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The Deterioration in Children's Nutritional Status in Rural Chad: The Effect of Mothers' Influence on Feeding

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ABSTRACT

Objectives. This study examined how maternal influence on child feeding modified the deterioration of child nutritional status in Chad.

Methods. The pattern of height with age was examined in 98 rural Chadian children aged 12 through 71 months from 64 households randomly chosen.

Results. Younger children were more stunted than older ones, probably reflecting secular deterioration in weanlings' nutritional status from 1982 to 1987. Children of mothers with influence over child feeding were taller than children of mothers with less influence, but this held only for the youngest children.

Conclusions. Height-for-age can be a useful indicator of recent changes in social and environmental effects on child health. The mother's influence may have buffered the negative impact of socioeconomic conditions on child growth. (*Am J Public Health.* 1997;87:1356–1359)

Introduction

Height-for-age is a primary indicator of children's nutritional status.[1] It is useful for monitoring changes in nutritional status, evaluating the impact of specific interventions, and monitoring secular changes.[2] Height differences among populations are due primarily to nutrition and health during early childhood.[3–4] Because stunting is stable after year 2 or 3, cross-sectional data from many ages are used to examine effects of social and environmental factors on growth when children were young.[5]

In rural Chad, we observed a marked decrease in height-for-age among younger preschoolers, not reported before. We provide possible explanations for this unusual observation, and show that maternal influence on child feeding modified the trend.

Methods

Data were collected cross-sectionally in October through December of 1988 among agricultural households in a Sahelian area of Chad (Mao). The sample and area are detailed elsewhere.[6–7] Among 84 households randomly chosen, 64 with preschoolers (136 preschoolers) were surveyed. In total, 16 infants and 98 children (12 through 71 months) had no missing weight or height. Child length (< 24 months old) or height was measured to 0.1 cm with standard procedure followed.[8] Age was obtained from immunization cards or maternal recall, with the use of a historical calendar of local events. Heights were converted to sex- and age-specific *z* scores[1] relative to the National Center for Health Statistics/World Health Organization distribution.[9]

We collected socioeconomic, demographic, biological, behavioral, and attitudinal information on mothers and households and retrospective information on child mortality. Seven variables, the best predictors of height-for-age in earlier analyses, were examined for relationship with height-for-age, and three had an interaction with age. Of these, mother's influence on child feeding had the most consistent effect on height-for-age throughout various analyses.[6] That variable was available for 93 children, and we present only the results that include it. The mother's influence was determined by asking the mother whether she was involved in decisions regarding the kind of food given.

Regression analyses[10] are presented for individual children and for groups of children, according to annual age and mother's influence. Group regression using variances as weights yielded identical results. For individual regression, variance components analyses[11] demonstrated that residuals were independent, as required for regression. Cereal sales in the past 6 months by men was a covariate, being an important determinant of height-for-age. Other socioeconomic variables were not in previous regression analyses[6] and so were not included. Logistic regression examined mortality on age, influence, and their interaction.

Results

Height-for-age *z* scores declined precipitously throughout the first year of life, but increased linearly (.423 *z* score/year of age; [$P = .007$], thereafter up to 71 months) (Figure 1). Among children aged 12 to 35 months, 73% were stunted (< −2.0 *z* score), compared with 31.7% of children older than 3 years.

Of the mothers, 77% reported being able to influence child feeding. From the

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individual regression (Table 1), the interaction estimate means that for mothers with influence (slope = 0.560), the slope was 0.264 *z* score/year less steep than for mothers without influence (slope = 0.296). Younger children had higher *z* scores if their mothers had influence, whereas for the oldest children there was no difference (Figure 2). Analysis on groups gave similar results. The residual standard deviation for the individual regression was about 1 (1.064), and for the group regression was small (0.249), indicating a close fit of the model to the 10 group means.

There were no significant main or interactive effects of child age and mother's influence on mortality (smallest $P = .49$).

Discussion

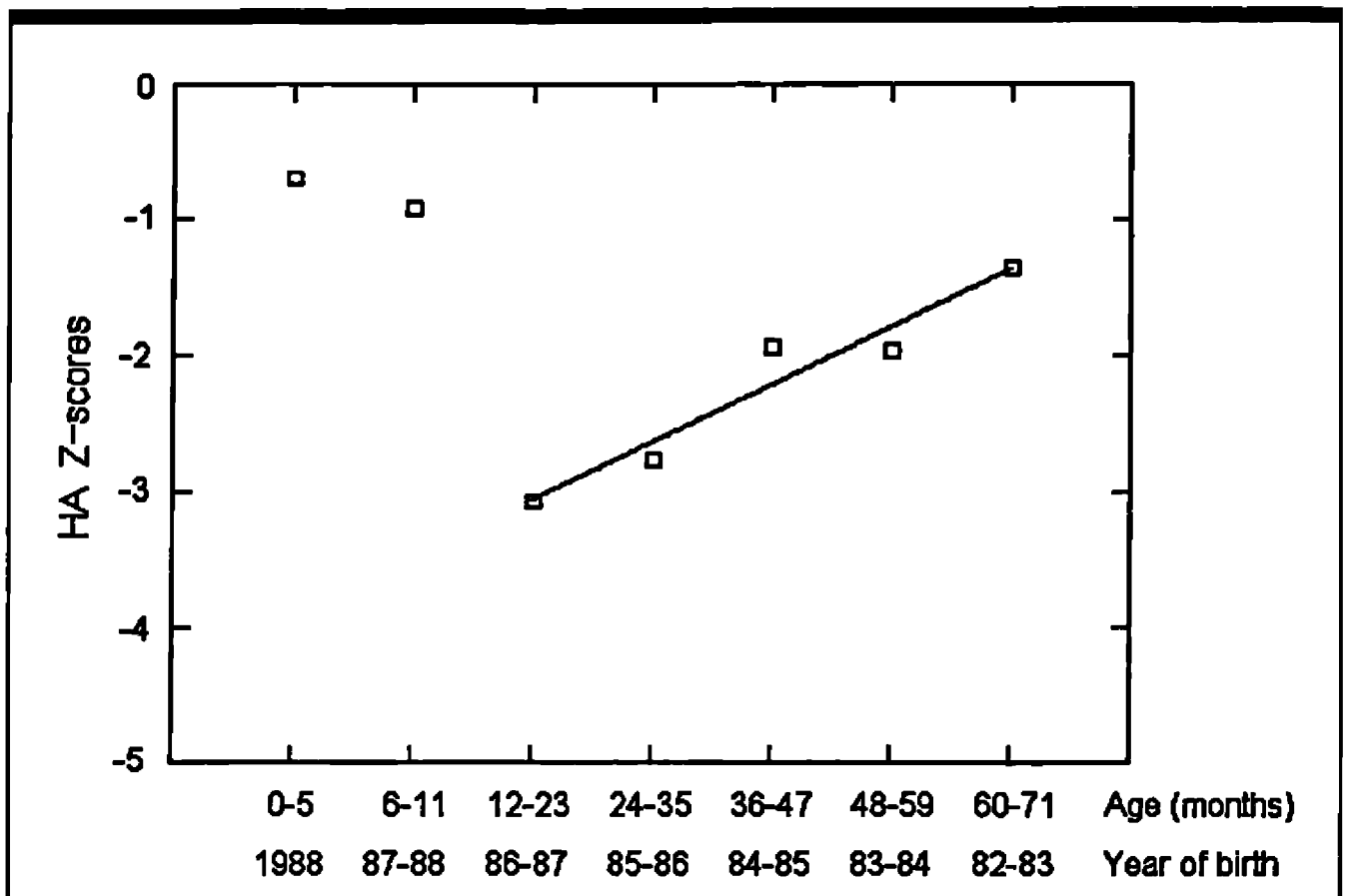
The increased stunting in younger children is different from what is usually observed in developing countries.[12] Although slight improvement has been reported after age 5,[13,14] such a large increase in height-for-age over a short period has not been previously observed. Four explanations are possible.

1. Catch-up linear growth is possible if living conditions improve, examples being improved child's diet through intervention,[15,16] improved socioeconomic status,[17] and the migration of underprivileged children to industrialized countries.[18,19] No nutritional intervention occurred to induce such accelerated growth in older children, and the underlying situation did not improve. Only very considerable catch-up (0.42 *z* score/year) would account for the observation.

2. Age underestimation in older children would make them appear better nourished than they were. If *z* scores were stable after 18 months, children assumed to be 66 months old would have had to have their ages underreported by 16 months. Estimating children's ages was relatively easy because of a clear chronology of annual events. The worst case of age misreporting in preschoolers was about 6 months.[20] Africans tend to overstate the ages of preschoolers.[21] Therefore, the stunting trend was not due to age misreporting.

3. Child survival bias could explain the higher *z* scores of the older children, whereby stunted children died with worsening conditions. Survival bias would increase with age. However, there was no significant relationship of mortality with age, mother's influence, or height-for-age. It would take a strong survival bias to have any effects on group height-for-age means.[22]

4. The data instead suggest deterioration in the nutritional status of children aged 12 through 23 months during 5 years (1982 through 1987) because of unfavorable environmental and socioeconomic changes. The Sahelian zone was much affected by famine in 1984 and 1985 related to a severe drought[23] that de-



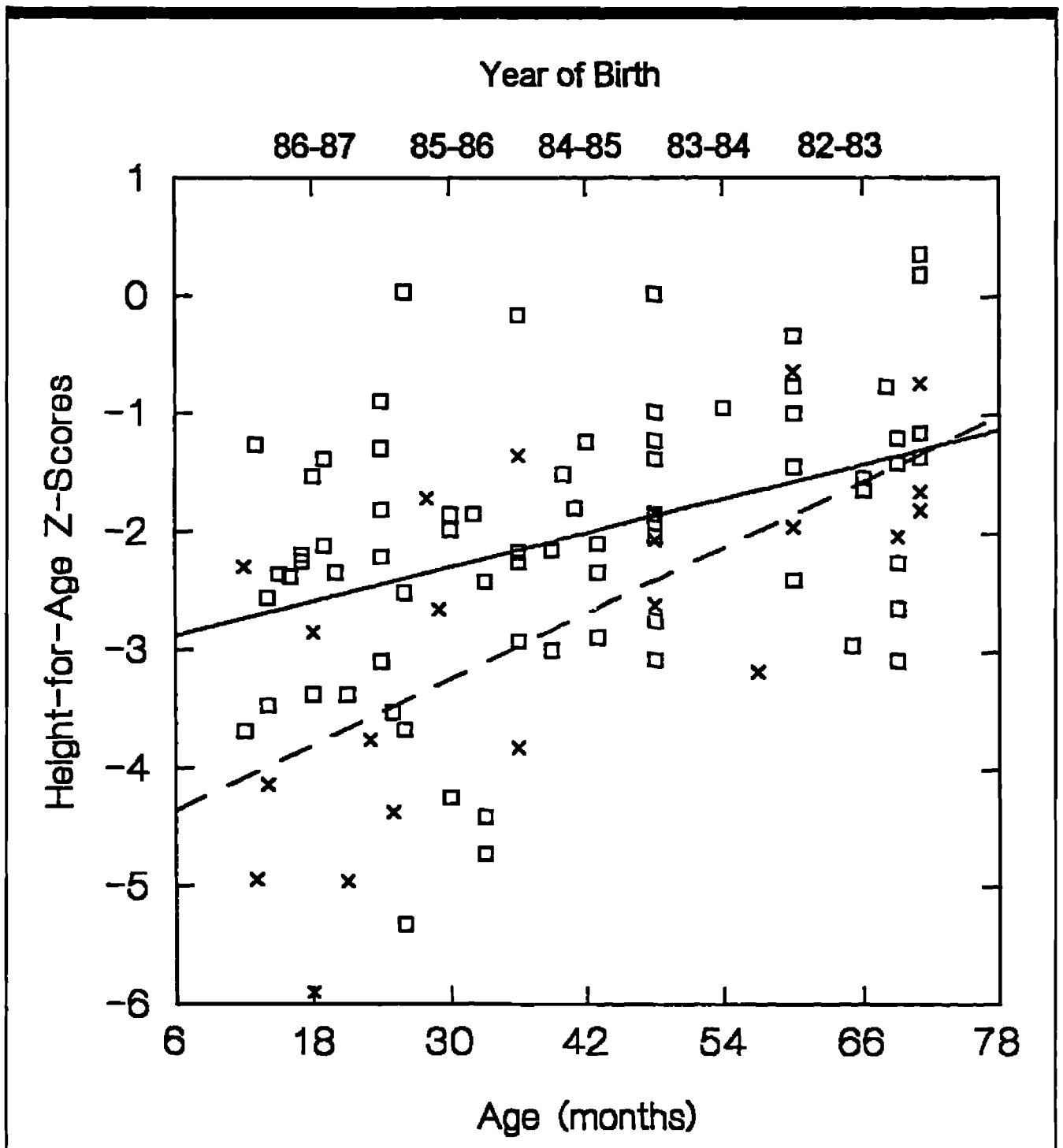
Note. In comparison with the 50th percentile of the National Center for Health Statistics/World Health Organization reference population, the children 60 through 71 months old were about 7 cm below reference, compared with 9.4 cm at ages 24 through 35 months.

FIGURE 1—Mean height-for-age *z* scores of preschool Chadian children (boys and girls combined) by age and year of birth.

TABLE 1—Regression Equation for Height-for-Age for Individual Data and for 10 Groups Defined by Annual Age and Mother's Influence on Feeding[a]: Preschool Children in Rural Chad

Variable	*df*	Coefficient	Standard Error	*P*[b]
Individual data (n = 93)				
Constant	1	−5.073	0.524	.0000
Age of child, y	1	0.560	0.132	.0001
Cereal sales by men, 1 = yes	1	0.863	0.226	.0003
Mother's influence, 1 = yes	1	1.617	0.588	.007
Age × influence	1	−0.264	0.156	.091
Residual SD = 1.064				
10 × group data				
Constant	1	−6.733	0.579	.001
Age of child, y	1	0.605	0.080	.001
Cereal sales by men, proportion[c]	1	1.631	0.453	.016
Mother's influence, 1 = yes	1	2.440	0.640	.012
Age × influence	1	−0.305	0.115	.045
Residual SD = 0.249				

[a]For mothers with no influence, numbers of children for each age group were: 7 at age 1 year, 3 at age 2 years, 2 at age 3 years, 4 at age 4 years, and 6 at age 5 years, while for mothers with influence, numbers of children for each age group were 14, 17, 12, 10, and 18, respectively.
[b]A two-tailed test was used to calculate statistical significance.
[c]Household heads were asked whether they had sold cereals in the past 6 months.



Note. See Table 1 for sample size, regression coefficients, and statistical significance.

FIGURE 2—Mean height-for-age *z* scores of preschool Chadian children by age and year of birth, according to mother's influence on child feeding.

stroyed whole cattle herds and harvests.[24] Many lost their herds and converted to cereal production.[25] Cereal yields decreased, resulting in national food shortage[26] and a substantial increase in cereal prices.[27] Impaired income and price increases were likely to affect nutrition, especially in children who were being weaned.

The change from animal husbandry to cereal farming reduced the availability of milk, a major weaning food, during the famine and subsequent years. Children 3 to 5 years old were weaned either before, during, or after the agricultural changes. Children aged 24 through 35 months were born after the famine, but their mothers were likely to have been adversely affected.* Consequently, these children may have had longer exposure to malnutrition, beginning in utero. Those aged 12 through 23 months were being weaned at the time of survey. The amount and quality of food given were generally inappropriate.[6]

For older children, the mother's influence did not affect nutritional status during the first year, possibly because the more favorable situation permitted children to grow relatively well then. However, for children born after 1983, the mother's influence may have buffered the negative impact of deteriorating conditions. Age, parity, or socioeconomic status were not significantly different for the two groups of mothers, but mothers with influence were more likely to influence household food expenditures.[6]

In brief, social and environmental conditions can cause deterioration in height-for-age over relatively short periods of time in young children; cross-sectional height-for-age can be a useful indicator of recent changes in social and environmental effects on child health. The mother's influence on child feeding buffered the negative impact of deteriorating conditions on child growth. □

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