In the Soviet Union, however, ecological reconstruction of the same order as in Warsaw had not occurred.

Summary. The city of Warsaw was razed at the end of World War II and rebuilt under a socialist government whose policy was to allocate dwellings, schools, and health facilities without regard to social class. Of the 14,238 children born in 1963 and living in Warsaw, 96 percent were given the Raven's Progressive Matrices Test and an arithmetic and a vocabulary test in March to June of 1974. Information was collected on the families of the children, and on characteristics of schools and city districts. Parental occupation and education were used to form a family factor, and the district data were collapsed into two factors, one relating to social marginality, and the other to distance from city center. Analysis showed that the initial assumption of even distribution of family, school, and district attributes was reasonable. Mental performance was unrelated either to school or district factors; it was related to parental occupation and education in a strong and regular gradient. It is concluded that an egalitarian social policy executed over a generation failed to override the association of social and family factors with cognitive development that is characteristic of more traditional industrial societies.

Table 1. Distribution of items and factor loading in two district factors obtained from principal component analysis of 68 Warsaw urban districts; standard deviation, S.D.

Item*	Mean	S.D.	Minimum	Maximum	Eigenvector	Loading
		1. City center				
Number of post offices	1.09	1.15	0.0	5.0	0.293	0.794
Number of residents	19,442.98	17,986.89	1,323.0	75,458.0	0.285	0.772
Number of secondary schools	0.73	0.93	0.0	4.0	0.274	0.742
Percentage of apartments with running water	70.31	30.02	15.8	100.00	0.273	0.739
Number of libraries	1.41	1.24	0.0	5.0	0.264	0.715
Number of cinemas	0.89	1.80	0.0	13.0	0.248	0.672
Residents per hectare	7,134.07	8,485.39	107.0	32,581.0	0.245	0.663
Percentage of nonagricultural population	95.85	7.37	58.5	99.9	0.235	0.609
		2. Social marginality				
Percentage aged 7 to 17 years	17.15	3.28	9.9	26.2	−0.313	−0.710
Rooms per dwelling	2.56	0.31	1.7	3.6	−0.299	−0.678
Persons per household	2.86	0.31	2.2	3.7	−0.280	−0.635
Crude delinquency rate†	200.34	205.08	10.2	1,138.0	0.244	0.553
Alcohol-associated crime rate	6.80	6.65	0.0	45.4	0.264	0.599
Adult offenders†	94.12	57.08	15.1	353.6	0.317	0.719
Percentage receiving pensions and welfare	14.18	5.04	4.3	26.0	0.314	0.712
Percentage aged over 60 years	16.20	4.56	6.1	26.4	0.336	0.762

*Items not significantly related to either factor are as follows: male/female ratio, percentage aged 0 to 6 years, percentage employed, percentage without own dwelling, apartments in building, persons per room, square mile per capita in dwelling unit, percentage of children in kindergarten, pupils per classroom, number of books in library, outpatient clinic attendance, pharmacies per 10,000 inhabitants, shops, service centers, juvenile delinquents per 10,000 inhabitants. †Per 10,000 inhabitants.

Description of the Study

The population under study included all children born in 1963 and living in Warsaw at the time of the survey. The first step in establishing the population was to compile school registers. The next step was to validate the registers against the population census of the city of Warsaw for the year 1970. This cross-checking proved important both to correct identification and to follow-up. Finally, 14,238 children were identified, of whom 90.2 percent were discovered in both sources. Of 861 children identified in the school registers but not in the census, the majority could be accounted for by immigration subsequent to the census. The remainder are attributed to enumeration errors. Every eligible child identified from the census has been located in the school registers.

Two sets of variables, one set relating to the character of districts and the other to the quality of schools, were designated extrinsic variables. The district set of variables yielded two separate factors as will be described below. Parental occupation and education, birthplace of parents, sibship size, and birth order were family-related and designated intrinsic variables.

Warsaw comprises 79 urban districts (analogous to census tracts in the United States), of which 68 are residential. For each residential district information was sought on seven dimensions: demographic characteristics of the population, housing, schools, cultural facilities, services (including health services), delinquency and crime, and employment. From official sources we abstracted 31 items related to these dimensions for each district. The two major factors obtained from these items by principal component analysis were subjected to further analysis. One factor was named "city center," the second factor "social marginality."

Table 1 shows the distribution and the loading for the items comprising each factor. Although detectable, differentiation among districts characterized by these two factors was not sharp. Districts heavily loaded on the "city center" factor were in downtown areas with well-developed cultural and consumer facilities; those lightly loaded were more distant. A strong common element in this factor is clearly the location of the districts in relation to the city center. The districts heavily loaded on "social marginality" tended to have been inhabited before the war by so-called lumpenproletariat, and a proportion of homes in these districts had survived the war-time destruction of the city. A strong common element in this factor is a mix of social dependency (in the form of welfare support and pensions) and deviant behavior (crime and alcoholism) that seems typical of many societies. In Warsaw, however, these items are associated with fewer school-age children in fewer rooms per dwelling and, surprisingly, fewer persons per household.

Table 2. Distribution of three variables among 208 Warsaw regular schools.

Variable	Mean	S.D.	Minimum	Maximum
Average number of pupils per class	29.9	3.0	8.8	35.7
Percentage of teachers with university degrees	25.7	11.0	0	57.0
Percentage of children repeating grades in 1973–1974	1.7	1.2	0	7.8

Descriptive data were collected for all the 208 regular schools in Warsaw. The data covered the physical environment, facilities, quality of teachers, numbers and types of pupils, and efficacy of schooling. Three measures were found to be well specified, complete, and not redundant—the average number of pupils per class, the percentage of teachers in the school who had university degrees, and the average percentage of pupils repeating grades. Each of these is treated as a separate variable in the analysis. Their distribution is shown in Table 2.

Data on the families of all children tested were obtained from school records and were supplemented by a brief questionnaire taken home by the pupils and filled in by the parents. These data included age, education, occupation, and birthplace for each parent. Information on sibship size and birth rank was obtained from the pupils themselves. The completion rate for any item was never less than 87.8 percent. In comparison with a sample of data available from the 1970 census, the school data were not only contemporary but were more complete and specific on the given items, and particularly on parent's occupation.

The distribution of these variables underlines special characteristics of War-

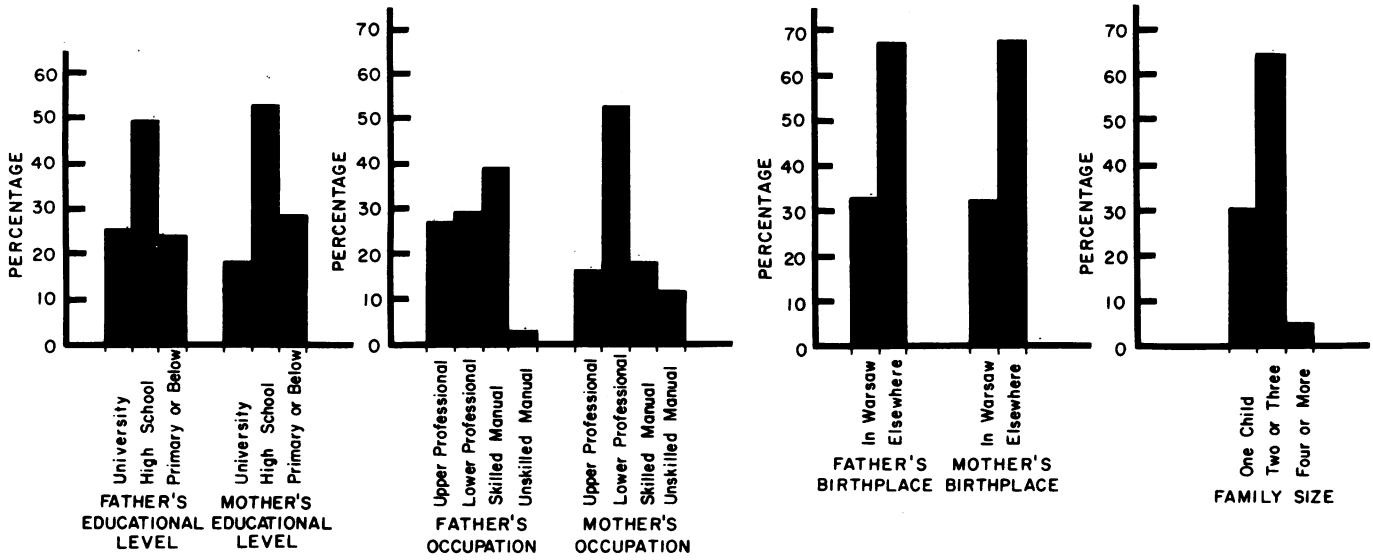

Fig. 1. Distribution of parental characteristics and family size among approximately 14,000 children born in 1963 and living in Warsaw in spring 1974.

saw over and above those which led us to choose it for study. Warsaw attracts a selected population as a capital city and as a major industrial and cultural center with the largest share in the country of institutions for higher education. Selection was probably reinforced in 1954 by special regulations promulgated to curb the inflow of population; these gave priorities to special qualifications and occupations. In consequence, there is an unusual concentration of parents, both mothers and fathers, who have higher education (25 percent), who are in professional occupations (25 percent), who both work full-time (72 percent), and who have small families (80 percent have one or two children). Two-thirds of the parents were born outside Warsaw. Many of these data are summarized in Fig. 1.

In addition to the ordinal scales for each family variable, composite variables were created for parental educational levels combined, for parental occupations combined, and for a combined global index of both education and occupation (Table 3).

Assessment of Mental Performance

Measures of cognitive performance were obtained from the total cohort. At the time of testing during the period March 1974 through June 1974, this cohort was 10.3 to 11.6 years old.

A population of 14,238 children was identified in the 1963 birth cohort. Of this number, 13,695 (96.2 percent) were given an intelligence test, 13,684 an arithmetic test, and 13,543 a vocabulary test. Some children (206; 1.4 percent) had left Warsaw and were not followed; 91 (0.6 percent) were not tested because of severe mental or physical handicap or serious illness. The remaining 246 children (1.7 percent) could not be reached.

Group testing was carried out by trained psychologists in the regular school situation. Schools were visited in random order. By prior appointment, all children of the selected cohort were gathered together at a given hour. The tests were in a given sequence with a break between each. Children absent from school and not found on a revisit were later brought together and tested at a common gathering point. Exhaustive efforts were made to obtain complete coverage of the cohort.

The tests used were (i) Raven's Progressive Matrices Test. This nonverbal group test has advantages for cross-cultural comparisons. The test has been widely used among Polish school-age children. (ii) A verbal test. (iii) An arithmetic test. The tests were adapted and standardized after preliminary trials in the city of Lublin among a sample of more than 400 9- to 12-year-old children.

The raw scores of the total cohort for each of the three tests were transformed to yield a mean of 100 with a standard deviation of 15. It should be noted that, for a representative sample of 213 of the cohort subsequently given individual tests, the mean score on the Wechsler Intelligence Scale for Children (WISC) was 109 ± 15. This high mean IQ, presumably attributable to the social selection of the Warsaw population, needs to be kept in mind in interpreting the results of the standard scores.

For the sake of simplicity, in this article we shall present tabulated data on

Table 3. Construction of global index of parental education and occupation.

Parental index of education

Mother's education	Father's education 1	2	3	4	5
Less than primary	1	0	1	2	3	0
Primary, vocational	2	1	2	3	4	1
Secondary	3	2	3	4	5	2
University	4	3	4	5	6	3
Not known	5	0	1	2	3	x

Parental index of occupation

Mother's occupation	Father's occupation 1	2	3	4	5
Unskilled	1	0	1	2	3	0
Skilled	2	1	2	3	4	1
Lower professional	3	2	3	4	5	2
Upper professional	4	3	4	5	6	3
Not known	5	0	1	2	3	x

Global index

Education of parents	Occupation of parents 0	1	2	3	4	5	6
0	0						6
1		2					7
2			4				8
3				6			9
4					8		10
5						10	11
6	6	7	8	9	10	11	12

Table 4. Correlation matrix of family factors, district factors, and school factors among the individual children of the 1963 birth cohort living in Warsaw.

Factor	Family: Education: Father	Family: Education: Mother	Family: Occupation: Father	Family: Occupation: Mother	District: City center	District: Marginality	School: Class size	School: Graduate teachers	School: Repeaters
Family									
Education									
Father	1.0								
Mother	0.69								
Occupation									
Father	0.84	0.63							
Mother	0.65	0.83	0.62						
District									
City center	0.21	0.21	0.20	0.19					
Marginality	−0.01	0.01	−0.02	−0.02	−0.37				
School									
Class size	0.07	0.07	0.07	0.08	−0.09	−0.34			
Graduate teachers	0.12	0.12	0.12	0.11	0.33	0.03	−0.16		
Percentage of repeaters	−0.17	−0.17	−0.16	−0.16	−0.22	−0.03	−0.12	−0.10	
Test									
Raven score	0.29	0.27	0.28	0.29	0.11	−0.02	0.06	0.07	−0.08

the dependent variable for the Raven test only, and not for the arithmetic and vocabulary tests. Similarly, we shall present tabulated data on the family variables for occupation and education only, and not for birthplace of parents, family size, or birth order. Neither the use of other dependent variables nor the inclusion of the additional variables alters the direction or magnitude of any of the results reported here.

Results

Table 4 shows a matrix of the bivariate correlations among the attributes of the individual members of the cohort. The variables are arranged in four groups (district, school, family, test scores) in accord with the questions being explored. Within variable groups, the intercorrelations among pairs of variables are high for the family group (0.62 to 0.84), moderate for the district group (−0.37) and slight for the school group (−0.10 to −0.16).

Significant correlations (of about $r = .2$) are seen between one variable of the district group (city-center factor) and all those in the family group. Families with higher levels of education and occupation tended to cluster around the facilities of the center of the city. Lesser but significant correlations are seen between the school group of variables and those in the family group. In spite of the historical and political circumstances referred to above we cannot, therefore, entirely ignore residential clustering, either by occupation and education or by the characteristics of schools.

With regard to cognitive performance, it is clear from Table 4 that the family group of variables correlates much more highly with test scores than do the district or school group variables. In Table 5 multiple regression analysis is used to separate the unique contributions to test scores of family, district, and school variables. For ease of comprehension in this analysis, each group of variables is combined into a single set. Whatever the order in which the other variables are entered into the equation (as in models 1, 2, 3, and the three other models that can be derived from these) the family variables make the major contribution.

The three sets of variables together account for 10.6 percent of the variance in Raven scores. From the permutations of the three sets of variables shown in the equations for different causal models in Table 4, it can be inferred that the proportion of this explained variance that is accounted for by family variables can not be less than 85 percent and could be as much as 97 percent. Thus in model 1 of Table 4, the maximum variance is assigned to the district and school variables by entering them into the equation before the family variables. In that equation, the extrinsic variables combined account for 2.1 percent of total variance and 20 percent of explained variance. When family variables are entered first as in model 3, the extrinsic variables combined account for only 0.35 percent of total variance and 3.3 percent of explained variance. Thus under the conditions of all the possible causal models for the Warsaw data, the contribution of the extrinsic school and district variables is minor (*13*).

Table 5. Proportion of variance (R^2) in Raven scores of 1963 birth cohort accounted for by family, district, and school variables in multiple regression equations for different causal models.

Step	Variable entered	Total R^2 explained	R^2 change
	Model 1		
1	District	0.01586	0.01586
2	School	0.02161	0.0575
3	Family	0.10618	0.08458
	Model 2		
1	School	0.01315	0.01315
2	Family	0.10482	0.09168
3	District	0.10618	0.00136
	Model 3		
1	Family	0.10271	0.10271
2	District	0.10514	0.00244
3	School	0.10618	0.00104

Table 6. Mean score on Raven test by global index of parental occupation and education (see Table 3) in 13,108 children of the 1963 birth cohort living in Warsaw (data incomplete for 1130 children).

Global index	Score	S.D.	*N*
0	85.85	15.56	103
1	90.63	16.88	221
2	91.68	15.66	510
3	93.63	15.45	1278
4	96.02	14.89	1976
5	97.14	14.90	1116
6	100.15	14.23	1547
7	101.86	13.60	895
8	102.35	13.44	1618
9	104.27	13.01	608
10	105.42	12.97	1362
11	105.20	12.82	432
12	108.07	12.08	1442

Table 7. Proportion of variance (R^2) in Raven scores explained by family, district, and school variables for children of the 1963 birth cohort living in Warsaw whose parents had had primary education only. The data are shown in multiple regression equations for different causal models.

Step	Variable entered	Total R^2 explained	R^2 change
	Model 1		
1	District	0.04186	0.04186
2	School	0.04406	0.00220
3	Family	0.06310	0.01904
	Model 2		
1	School	0.007	0.00700
2	District	0.04406	0.03700
3	Family	0.06310	0.01904

In Table 6 we set out the relation between the combined global index of parental occupation and education and mean score on the Raven test. The regularity of the declining gradient in mean score with this index is striking.

Table 7 analyzes the performance of children whose parents had less than a primary school education. One might expect schooling to be more influential among such children, since it might contribute an educational element lacking in their families. Thus some results from studies in the United States suggest that school factors account for a larger proportion of variance in mental performance among children at a social disadvantage than among others (*6*, p. 23). In Warsaw, the correlations of school variables with mental test performance among children of parents with less than a primary school education are no higher than among other children. Hence schooling appears not to contribute proportionally more variance to their mental performance.

Discussion

The initial assumptions of our research design about the special characteristics of Warsaw are, by and large, supported by the loose associations of extrinsic with intrinsic or family variables. That is, social policy has indeed resulted in the even distribution of school and district variables across the population. This distribution ensures both an adequate range of intrinsic variables across districts and schools for analysis, and effective analytic control of such covariation as remains.

The study therefore allows us to consider the impact of social policy on the relations of two aspects of environment with mental performance. With regard to the ecological milieu, our results are highly suggestive but cannot be conclusive. The contribution to total variance in test performance of the extrinsic variables combined, we have shown, is no more than 2.1 percent. The range of variation among the extrinsic variables themselves is not great, however; such effects as they may have would be

largely neutralized by their even distribution across districts.

For this reason one cannot say from our study that extrinsic factors are not salient in mental performance, but only that they are not salient under the equalized conditions of habitation found in Warsaw. In other words, social policy may have removed the effects of extrinsic factors from the reach of measurement. Thus in the United States in the 1960's, 2 to 10 percent of the variance in school achievement for children in the sixth grade was accounted for by factors related to school quality. One must allow, however, that the components of school quality in these studies include such matters as the quality of the student body (*6*, p. 302). An alternative argument could be that our extrinsic measures are too insensitive to detect effects.

With regard to intrinsic variables, the situation in Warsaw meets the conditions for a conclusive answer to a crucial question. Since social policy has distributed families of varying occupation and education fairly evenly across the ecological milieu of the city, we are in a position to assign a value to the association of mental performance with occupation and education. Despite this social policy of equalization, the association persists in a form characteristic of more traditional societies. Indeed, contrary to expectation, these associations are as strong as many reported in large-scale studies from Western countries (*7*, pp. 78 and 117; *8*, chap. 7; *14*). The unusual selection and composition of the Warsaw population perhaps contributes to the sharp gradient.

Parental occupation and education are indicators of family microculture as well as of status. Since in our Warsaw data these variables can be separated from the ecological milieu of the families under study, we believe that they can be interpreted as indicators of family effects, and particularly of intrafamilial effects. On the basis of our studies thus far, we are not able to apportion these effects among social and genetic factors.

On the basis of this study we may assert that in Warsaw, social policy has achieved a degree of equalization of living conditions and schooling. For lack of historical data and because of the success of this policy, it is not possible to assess how much these changes have affected the mental performance of children. It is plain, nevertheless, that societal changes over a generation have failed to override forces that determine the social class distribution of mental performance among children. For further elucidation of the determinants of cognitive abilities, we need to turn our attention to intrinsic factors.

In matters of social and educational policy too, the microculture and the status of families can be seen as antecedent conditions with which educational systems must cope. The traditional approaches of mass education clearly do not supersede them. Ordinary schooling may be merely inadequate to the task or, as various studies suggest, schooling may actively reinforce inequalities in intellectual competence that reside in family background. At the population level, selection within stratified educational systems intensifies social stratification (*15*), and at the classroom level teacher-student interaction subtly differentiates children by their family background and motivates or frustrates learning accordingly (*16*). An educational policy that would improve levels of cognitive ability would require more research on the relation of parental occupation, education, and other family factors to schooling and the larger environment.

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17. We thank M. Czarkowski for conducting the fieldwork, L. Belmont and J. Kostrzewski for help in the selection and adaptation of psychological tests, and L. Belmont and M. Czarkowski for help in the conceptualization and development of this study. The work was supported in part by Department of Health, Education, and Welfare contracts 19-P-58343-HD 42808 and grant 1-T32-HD 07040-1. Requests for reprints should be addressed to M. Susser, Department of Epidemiology, Columbia University, 600 West 168 Street, New York 10032.