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Prenatal Environment and Classroom Performance

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THE German measles epidemic of 1941 had especially tragic results for children of women who contracted the disease during the first trimester of pregnancy. The effects of this epidemic served to alert medical science to the importance of the prenatal environment in shaping the subsequent development of the child. Since that time medical literature has been replete with reports of a variety of factors (X-ray; anesthesia; nutrition, including excessive dosages of vitamin D; various drugs and chemical agents such as thalidomide, LSD, and calcium cyclamate) which are known or at least are thought to be inimical to optimal fetal development. Concomitant with this increased knowledge has been the refinement of various therapeutic techniques, including such radical procedures as intrauterine transfusion and fetal surgery, and the development of a new medical specialty, fetology.

The implications of this increased knowledge for education has only become apparent in recent years. Educators may previously have seen little connection between medical aspects of the prenatal period and the problems of school achievement with which they are primarily concerned. Examination of current literature in this area, however, makes this relationship considerably more significant than might have been supposed.

Benjamin Pasamanick and his associates presented some of the first investigations which provided evidence for a link between complications during pregnancy and delivery and learning problems in children. The numerous studies conducted by these researchers have been based on similar methodological procedures. Children attending special classes within the Baltimore school system, believed normal in all respects other than the disability under study, were selected as the target sample. The records of those children who were also born in Baltimore were located in the Bureau of Vital Statistics. The control population was then drawn from these records by selecting the child nearest in age to and of the same race and sex as the atypical child. Subsequent checks were also made to ensure that these matched pairs were also equivalent with regard to social class and age of mother. The hospital birth records of these children were then examined for mention of complications during pregnancy and delivery.

Pasamanick and his associates are fully aware that there are several weaknesses in

these procedures. In the first place, hospital records may contain inaccuracies; and second, placement in special or regular classes is not always a valid measure of the dependent variable, the presence or absence of disability. Nevertheless, this particular group has presented convincing evidence that prenatal complications are related to subsequent learning problems. In some instances differences between the two groups were very marked. With respect to reading problems, for example, Kawi (1959) reported that 45.4 percent of mothers of children with reading problems suffered one or more complications, compared with 21.4 percent of the control group mothers. Contrasting the percentages of mothers having had two or more complications, the differences are even more striking: 17.6 percent for the reading problem group and 1.9 percent for the controls. The reading problem group in this study was defined as children enrolled in remedial reading classes who were at least ten years old and of normal intelligence.

Significant differences were also noted by Rogers, Lilienfeld, and Pasamanick (1955) in comparing children referred to the Special Services Division of the Department of Education in Baltimore for deviant behavior. In this investigation premature birth was found to be related to these subsequent behavior problems.

This research team having also presented similar findings with respect to mental deficiency (Pasamanick and Lilienfeld, 1955a), epilepsy (Pasamanick and Lilienfeld, 1966b), and tics (Pasamanick and Kawi, 1956) has postulated a continuum of reproductive causality with a lethal component, consisting of abortions, stillbirths, neonatal deaths, and a sublethal component—cerebral palsy, epilepsy, mental deficiency, and, less seriously, reading problems and behavior disorders. It is their contention that an important factor in the incidence of these disorders is brain injury sustained during the prenatal and neonatal periods.

More recent longitudinal investigations concerning the effects of prenatal and postnatal anoxia have presented similar results. Corah *et al.* (1965) followed 101 full-term anoxic infants and a comparison group of 134 normal infants. All had received extensive examinations at birth and were administered tests of cognitive, perceptual, and perceptual-motor functioning as well as neurological examinations and personality assessment at the ages of three and seven. The test results at these two age levels were inconsistent, possibly due to differences in tests used with the three- and seven-year-olds or to the fact that the manifestations of neurological impairment vary with developmental level. Nevertheless, the findings indicated that three-year-olds who had suffered anoxia performed significantly more poorly on various conceptual tasks and on the Stanford-Binet, particularly on the vocabulary items, in comparison to control subjects. Differences in IQ were attenuated by the time these children were seven, but vocabulary differences persisted. Reading scores, perceptual-motor performance, and social competence ratings of the anoxic children were significantly lower at this time. Furthermore, although in both groups some children did poorly in certain areas, anoxic children were more likely to perform poorly in more than one area.

In addition to other pathogenic circumstances in pregnancy and delivery, premature birth has also been shown to have an ill effect on subsequent development. According to the World Health Organization (1961), premature birth, the largest single cause of infant death, is a significant source of nonlethal neurological damage. Of the premature infants who do survive, as many as 50 percent may suffer impairment ranging from minimal damage to severe retardation. Braine (1966), for example, reports a 17-point difference between premature and full-term male babies in scores on mental tests administered at the age of 13½ months. Wortis (1967) states that even among prematurely born children with no obvious defect, IQ's are likely to be lower than those of their full-term siblings.

It must be recognized, of course, that the poorer performances of prematurely born children may be due to overprotection on the part of the mother or other factors than purely physiological ones. In any event, how-

ever, the prematurely born have a more limited opportunity for optimal development.

The relationship between pathogenic circumstance in pregnancy and delivery and subsequent learning and behavior problems which has been documented by these studies has also been shown to be related to a third variable, that of social class. Many investigations have shown that the incidence of disorders during the prenatal period is three to four times as high among lower class in comparison to middle class families. Pasamanick (1965), for example, reports that toxemia, a condition of pregnancy found in some instances to be related to mental deficiency in the offspring, occurred in 18 percent of the pregnancies of lower class Negro women studied compared to 5 percent for middle class white women.

Premature birth is also related to social class membership. According to Wortis (1967) the percentage of premature births in Chicago in low income areas was 15 percent compared with 7.5 percent in areas where income was highest. The figures for New York reveal an even greater difference: 16.5 percent and 6.2 percent for low and high income areas respectively. These distressing figures are underscored by the fact that the steady decline in premature birth rate in evidence throughout the century has been halted, with the 1960 reports actually revealing an increase in these figures. Although it is expected that the 1970 figures will show an improvement, prematurity rates in the United States remain higher than those in many countries of western Europe.

Lower social class membership, however, is associated not only with greater incidence of neurological impairment, but also with reduced opportunity for recovery once impairment has taken place. In studying the progress of 250 prematurely born 2½-year-olds from lower social classes, Wortis *et al.* (1964) report that the deviant behavior patterns observed (poor sphincter control, sleep disturbances, bad temper) were frequently associated with disorganized family patterns. Similarly Braine (1966), in another longitudinal study of prematurely born children, found that social class differences contributed to the impairment of the most vulnerable group, those with the lowest birth weights. He concluded that environmental factors may have selectively handicapped the development of children who had already suffered some damage. Those with impairment of the central nervous system may be less able to adjust to an environment characterized by overly strong or inadequate stimulation.

The implications of these various investigations are clear. To the extent that the quality of prenatal and postnatal care can be improved, the number of school age children with learning or behavior disorders will be reduced. Scientific advances in obstetrical practice are, of course, one avenue by which this goal can be reached. But the discrepancies in maternal health figures for middle and lower class groups suggest that presently available medical knowledge is not being adequately disseminated in the population.

The reasons for this failure are legion—the poorer health education of the lower class woman, the inadequate staffing of publicly supported maternal health clinics, the impersonal treatment which women receive there, the inconvenient hours and locations at which services are dispensed, and the complicated procedures for establishing financial eligibility. It must be recognized, too, that low income women constitute a higher risk group during pregnancy: they may be in poorer prior health, and they include a larger percentage of those below 20 or over 35 years of age, as well as those with a greater number of previous pregnancies. These factors, which contribute to increased rates of prenatal complications, also clearly indicate that this group must receive greatly improved maternal care.

Educators can and must contribute to the solution of these problems not only in the interests of social welfare, but also because the consequences directly affect their school populations. Efforts which educators can take in this direction encompass the inclusion of a rigorous maternal health aspect to the high school curriculum, particularly in communities in which most students do not enter

college and where many pregnancies occur at an early age. Providing effective discussion groups or lecture-demonstrations for mothers who have not yet completed their families is another possibility.

The kind of parents' organizations associated with such programs as Head Start provides an excellent opportunity for this type of project. And finally, requesting information concerning complications during pregnancy, delivery, and the neonatal period at the time of school registration might aid in the early recognition of disabilities by signaling a group of children whose progress must be observed with more than usual care. In view of the trend toward schooling at increasingly early ages, such a practice seems particularly well advised.

The goal of reducing birth defects in the United States is one of very great importance. The role of educators in helping to achieve this goal is not to be minimized.

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