

III. Relationships between developmental, medical, and nutritional variables

Nutritional indexes of clients in a maternity and infant care project

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Medical and nutritional factors which may influence an infant's development in the gross motor, fine motor-adaptive, language, and personal-social areas during the first year of life were analyzed, and statistical relationships are reported.

Reports have been published relating malnutrition in prenatal and early childhood to subsequent retardation in intellectual development (1,2). Most of these studies have been conducted in developing countries where severe protein-calorie undernutrition exists. Few studies on this topic have been reported in the United States (3), where undernutrition is not generally manifested to the extent found in developing countries.

The most prevalent nutritional deficiency in this country is iron deficiency anemia (4), which has been reported to have consequences on growth and physical and mental performance (5,6). Studies of iron-deficient preschoolers demonstrated a lowered ability to orient oneself to, attend to, and concentrate on learning performance tasks (6,7). It is recognized, however, that undernutrition is also associated with many external environmental factors, especially those that accompany poverty. A mother who, herself, suffers from "nutritional lethargy" may fail to provide adequate stimulation for her child. Despite the many potential factors influencing cognitive growth and performance, it is nevertheless striking that, in these studies, performance by preschool children improved after correction of iron deficiency.

Our previous report (8) indicates that low-income minority groups, as typified by the Detroit Maternity and Infant Care Project (DMICP) population, eat marginally adequate diets which are improved by vitamin and mineral supplementation. This paper describes the development of the infants during their first year of life and identifies the relationships between nutritional indexes, growth, and development of mother and child.

Methods

Developmental, medical, and nutritional information was obtained from the charts of 198 pregnant women and their infants who were seen at Crittenton Hospital (a DMICP center) during 1971 and 1972. Only patients seen by a nutritionist were selected. Methods of collecting the data have been reported (8).

Developmental information was based on recorded results of the Denver Developmental Screening Test (DDST) (9), which was administered by a trained public health nurse close to the infant's first birthday. The DDST is based on 1,036 presumably normal children, age two weeks to six years, whose predominantly white families (only 17 per cent were black) reflect the ethnic and occupational characteristics of the population of Denver. The results of the screening test were reported in terms of developmental age and rate: Normal, questionable, or abnormal.

Information obtained was statistically analyzed according to methods previously described (8). Computed product-moment correlation coefficients provided information on relationships of selected variables and were calculated separately on related variables.

Results and discussion

DEVELOPMENT OF INFANTS. The results of the DDST were analyzed to draw information from four areas of the infants' development: Gross motor, fine motor-adaptive, language, and personal-social.

Table 1 shows that the mean developmental age for all four areas exceeded the infants' chronologic age. Although the DDST was supposedly administered close to the infants' first birthday, the mean age at testing was 10.6 months. The mean performance age of all the infants was 14.7 months. The mean performance rate of these infants was 97.6 per cent; only 3.4 per cent had questionable rates; and no abnormal rates were found. The highest percentage of normal rates occurred in the gross motor areas, where all but one infant performed at a normal rate.

Infants from this lower socioeconomic group appeared to have an advanced developmental age during the first year of life. It has to be noted, however, that the DDST has limited value in predicting later intellectual development and that "it is to be used only to alert professional child workers to the possibility of developmental delays so that appropriate diagnostic studies may be pursued" (9).

MEDICAL, NUTRITIONAL, AND DEVELOPMENTAL VARIABLES. Selected variables and their correlational findings are shown in Figure 1; correlations between separate related variables are indicated by a line enclosure. The prenatal hematologic indexes include hemoglobin and hematocrit at twenty-one, twenty-nine, and thirty-seven weeks mean gestational age. The infants' hemoglobin levels include values obtained from

Table 1. Ratings of infants on the Denver Developmental Screening Test

parameter	according to age			according to rate		
	number of infants	mean age	range of values	number of infants	number of infants*	normal rate per cent
		months				
gross motor	86	14.1±1.1†	8-15	84	83	98.8
fine motor	86	14.9±1.4	5-20	84	81	96.4
language	81	13.7±1.5	4-21	83	80	96.4
personal-social	86	16.5±1.8	5-22	84	81	96.4
mean performance	81	14.7±1.1	7-17	83	81	97.6

*No abnormal rates were observed; therefore, the difference between the total number of infants and the number with normal scores represents the number of infants with questionable rates.
 †Standard deviation.

the cord and at one and four months. Dietary variables include maternal intake of the following food groups: Milk, meat, eggs, legumes, vegetables, fruit, and cereals and breads.

No correlation was found between the following variables: Age, education and protein intake of the mother; the mother's protein intake and her infant's developmental age; and infant's anthropometric measurements, hemoglobin, and APGAR (10) score and his/her developmental age. These findings indicate that, while the DDST is a good screening tool for developmental delays, it cannot and has not been intended to measure fine indexes of development.

Some significant positive correlations were found when mother's age, education, height, and weight were correlated with the child's anthropometric mea-

surements. The mother's age was positively correlated with the child's head circumference, as was her education with her infant's birth weight ($P < .05$). The relationship between mother's weight prior to pregnancy and her infant's weight and height at birth was highly significant ($P < .01$).

Mother's weight gain during pregnancy showed significant correlation with several variables. It was positively related to the infant's birth weight, height, and head circumference. Weight gain appears to be an important index in determining the anthropometric status of the infant at birth; thus, periodic monitoring throughout pregnancy, using the weight grid, is considered essential. Significant negative correlations were found between prenatal weight gain and the child's fine motor, personal-social, and mean developmental age. However, the implications of these findings are not clear.

When the infant's anthropometric indexes were correlated with the mother's biochemical indexes, only head circumference and hematocrit at twenty-one weeks gestation were significantly related.

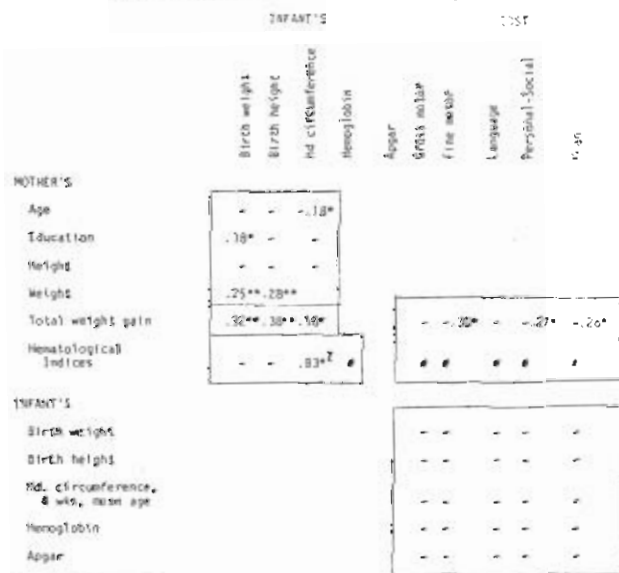
Few significant correlations were found between mothers' dietary variables and those of the infants. Mother's protein intake was highly related to the infant's birth height. Among the food groups, only intake of vegetables correlated significantly with both APGAR scores; the implications of this correlation are not clear. While maternal intake of vegetables was low, vitamin-mineral supplements compensated for expected inadequacies of these nutrients.

Summary and conclusions

Data relating to developmental, medical, and nutritional characteristics of 198 pregnant women and their infants were correlated with developmental age and rate of the latter.

The results of the Denver Developmental Screening Test showed that the infants, in general, were far advanced for their chronologic age in four areas of development: Gross and fine motor, language, and personal-social.

Although some infants had lower-than-normal he-



Lines indicate group of variables correlated.
 * Only hematocrit at 21 wks gestation was found significantly correlated to head circumference.
 - Correlation is not significant.
 # Correlational analysis was not done because number of cases were few.
 * Significant at 95 percent level of confidence.
 ** Significant at 99 percent level of confidence.
FIG. 1. Correlation of developmental, medical, and nutritional variables.

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moglobin levels, no correlation was found between this biochemical index and developmental indexes.

Correlational analysis showed that weight gain is an important index in determining the infant's birth weight, height, and head circumference. Periodic monitoring of weight gain throughout pregnancy is recommended.

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Meat-buying practices of Caucasians, Mexican-Americans, and Negroes

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Data reported here on meat purchases of three ethnic groups could be of value to nutrition educators, as well as to the meat industry.

Information on meat-buying practices of Americans is needed by meat producers, marketers, and educators (1), yet little information concerning practices of ethnic groups is available. Research concerning food purchase practices of ethnic groups has considered two questions: "Does an ethnic market exist?" (2-5), and "Prices: Do the poor (blacks) pay more?" (6-8). Fitzhugh described (4) ethnic marketing as "an exciting new challenge" and stated that the prime ethnic market targets are blacks and Spanish-speaking consumers. In reply to the second question, Sexton concluded (8) that blacks were not charged higher prices. A study published after the present research was begun reported (9) differences

¹The authors appreciate the cooperation given by Furr's and Piggly Wiggly stores.

in the South in food spending of black and of white households.

Most food-buying information has been obtained by questionnaires completed by consumers (10,11), with consumer panels the major sources of marketing data (12,13). Observation of purchases is the ideal approach for obtaining marketing data (14), although normal marketing procedures should not be interrupted (15). Most meat-buying studies in the last decade (16-22) used questionnaires completed by consumers and did not consider all three groups: Caucasians, Mexican-Americans, and Negroes.

In this research, meat-buying practices of these three groups were investigated, as well as the accuracy of questionnaires completed by consumers and a new approach for obtaining food-buying information.

Methods

The form used for recording data (Figure 1) was finalized as a result of information obtained in a preliminary study. The meat items listed were those bought by the greatest number of shoppers in the preliminary study; space was also provided to write in any other meat items a shopper might have purchased.

Meat purchases of 600 shoppers were observed in six supermarkets. Kind, weight, and cost of meat and total money spent were recorded at the checkout counter for every shopper who bought meat at the