

STEPHEN A. RICHARDSON

*Department of Community Health, Albert Einstein College of Medicine of
Yeshiva University, Bronx, New York, USA*

I appreciate the opportunity to respond to the letter of Dr. McGregor (1). Her first point is that she feels my paper (4) may have misled some readers into minimizing the relationship of severe malnutrition to intellectual development. The opening paragraph of my paper states . . . "There is fairly general agreement that infants who have suffered severe malnutrition in infancy do less well at later ages on tests of learning and intelligence than do control subjects who were not malnourished." Table 1 of Reference 4 shows that the children in our study who had been hospitalized for severe malnutrition (index cases) had significantly lower IQ's at ages 6-10 than the comparison children who had not been hospitalized for malnutrition and who were matched on age, sex, and general neighborhood. Both the general statement quoted above and the specific findings of our study show a similar association to the one Dr. McGregor reports in her letter.

In her second paragraph Dr. McGregor suggests that a significant number of the contrast (comparison) children in our study were underweight during the first 2 years of life and that this would reduce the difference in intellectual levels between index and comparisons. Even though she does not cite any research evidence in support of this suggestion, let us consider it as a tenable hypothesis. It would lead to an expectation of no difference between our index and comparison cases. Our results do not uphold this expectation.

In her second paragraph, Dr. McGregor uses a variety of terms: severe malnutrition, undernutrition using the "Wellcome classification," malnutrition, underweight during the first 2 years of life, mild-moderate malnutrition. The variety of terms and definitions which are used in research in malnutrition can easily add confusion because either they define different groups of children, or they are too vague to permit replication studies by other investigators. The strength of the association between malnutrition and intelligence test scores may well differ markedly depending on what criteria are used to select the children who are then called malnourished or undernourished.

Our research into the long term consequences of severe malnutrition on the development of children has proceeded in two stages. The first was to determine whether the index children had significantly lower intelligence scores than their comparisons. We found this to be so and proceeded to the second stage of trying to account for what factors may contribute to the difference found in stage 1. The paper under discussion (4) deals with stage 2 and its purpose is "to examine the ways in which intelligence of school age boys is related to the presence or absence of severe malnutrition in infancy, their overall life history of nutrition and the social and economic conditions they have experienced." Perhaps the most important point of this paper is shown in Table 6 and Figure 1 of Reference 4 where the findings suggest that the long term consequences of severe mal-

nutrition vary depending on the human ecologic context in which they occur. The effect appears to be negligible in a context of an overall history of good physical growth and a favorable social background, but has a clear effect in a context of a poor overall history of physical growth and an unfavorable social background.

Hopefully, the results are a step toward a fuller recognition of the complexity of the issues and a step away from the overly simple conclusion that an association between severe malnutrition and low intelligence scores may be interpreted as malnutrition causing intellectual impairment. There is still no research which has clearly demonstrated this causal effect in humans.

The result Dr. McGregor reports for her study deals with the first of the two stages described earlier in this letter. It shows a difference consistent with the general literature and our own study. I hope Dr. McGregor will proceed to the second stage just described, and consider the wide array of factors other than malnutrition which may have contributed wholly or partly to the difference she reports. For example, our index and comparison children as well as her cases came from similar socioeconomic backgrounds using the traditional measures. It was only when we used more detailed measures of the children's social histories that we found that the index children came from backgrounds more disadvantageous for intellectual development than the comparisons (2, 3). Although Dr. McGregor has matched for hospitalization, it will be important to compare the hospital experiences of both groups because the developmental quotient measure obtained 1 month after leaving the hospital is likely to be influenced by the nature of the hospital experience.

I believe Dr. McGregor cites the result of her study of young children hospitalized for malnutrition for purposes of direct comparison with our study. I do not believe such a direct comparison is meaningful for several reasons: (1) there is no reason to believe that differences she finds will remain the same over the next 4-8 years when the children in her study will be comparable in age to the children in our study (2) the behavior measured by the Developmental Quotient is not the same as the behavior measured by the WISC, (3) in general, the Developmental Quotient is not a good predictor of WISC score at ages 6-10.

REFERENCES AND NOTES

1. McGregor, S. M., and Stewart, M.: Letter to the Editor. *Pediat. Res.*, 11: 141 (1977).
2. Richardson, S. A.: The ecology of severe malnutrition and intellectual development. In: D. A. A. Primrose: Proceedings of the Third Congress of the International Association for the Scientific Study of Mental Deficiency (Polish Medical Publishers, Warsaw, 1975).
3. Richardson, S. A.: The background histories of school children severely malnourished in infancy. In: I. Schulman: Advances in Pediatrics, Vol. 21 (Yearbook Medical Publications, Inc., Chicago, 1974).
4. Richardson, S.A.: The relation of severe malnutrition in infancy to the intelligence of school children with differing life histories. *Pediat. Res.*, 10: 57 (1976).
5. Requests for reprints should be addressed to: S. A. Richardson, M.D., Professor of Pediatrics, Community Health, Albert Einstein College of Medicine of Yeshiva University, 1410 Pelham Parkway South, Bronx, N. Y. 10461 (USA).