Book Reviews

Environmental Predictors of IQ

Preschool IQ. SARAH H. BROMAN, PAUL L. NICHOLS, and WALLACE A. KENNEDY. Erlbaum, Hillsdale, N.J., 1975 (distributor, Halsted [Wiley], New York). x, 326 pp., illus. $18.

Has the Collaborative Perinatal Project (CPP) proved a morass, or a mine of information? The project, set up by the National Institute of Neurological Diseases and Blindness in 1955, was an ambitious undertaking involving the collaboration of 14 centers. It was designed as a detailed prospective study of pregnancy and pregnancy outcome. At first the stated objective was a limited one, to cast light on the causes of cerebral palsy and neurological deficits of childhood, but in time a more general objective was adopted, to evaluate the effects of prenatal factors on the health of the individual child. The absence of representative sampling of the population at large, the elaborate records, the problems of coordinating the work and of controlling the quality of the data at the different centers, not to mention mounting costs as data collection and follow-up proceeded, caused many to regret that the undertaking had ever got off the ground.

Some of the gloom of the severest critics should be dispelled by this book, the major report among many valuable ones now owing to the CPP. It begins with an account of the project, taking us back to its origins. There was at that time perhaps more confidence in our understanding of the relation of prenatal and perinatal events to subsequent neurological deficit. Deficits arising from prenatal insults were believed by many to be widespread among children exposed to harsh environments, and to account for an array of neurological and developmental handicaps. There was fortunately considerable difference of opinion as to what the relevant prenatal events might be, and we can be grateful to the planners, consultants, and panels who saw to it that a comprehensive range of clinicopathological variables was included in the prenatal and perinatal protocols. Although it is widely asserted that the definition and reliability of the protocols of pregnancy were deficient and required years of work to get into reasonable shape before analysis could proceed, the protocols describing the infants and children were by all accounts carefully prepared. Testers were trained in the administration of the psychological tests and evaluated, and standards of reliability were set and maintained. A creditable level of follow-up to the seventh year was attained by 12 of the 14 collaborating centers.

About 53,000 women participated in the research, and the greater part of the protocols have now been checked, ordered, coded, punched, and entered on magnetic tape. The book under review analyzes and presents some of this processed information, and it demonstrates that at this point in time the CPP does indeed constitute a valuable source of information for the health sciences. The book deals with records of the sample of 12,000 white and 14,000 black singleton children whose mothers were enrolled in the CPP and who stayed with it at least until the fourth birthday. The sample is very similar in demographic and neonatal characteristics to the study population from which it was drawn. The outcome of central interest to the analysts is the score on the Stanford-Binet IQ test at age 4, and the question explored is the extent to which preexisting prenatal, perinatal, and postnatal factors predict this outcome. ("Predict" is here used technically, and circumvents the more elusive issue of "cause.")

The data are analyzed in several different ways. A screen of bivariate correlation coefficients first reduced many possible predictors to a manageable number. These predictors are presented in graphs and tables of means. In an attempt at logical ordering of variables, a multiple regression brought groups of predictors into the regression equations in sequence. A discriminant analysis sought to discriminate between "normal" and "low" scorers.

Whichever the method, the pattern of results varies little. Variables that described the social position and social experience of the mothers predicted the greater part of the "explained" variance in 4-year-old IQ scores. The recorded events up to the time of testing explained 15 to 17 percent of preschool IQ in black children and 25 to 28 percent in white children. Most of this explained variance (in black children 8 to 11 percent, in white children 20 percent, of the total variance in IQ) could be ascribed to circumstances not connected directly with the pregnancy; socioeconomic status of the family and education of the mother were the most important variables. Factors directly associated with the prenatal and perinatal period explained only 1 to 2 percent of the total variance in 4-year-old IQ: these were mainly dimensions of the infant at birth. Factors associated with infancy and childhood explained about 4 to 6 percent of the total variance: these were mainly scores on the Bayley mental and motor scales and physical measurements.

Among the perinatal variables, the associations with IQ of dimensions of the newborn infant (birth weight, length, head circumference) have been closely studied in the CPP and elsewhere. In the CPP each newborn infant measure, taken on its own, correlates significantly with 4-year-old IQ. The effects are small and nonlinear, and they are much reduced when antecedent demographic factors are taken into consideration. These results suggest to the reviewer that social position and social experience are the common cause of the outcome at birth and later IQ, rather than that there is a strong causal chain leading from social position through the dimensions of the newborn to later IQ. When the somatic measures of later childhood are also included in the multiple regression analysis, none of the associations of newborn infant dimensions with IQ retains significance. Is it premature to suggest now, after nearly three decades of study, that there is little to support a causal connection between infant dimensions at birth in general and later IQ (excepting in the extreme case of very small infants)?

From this book and other recent cohort studies (*1*), one is led to ask whether a great deal more will be learned about the determinants of IQ in populations from further studies of the details of pregnancy and birth. To explain environment-related variance in IQ we might better turn our attention toward the postnatal period and the socialization of parents and children. That the circumstances surrounding pregnancy and birth modify survival patterns in the perinatal period is not in doubt. Among the great mass who survive, however, it is clear that these circumstances are not intervening variables of sufficient import to account for the relationship of IQ with social position. Nor do the CPP data enable one to argue for an association of pregnancy factors with IQ by appealing to an interaction phenomenon. Manifestations of handicap were not greater among socially disadvantaged children who experienced deleterious events in the pre- and perinatal period than in advantaged children with similar experiences. The expected major adverse effects on IQ were found with such detectable clinical phenomena as Down's syndrome, brain abnormality, and retarded motor development.

The occurrence of these conditions is not associated with socioeconomic status, however, and the numbers affected are too small to contribute to the prediction of variance in IQ in the population. In any event, prospective studies of unstratified populations are usually not the method of choice for studying these conditions.

There is much more of interest in this book, although the presentation is disciplined to a fault, so that the broader implications of the findings are seldom broached. There is also much more in the CPP that remains unreported and demands study. No single analysis of these important topics, even of monograph length, can satisfy all readers or meet the needs of all investigators. Some might ask, for instance, for analyses that merge the data on black and white children and do not keep them separate throughout, as was done here. One effect of merging might be to heighten the proportion of variance in IQ accounted for by social status and maternal education. Would such a result be nearer or further from the truth? Some might prefer to consider systematically the contribution of the predictors to various outcomes taken in sequence, for example, newborn infant dimensions, 8-month-old Bayley scores, and so on. There is considerable interest, too, in anthropometric measures as outcomes. Clearly even a volume as thoroughly executed as this one cannot do justice to this rich data source.

Since no one in his senses would contemplate repeating the CPP, the scientific need for intensive exploration of this massive data set is compelling. A strong case can be made for setting up the materials as a public resource. The public interest stems from the vast federal expenditure on the CPP, from the multiple data sources and contributors, and from the probability that many of the data will be left fallow or incompletely used if they are not made available. The tapes ought now to be made readily accessible to researchers and their use encouraged. A mine the CPP certainly has proved to be, and it deserves to be fully exploited.

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References

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Muscle Research

Exploratory Concepts in Muscular Dystrophy II. Control Mechanisms in Development and Function of Muscle and Their Relationship to Muscular Dystrophy and Related Neuromuscular Diseases. Proceedings of a conference, Carefree, Ariz., Oct. 1973. A. T. MILHORAT, Ed. Excerpta Medica, Amsterdam, and Elsevier, New York, 1974. xviii, 664 pp., illus. $51.95.

In 1973 the Muscular Dystrophy Associations of America, with the Italian National Research Council, sponsored an international research meeting. The resulting volume is testimony to the good works of this voluntary organization. With the arrested and uncertain growth of the National Institutes of Health, it has become a major force in supporting muscle research that has wide ramifications.

The volume contains 52 papers, which encompass the field. From the variety of investigations reported several trends can be discerned:

1) Muscle cell culture has come to occupy a central position in studies of membrane specialization, such as development of acetylcholine receptors (Fambrough and Devreotes) or surface alterations that prepare for the fusion of myoblasts to form myotubes (Bischoff and Lowe), and of nerve-muscle interaction (Steinbach and Heinemann).

2) Structural differences of the contractile proteins from different sources (Adelstein and Conti; Adelman; Perry) and factors controlling the synthesis of these proteins (Schubert and Tarikas; Sarkar; Morkin; Morales *et al.*) are being identified.

3) The interactions between these proteins (Ebashi *et al.*; Bárány *et al.*) have become linked to phosphorylation, influenced by calcium and protein kinase (Krebs *et al.*) as well as sarcoplasmic reticulum (Margreth *et al.*).

4) The relative importance of neural control and activity patterns of muscle in determining the physiological and biochemical characteristics of individual muscles (Buller; Close; Mommaerts; Schiaffino *et al.*; Robbins; Sréter *et al.*; Romanul *et al.*) continues to be a major unsolved problem.

5) New ultrastructural techniques, including freeze-fracture (Rash *et al.*), scanning electron microscopy (Shimada and Fischman), and quantitative morphometry (Eisenberg), are beginning to be applied to the study of muscle membranes.

6) At this meeting, the emphasis was on basic science. Only a few papers are directly concerned with dystrophies, and more of these are concerned with mouse and chicken than with the human diseases. Times seem to be changing, however. Human sarcolemma is beginning to be studied in dystrophic muscle (Peter *et al.*); mitochondrial biochemistry has been applied to human disease (DiMauro *et al.*); disorders of carnitine metabolism cause different syndromes in man (Engel *et al.*; DiMauro *et al.*); diseased human muscle can be grown in culture (Askanas); and the neurogenic theory of the dystrophies (McComas *et al.*) is challenged (Buchthal *et al.*; Desmedt and Borenstein).

The accelerating attention to muscle augurs well for the future solutions of important problems, and this volume amply records the present state of affairs.

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Vitamin B_2

Riboflavin. RICHARD S. RIVLIN, Ed. Plenum, New York, 1975. xiv, 434 pp., illus. $46.90.

This volume is a collection of 12 review articles designed to "represent an interdisciplinary approach to an understanding of the chemistry, physiology, and medical significance of the vitamin riboflavin." However, I found the focus to be almost exclusively on physiology and medical significance. Only the introductory chapter by Weimar and Neims deals with any of the chemical properties of flavins that are relevant to their biological function. This chapter is worth reading and presents a sensible although telescoped set of comments on spectroscopic properties of the isoalloxazine system, followed by a section on binding of flavin coenzymes to apoproteins and two or three pages on riboflavin synthesis. Only a single paragraph is allotted to how flavin coenzymes function. This strikes me as a major defect.

Chapters 2 and 3 deal with methods for flavin analyses in tissues. They could easily be omitted from the volume, since they provide technical information only and the methods have been reviewed recently in *Methods in Enzymology*. Replacing them with a full chapter on flavin chemistry including dark reactions and susceptibility to nucleophilic attack or electrophilic attack depending on oxidation state would have been a service. A chapter on the types of enzymatic reactions that require flavins as obligate coenzymes could then also have been inserted.

Such chapters would have provided a molecular basis for the evaluation of sub-