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Infant Feeding Practices in Barbados: The Role of Maternal Depression and Anxiety

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Executive Summary

Background

Breastfeeding has been shown to influence infant growth at least in the first six months, although advantages in cognitive development have been more difficult to identify. Nevertheless, it has been widely recognized that there has been a decline in breastfeeding in developing countries as socioeconomic levels rise. The general pattern in these countries is that breastfeeding lasts longer (1) in rural areas than urban areas; (2) among women of lower socioeconomic levels than among those of higher socioeconomic levels; and, (3) among women who introduce bottle feeding after approximately three months postpartum. The reasons for the decline in breastfeeding are not well understood and recent studies in Western countries suggest that the role of psychosocial variables, such as maternal depression and other maternal and infant factors, should be assessed.

Studies of infant feeding practices have often been contradictory and difficult to interpret for several reasons. First, cross-cultural practices vary greatly, such that generalizations cannot be made especially from developed to developing countries. Second, despite the recognition that a consistent terminology across studies would make studies across different populations more interpretable, this has often not been practiced. The use of categorical descriptions, such as predominant or partial breastfeeding, to predict infant outcomes has been misleading . Moreover, conclusions based on such categories ignore the variations in infant feeding practices that are present in most families, and changes from one time period to another. Third, the disadvantages of bottle-feeding have been difficult to isolate from poor environmental conditions, over-dilution, and infection, which may also be more common in populations where breastfeeding is abandoned early. This is especially true in developing countries where malnutrition and poverty are prevalent.

These issues were addressed in our study of psychosocial variables affecting feeding practices and infant outcomes in Barbados. In the current study, we followed 226 healthy infants born at the Queen Elizabeth Hospital, Bridgetown, and their mothers from birth to six months and documented patterns of infant feeding practices at seven weeks, three months, and six months of age, using a range of variables to describe feeding practices and infant outcomes. Sophisticated statistical approaches were used, including factor and multivariate analyses of the longitudinal data set, which allowed us to examine the possibility of a reciprocal relationship between feeding practice factors and infant growth. In a theoretical paper describing mother-infant interaction and infant nutrition, we predicted that variations in infant feeding practices would affect infant growth in a reciprocal fashion. The present study is important because of the lack of extreme poverty or nutritional deficiency and the better standards of health and education in Barbados, as compared with other developing regions of the world. Thus, confounding effects of infection or diarrheal disease were not present.

The study was conducted in 1986, in the Caribbean island of Barbados, where the population is homogeneous and generally of low middle class. The study was based at Queen Elizabeth Hospital because 99% of all birth occur there, making these families representative of the population. We had a complete set of infant outcome data for 101 mother-infant pairs through the six-month period. Infant anthropometry and maternal anthropometry were both measured. Three major questionnaires were used: a Feeding Practices interview, a Home Enviroment interview, and Zung Depression and Anxiety scales, which are summarized below.

Infant Feeding Practices and Their Relationship to Infant Physical Growth

All mothers initiated some breastfeeding. Maternal reports of breastfeeding frequency were included in the factor analysis of feeding practices, which groups related items from the questionnaire in order to reduce the number of domains being studied. The analysis of the Feeding Practices Interview for those 112 mothers who attended all three visits yielded five independent groups of items (factors). Three factors, including the Preference for Breastfeeding, Feeding Intensity, and Feeding Difficulty, all declined with infant age; the two remaining factors, the extent to which Father and Relatives Help, increased with infant age.

Infants' weights and lengths were well within or exceeded the National Center for Health Statistics reference values, showing that the Barbadian infants were not malnourished. At all ages studied, infant weights and lengths were closely related to the feeding factors. Of the five feeding factors identified, the Preference for Breastfeeding and infant Feeding Intensity were most closely associated with infant growth in the first six months of life. Mothers with a higher frequency and greater preference for breastfeeding had longer infants at six months. In addition, infants who weighed more were more likely to be rated as feeding intensely at later ages. Thus, the relationship between infant size and feeding practices was bidirectional, each affecting the other at later ages.

The Role of the Home Environment on Feeding and Infant Growth

Next, we measured the role of the socioeconomic conditions and other conditions in the infant's home environment to determine whether these have an effect of infant feeding practices and infant outcomes. The home environments of women in this study were comparable to those of the general Barbadian population. Factor analysis, which groups related items, resulted in nine different factors. These were strongly associated with infant feeding practices, especially Household Composition, Health of the Mother, and Maternal Literacy. However, the significant longitudinal relationships between feeding practices and infant growth described in the previous section were mostly retained, even after controlling for home environment. There are several alternative explanations. First, excellent health and educational programs in Barbados may protect infants from adverse home environmental conditions. This is a likely explanation since we found that maternal size was affected by adverse home environment conditions, whereas infant size was not affected. Second, home environment factors may affect infant growth indirectly by modifying feeding practices early on. Once established, the feeding practices are the determining variable, but not the home environment.

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The Role of Maternal Depression and Anxiety

The Zung Scales, administered at seven weeks and six months postpartum, measured the role of maternal depression and anxiety in our population. Cases of moderate to severe depression were few. However, the prevalence of mild depression in this population was 16-19%,which was comparable to figures reported in developed countries. Disadvantaged home environments, including lower literacy levels, less family income and poor maternal health, were associated with higher depression and anxiety scores in the women. Again, this pattern was similar to that seen in developed countries.

An important finding in this study was the striking relationship between feeding practices and depressed mood. Thus, higher depression scores at seven weeks postpartum were associated with less Preference for Breastfeeding and increased infant Feeding Intensity at later ages. These results remained even when the effects of the home environment were controlled, and have important implications for public policy. Maternal mood also interacted with feeding practices. Specifically, babies who slept with their depressed mothers did not grow as well as babies who did not. However, maternal mood was not independently related with infant growth. We are currently in the process of analyzing other infant outcomes, including developmental quotients and temperament, which may be more sensitive to maternal mood than physical growth.

Implications for Policy, Programs, and Further Research

This study has important policy implications in supporting intervention programs to encourage mothers to increase the frequency and duration of breastfeeding. The clear advantages of breastfeeding in a large, randomly selected population with general good health should be convincing to policy makers in developing countries.

The health care system in Barbados is extremely comprehensive, especially for children less than five years of age, who are required to have regular medical visits to qualify for school entry. We showed that breastfeeding was beneficial in both advantaged and disadvantaged home environments. Programs supporting breastfeeding should therefore be closely linked with health programs supporting the general well-being of the infant.

Finally, intervention programs dealing with mothers and young infants should also take into account the mood of the mother. Depression, even very mild cases, may intefere with a mothers ability to breastfeed and may interact with feeding practices to influence infant outcome. Otherwise successful programs may not have the expected impact if maternal depression is not considered.

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Full studies, entitled "Infant Feeding Practices in Barbados: I. Effects of Physical Growth," "Infant Feeding Practices in Barbados: II. The Role of the Home Environment," and "Infant Feeding

Practices in Barbados: III. The Role of Maternal Depression and Anxiety" have been submitted for publication to scientific journals by the authors, are presently being reviewed. The third study is presented below as EPB's final working paper.

DRAFT

Feeding Practices and Maternal Mood

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Infant Feeding Practices in Barbados:

III. The Role of Maternal Depression and Anxiety

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ABSTRACT

This report is one of series of studies designed to identify psychosocial variables affecting feeding practices and infant outcomes in 226 healthy women and infants who were followed from birth to six months of age at the Queen Elizabeth Hospital, Barbados. In the current report, we studied the role of maternal depression and anxiety, as measured by the ***Zung Scales***, at seven weeks and six months postpartum. The prevalence of mild depression in this population was 16-19%. Cases of moderate to severe depression were few, but they increased over time. Anxiety scores were closely related to depression scores and increased over time. Disadvantaged home environments, including lower literacy levels, less family income and poor maternal health, were associated with higher depression and anxiety scores. However, when the effects of the home environment were controlled, significant relationships between feeding practices and depression, but not anxiety, scores remained. Higher depression scores at seven weeks were associated with a reduced ***Preference for Breastfeeding*** and increased infant ***Feeding Intensity*** at several postpartum ages. Of note, these feeding practices were previously identified by us as most likely to affect infant growth. However, the ***Zung*** scores were not independently correlated with infant growth from birth to six months, although interactions with maternal age and whether the infant slept with its mother were noted. We concluded that mood may modify feeding practices early, which, once modified, are independently responsible for affecting growth. Depressive or anxiety symptoms may also modify infant growth by interacting with feeding practices.

Keywords: Depression, anxiety, Zung scales, postpartum, breast feeding, feeding practices, anthropometry, infant growth, weight, length, Z-scores, socioeconomic conditions

ABBREVIATIONS

QEH- Queen Elizabeth Hospital

ANOVA - Analysis of Variance

NCHS - National Center for Health Statistics

INTRODUCTION

The role of psychosocial factors in determining the duration and pattern of feeding practices has received increased attention in the past decade as a means of enhancing breast feeding programs worldwide. Several studies in Western countries have examined the relationship between maternal moods and feeding practices. These have concluded that postpartum depression may play a role in limiting the choice and duration of breast feeding (1-3). Interpretation of these studies has been hampered by limited descriptions of feeding practices, and, as discussed (4), the tendency to focus on severe clinical cases of postpartum depression rather than mild cases of depression and anxiety and dysphoria, which are more common during the postpartum period. Moreover, there have been no parallel studies in developing countries addressing the effects of postpartum depression and anxiety on feeding practices. This is of particular concern because the benefits of breast feeding in developing countries may be greater than in developed countries.

In a series of studies in Barbados (5,6), we have extensively examined feeding practices and infant outcomes over the first six months of life. The sample of 226 infants was randomly selected from healthy births at the Queen Elizabeth Hospital, Bridgetown, Barbados, and was representative of the general population of the island. We have previously shown that a range of feeding practices was closely associated to conditions in the home environment, especially household composition, maternal health and literacy (6). However, infant feeding practices, especially breast feeding and infant feeding intensity, were independently associated with infant growth at six months, even after correcting for the home environmental factors. In the current report, we evaluated the effects of maternal moods, using the Zung depression and anxiety scales. These scales have established validity in cross-cultural settings, including developing countries (7). Although other scales have been developed to address the special conditions associated with the postpartum period (8), these have not been adequately tested in cross-cultural settings. The Zung scales were administered at seven weeks and six months postpartum. Scores were examined in relationship to longitudinal measures of infant feeding practices, infant growth and home environmental conditions assessed at seven weeks, three months and six months postpartum.

METHODS

Site. As described in a previous paper (5), the study was conducted in Barbados, a small island in the Eastern Caribbean with a population of 250,000 inhabitants. The population is homogeneous, generally of low middle class. Most residents have running water. With a literacy rate of 99%, socioeconomic standards in Barbados are higher than in other islands of the area. Our study was based at the Queen Elizabeth Hospital (QEH) where 99% of all births occur. The hospital has approximately 4,000 births per year. Health care is of a high standard; all women receive routine prenatal care at the hospital or at local polyclinics. We have previously followed women and children from this population with little attrition even after many years and have had maximal cooperation of all participants in our surveys. Further, the island is characterized by little in or out migration from the island. Therefore, conditions in Barbados were optimal for ensuring accurate and reliable information.

Study Population. The population surveyed included every other healthy baby born at the QEH during two months from October 17 - December 17, 1986. Within 24 hours after birth, 257 mothers met the following criteria: (1) good maternal health and nutritional status; (2) birth weight greater than or equal to 2.5 kg; (3) vaginal delivery; (4) no prenatal, perinatal or postnatal complications including Apgar scores equal to or greater than five; (5) agreement by the mother to participate in the survey. More mothers of boys (n=20) than mothers of girls (n=8) chose not to participate in the study (chi-square=5.11, $p<.05$). The two groups of mothers did not differ on any other variable tested (parity, marital status, age, and birth size of the infant). Of the 231 remaining mothers, 229 returned for one or more follow-up visits after the study began. Four infants were excluded from the analysis: one infant (a girl) died after her 7-week follow-up appointment; the second child was hospitalized for malnutrition secondary to a misshapen palate interfering with routine feeding; the third was found to have incomplete birth records. Of the final 226 infants, 115 were girls and 111 were boys.

Procedure. At 24 hours after birth, the project staff recorded reproductive history and birth-weights and birth-lengths from hospital records. In addition, all mothers responded to an interview involving mother's hospital experiences and feeding plans. These and subsequent questionnaires were orally administered by the project staff to insure that participants understood the questions. Mothers and infants were assessed at three follow-up visits at seven weeks, three months and six months after their infant's birth. The number of mothers attending was as follows: 157/226 at seven weeks (69%); 168 at three months (74%); 209 at six months (92%). A total of 112 mothers attended all three visits and data derived from these families was used in most of analyses described below. During the follow-up visits, women answered questions about their recent moods (Zung scales at seven weeks and six months), feeding practices (all three visits), and household Home Environment (seven weeks, predominantly). For Home Environment, most mothers (n = 158) answered questions at seven weeks, but the rest were interviewed at later visits. In addition, anthropometric measurements were made for the infants on all three postpartum occasions. Maternal anthropometry was assessed at the 6-months visit.

Measures

(1) Anthropometry. Infant birth weights and lengths were derived from the hospital records of each child in the study. Anthropometric measurements were evaluated in infants on all three follow-up visits, whereas maternal anthropometry was assessed only at the six months follow-up visit. Anthropometric measurements were done by the project pediatrician, Dr. Esther Archer, using the CMS Scale / (CMS Weighing, Ltd., U.K.). Infants were weighed in their diapers to the nearest 0.1 kg. Infants' lengths were measured to the nearest 0.5 cm. with an Infantometer (Graham - Field Surgreal Inc., New York) as the child lay in a supine position. Maternal weights were measured to the nearest 0.1 kg and heights to the nearest 0.5 cm. Arm circumference was taken at the midpoint between shoulder and elbow on the left arm. The Body Mass Index (BMI) was computed by the formula BMI = kg/m (2). A computer program (9) was used to convert the actual measurements into percentile and Z score values, based on the NCHS (10) reference data.

(2) Feeding Practices Interviews. These interviews have been described and analyzed in detail in earlier paper of tis series (5). Briefly, feeding practices Interviews were completed by local community health sisters, Marjorie Bowen and Jean Ramsey. Factor analysis to the 24 interview items resulted in five replicable factors, as follows: ***Preference for Breast Feeding (Factor 1)***, including the number of times babies was breast fed of bottle fed in the previous 24 hours, and the babies satisfaction after breast feeding, ***Father Helps (Factor 2),*** including the participation of the baby's father and lack of participation of grandmother, ***Feeding Intensity (Factor 3),*** including a strong interest shown by the baby in feeding, a strong suck and less interest in other food products, ***Relatives Help (Factor 4),*** including help from other relatives and the baby's sleeps with its ***mother,*** and ***Feeding Difficulty (Factor 5),*** namely the baby is not described as easy and fusses. As described in out earlier paper, good reliability was established by tests of internal consistency for each factor, using Armor thetas (11), which ranged from 0.75 to 0.37.

(3) Home Environment Questionnaire. This questionnaire has been described in detail in a companion paper of this series (6). Briefly, mothers were interviewed at the seven-week visit (*n*=158). If unavailable then, they were interviewed at either the three-month visit (*n*=50) or six-month visits (*n*=20). The Home Environment questionnaire consisted of items covering three main areas: economic standard of living, the mother's life history and current living situation. Fifty-seven scorable items from this questionnaire were factor-analyzed into nine principal components and rotated to simple structure by the normal varimax criterion. The factors were, as follows: Two factors reflected the family's standard of living, ***Household Amenities (Factor 2)*** and ***Family Income (Factor 3)***. Two other factors concerned the mother's current living arrangements and sources of support, including ***Household Composition (Factor 1)*** and ***Father's Income (Factor 4)***. The first factor showed the number and classification of adults in the household and whether the mother lived with her parents or the baby's father. The fourth factor reported fathers' financial support was a major source of income to the mother and infant. Remaining factors focused specifically on the mother, namely ***Late Starting Family (Factor 5)***, ***New Mother (Factor 6)***, ***Childhood Closeness to Parents (Factor 7)***, ***Healthy Mother (Factor 8)***, and ***Literacy (Factor 9).*** Good internal consistencies of the individual factors were confirmed by Armor's thetas. They ranged from 0.86 and0 0.84 for Factors 1 and 2, to 0 .43 and 0.39 for Factors 8 and 9.

(4) Zung Scales. Maternal moods were assessed using the ***Zung Depression*** and ***Anxiety Scales***, which were administered on twice. At seven weeks postpartum, 146 mothers were tested. At six months, 177 mothers were evaluated. Data was available for 115 mothers who were assessed for Mood at both visits. Maternal mood scores did not differ significantly between mothers with one versus two assessments. The ***Zung Depression Scale*** (12) consisted of 20 items designed to sample four areas of depressive symptoms: pervasive affective disturbance (two items); physiological disturbances (eight items); psychomotor disturbances (two items); and psychological disturbances (eight items). Each item was rated on a 4-point scale. Ten were phrased so that agreement suggested depression; the other 10 were phrased so that agreement suggested no depression. Zung (12) reported a split-half (internal consistency) correlation of .73 and concurrent validity against other commonly used measures of depression (e.g.., ***Beck Depression Inventory*** or ***Hamilton Depression Scale***). In our data, internal consistency measured by coefficient alpha was 0.80 at seven weeks and 0.84 at six months. The ***Zung Self-Rating Anxiety Scale*** (13) consisted of 20 items designed to sample physical symptoms characteristic of anxiety, cognitive disturbance and sleep difficulties. Each item was rated on a 4-point scale. Fifteen were phrased so that agreement suggested anxiety; the other five were phrased such that agreement suggested no anxiety symptoms. Zung reported an internal consistency correlation (split half) of 0.71. According to Zung (13), it correlated +0.66 with an observer-rated form of the same set of items. While it correlated only +0.30 with the ***Taylor***

Manifest Anxiety Scale (14), it differentiated among five groups of patients with different psychiatric diagnoses where the Taylor Scale did not. In the present sample, internal consistency (alpha) was 0.73 at seven weeks, and 0.80 at six months. The correlation between ***Depression*** and ***Anxiety Scale*** scores in the present sample was 0.75 at seven weeks and 0.78 at six months.

Data Analysis. Uncorrelated factor scores from the ***Home Environment*** and ***Feeding Practices Questionnaires*** were computed by the SAS (15) factor scoring program. Canonical were used to evaluate overall relationships between multiple predictor variables (e.g., ***Zung scales***) and multiple outcome measures (e.g., feeding practices factors). These were supplemented by multiple and simple Pearson correlations. Following Cohen and Cohen (16), we regarded component multiple correlations as significant only when they were 'protected' by a significant canonical correlation. Using similar logic, we interpreted Pearson correlations between a pair of variables as significant only when they were 'protected' by a significant multiple correlation involving the same pair. Partial canonical, multiple and Pearson correlations were applied when controlling for a third variable was necessary.

To evaluate interactions between mood with other variables (home environment, maternal anthropometry, maternal reproductive history and feeding practices) in predicting infant anthropometry, we created interaction terms, as follows. We created standard scores (Mean=0.0, SD=1.0) for all measures. These scores were used to create linear by linear interaction terms (Predictor Variable by Mood) by cross-multiplication, obtaining interaction terms that were uncorrelated with their component main effects. Each set of interactions terms was then correlated with birth weight or -length and with adjusted infant weights and lengths at the three follow-up ages in which we controlled for birth weight or -length, respectively. These procedures generated many interaction terms and correlations. We interpreted the relationships as meaningful only if they exceeded the number expected by chance at a level of $p<0.05$ (17). When this criterion was met, we evaluated the relationships more precisely with two-way unequal-N ANOVA with a priori contrasts for the two main effects and their interaction. For these analyses, mood scores and predictor variable factor scores were dichotomized at their respective means. Only those interaction terms with both statistically significant correlations and F-values were considered as interpretable.

RESULTS

The ***Zung Scales*** were completed by 146 mothers at seven weeks postpartum and by 177 mothers at six months postpartum. Of these, 115 completed the Zung twice and these were used to describe the prevalence of depression in this population. A total of 93 mothers had complete data sets, including ***Zung Scales***, Feeding Practice Interviews, Home Environment Questionnaires and anthropometry. Further, 84 mother-infant pairs had complete data sets for infant anthropometry at three follow-up ages and the four maternal assessments. This restricted sample size was used only for those analyses requiring the comprehensive set of data, whereas the other analyses described below were based on larger samples, as indicated in the text. There was no difference on any scale between those women who were included in the data analyses and those who were excluded because of missing data. Data for boys and girls were combined after determining that there were no significant effects attributable to gender.

Zung Scales at Seven Weeks and Six Months. Index scores on both the ***Zung Depression*** and ***Anxiety Scales*** can range from 25-100. Using scores from the 115 mothers who completed the ***Zung scales*** twice, we measured the prevalence of depression at both seven weeks and six months. At seven weeks, 95/115 (83%) of mothers scored within the normal range for this test (49 or below), 20 (16%) scored in the mild-moderate range (50-59), one (.01%) scored in the moderate to severe range (60-69) and one (.01%) scored in the severe range (over 70). At six months, 84 /115 (73%) mothers scored in the normal range, 22 (19%) scored in the mild-moderate range, eight (7%) scored in the moderate to severe range and one (.01%) scored in the severe range. Thus, the percentage of mothers especially in the moderate to severe groups increased between seven weeks and six months postpartum. The mean scores for the Depression Scale were 38.85 (SD= 9.42) at seven weeks and 41.15 (SD=11.28) at six months. This difference was significant (t=2.80; p<0.01). The correlation between the seven week and six-month scores was 0.65. Thus, the prevalence of maternal depression *increased* from seven weeks to six months.

Mothers' average Anxiety scores were 37.02 (SD=7.19) at seven weeks, and 38.59 (SD=9.33) at six months. The t-value for the difference was 2.48 (p<0.02). The correlation between the seven week and six-month ***Zung Anxiety Scale*** scores was 0.69. Although Zung did not specify cut off scores for clinical anxiety, he reported a mean score for patients diagnosed with Anxiety Disorder as 58.7 (SD=13.5). By this criterion, four (2.7%) mothers scored above 58.7 at seven weeks. Ten (5.6%) mothers scored above 58.7 at six months. Thus, maternal anxiety levels also increased from seven weeks to six months.

To ascertain the psychometric properties of the two scales, we correlated the Depression and Anxiety scores. At seven weeks, the correlation between the two was 0.75. At six months, the value was 0.78. Thus, there was considerable overlap between the two scales. In the subsequent analyses, we elected to retain the Depression and Anxiety scales as separate instruments, to compare the results with the published literature better.

Relationships Between Zung Scales and Home Environment. The relationship between maternal depressive symptoms and socioeconomic conditions has been previously described (18). To determine whether similar relationships were present in this population, we did canonical correlations and protected multiple correlations between the home environment Factors and the Zung scores. The results of these analyses are shown in ***Table I***. Both for the Depression and Anxiety Scales, the canonical correlations showed that the Zung scores were significantly related to the group of home environment factors. The protected multiple correlations predicting Anxiety and Depression scores from the group of home environment factors were significant at both seven weeks and six months. Inspection of the multiple correlations associated with the individual home environment factors showed that four home environment factors were most closely related to the Zung scores. Maternal ***Literacy (Factor 9)*** was negatively correlated with ***Depression*** and ***Anxiety Scale*** scores at seven weeks and six months. Thus, mothers more apt to seek outside advice and information were less depressed and anxious than those not so inclined. ***Family Income (Factor 3)*** was also negatively correlated with Depression scores at both infant ages and with Anxiety scores at six months. Mothers with higher incomes had fewer depressive and anxiety symptoms. ***Healthy Mother (Factor 8)*** was negatively correlated with both Anxiety and Depression at seven weeks, but not at six months. As expected, healthier mothers had less depression and anxiety. Being a ***New Mother (Factor 6)*** was negatively correlated with Depression and Anxiety scores at six months, but not at seven weeks. Variables loading on this factor were: (few) number of children living in the house, (more) uncertainty about child rearing, and leaving school at a later age. Of these variables, only the age at which the mother left school was correlated with mood. Thus, mothers who left school at older ages reported less anxiety and depression. These data confirm that Zung scores and home environmental factors were closely associated in this population in the expected directions, such that disadvantaged women were more likely to report higher Zung scores.

Correlations between Zung Scales, Maternal Anthropometry and Reproductive History. Next, we assessed the relationships between maternal anthropometry and the ***Zung Scales.*** The Anxiety scores were not associated with maternal size. However, the canonical correlation between the anthropometric measures (height, weight and arm circumference) and the Depression scores was significant (R_c=0.32; $p<0.05$). Protected multiple correlations confirmed significant associations at both seven weeks (R=0.30; $p<0.05$) and six months (R=0.30; $p<0.05$). Overall, mothers with higher seven-week depression scores were also more likely to weigh more (r=0.19; $p<0.05$). Because of the strong association between the ***Zung*** scores and 00factors in the home environment, we repeated the above analyses as partial canonical and multiple correlations, holding the nine home environment factors constant. The correlations between maternal anthropometry and Zung depression scores were stronger than those not controlling for home environment. A parallel set of canonical correlations between maternal reproductive history (age, parity and gravidity) and the ***Zung*** scores were not significant both with and without controlling for home environment. Thus, maternal depression, but not anxiety, was associated with maternal anthropometry even when home environment was controlled for, but did not appear to be related to her age or parity.

Zung Scales and Infant Anthropometry. Next, the relationship between scores on the Zung Depression and Anxiety Scales and infant size at birth and the subsequent six months of life was assessed. There were no significant correlations (out of 16) between maternal mood and infant weight and length Z-scores any age. We supplemented these analyses with weight and length residuals, controlling for birth size. As was the case for the uncorrected analyses, no significant correlations emerged. Moreover, there were no significant relationships present when controlling for home environment. We concluded that maternal mood had no direct relationship with infant growth.

Correlations between Zung Scales and Feeding Practices. The central hypothesis in this series of investigations was the expectation that infant feeding practices and infant growth were modified by psychosocial factors, including maternal moods. We have previously reported that feeding practices have a strong association with infant growth (5). To assess the relationship between the Zung scores, measured at seven weeks and six months, and groups of five feeding practices factors measured at the three follow-up ages, we chose two complementary ways for analyzing and presenting the data. In the longitudinal approach, we organized the data by observation period. This series of canonical correlations and protected multiple correlations were summarized in ***Tables IIa and IIb***, with and without controlling for the home environment factors. In the cross-sectional approach shown in ***Table III***, the data were organized by individual feeding factors, which were correlated with the pairs of depression and anxiety scores.

As can be seen in ***Table IIa***, three of the six canonical correlations were statistically significant. These included the canonicals between ***Zung*** scores and ***Feeding Practices*** at seven weeks ($p<0.1$), the seven-week ***Zung*** scores and ***Feeding Practices*** at three months ($p<0.01$), and the six-month ***Zung*** scores and ***Feeding Practices*** at three months ($p<0.1$). Although the remaining canonical correlations had probability values of .20 or less, the magnitudes and structure coefficients of all six canonical correlations were quite similar. The Table also shows protected multiple correlations between both depression and anxiety scores and the group of feeding factors. The most striking relationships were between the depression scores and feeding practices.

In ***Table III***, we organized the same data cross-sectionally to define the protected correlations between each individual feeding factor and mood scale. Among the individual feeding factors, three factors, including ***Preference for Breast feeding (Factor 1), Feeding Intensity (Factor 3) and Relatives Help (Factor 4)*** contributed to the significant canonical correlations. All three protected multiple correlations between ***Preference for Breast feeding (Factor 1)*** and the ***Zung*** Scales were significant. Two simple Pearson correlations (at seven weeks and three months) were significant for Depression and one (at three months) was significant for Anxiety. In all three simple correlations, the associations were negative. Thus, mothers with higher Depression and Anxiety scores reported less breast feeding and more bottle feeding. ***Feeding Intensity (Factor 3)*** was significantly correlated with Depression scores at three months. The simple correlations involving this factor were significant and positive (*p*

<0.05), especially in relationship to the seven-week ***Zung Depression*** score. Thus, mothers with higher depression scores reported that their infants fed more intensely (2).

As shown in the Table, all three significant canonicals were also supported by significant multiple correlations between ***Relatives Help (Factor 4)*** and maternal ***Depression*** and ***Anxiety*** scores. Three simple Pearson r's between ***Relatives Help*** and Depression scores were significant, and the fourth showed a tendency to significance. One correlation was significant for Anxiety scores. Thus, mothers who reported more Depressive and Anxiety symptoms received more help from relatives. We previously reported that one item in the Relative helps factor, *Baby sleeps with mother,* was responsible for the findings attributable to this factor as a whole (6). We therefore supplemented these analyses by correlating the individual items making up the ***Relatives Help*** factor with the Mood scores. *Baby sleeps with mother* at all three infant ages was positively and significantly correlated with both seven-week and six-month Depression and Anxiety scores (all twelve correlations $p<.05$). Thus, mothers who had higher depression and anxiety scores were more likely to sleep with their infants.

Because of the prominent role of home environmental factors in relationship to the Zung scales, we analyzed these data allowing for these factors (***Table IIb)***. After partialling out the nine home environment factors, two canonicals between the seven-week scores and feeding practices at three and six months were significant. However, the relationships between the six-month scores and feeding practices were eliminated. Moreover, depression scores continued to be significantly correlated with feeding practices, whereas anxiety scores were less striking.

Protected multiple partial and simple partial correlations for the individual factors showed that the relationships between depression scores and the ***Preference for Breast feeding (Factor 1)*** and ***Feeding Intensity (Factor 3)*** remained or were increased. However, ***Relatives Help (Factor 4)*** was no longer significant. Thus, the Zung depression scores were associated with feeding practices, especially breast feeding and feeding intensity, even after controlling for the effects of home environment in this population.

Independent Contribution of Feeding Factors to Infant Growth, controlling for Zung Scores. The role of maternal moods in relationship to feeding practices and infant outcomes was further analyzed by testing the association between feeding practices and infant growth, correcting for maternal moods. In our companion paper (5), we reported significant correlations between feeding practices and infant growth at all infant ages. We reanalyzed these data with Zung scores held constant. Canonical, multiple- and simple-partial correlations between the factor scores derive from the feeding practices and weight and height-z scores were computed by partialling out the effects of the ***Depression*** and ***Anxiety Scales*** separately. Besides birth weight and length, maternal height, weight and parity were also controlled for. ***Table IV*** summarizes longitudinal relationships between groups of feeding factors measured at each follow-up age and infant weights and lengths. When depression scores were held constant, three out of six correlations shown to be significant in the uncorrected analyses remained. These were feeding scores at seven weeks associated with infant length at six months, and the six month feeding scores associated with infant weight at three months and six months. However, the relationships between birth weight and six month feeding scores and two concurrent associations between seven week and six month feeding practices and infant length previously found significant now had p values greater than 0.05. Similar results were obtained (data not shown) when controlling for the anxiety scores.

These analyses were supplemented by ***Table V***, which presents the individual feeding factors at each follow-up age. ***Preference for Breastfeeding (Factor 1)*** and ***Feeding Intensity (Factor 3)*** were responsible for all the protected correlations. Moreover, many correlations for these individual factors were significant as compared the other three feeding factors. A third factor, ***Relatives Help (Factor 4),*** was significant only before the effects of maternal moods were corrected. These data showed that correcting for maternal moods reduced the number relationships between feeding practices and infant outcomes, but did not eliminate them. It thus appears that maternal mood may affect infant growth indirectly by modifying certain feeding practices.

Interactions between Zung Scores and Other Predictors of Infant Anthropometry. In the following series of analyses, we considered the possibility that mood, in combination with the home environment factors, maternal anthropometry, reproductive history or feeding practices, might be related to infant anthropometry. There were few significant correlations between the interaction terms and birth weight or -length. We therefore limited our presentation below to postnatal anthropometric measurements at seven weeks, three and six months.

(1) *Home Environment Factors.* To investigate the possible interactions between mood and home environment, we generated 36 Mood-linear by Home Environment-linear interaction terms (two moods x two ages x nine Home Environment factors),. These interaction terms were then correlated with postnatal weights and lengths, corrected for birth size. Of these terms, 5/108 (4.6%) relating to weight and 4 /108 (3.7%) relating to length were statistically significant at $p<0.05$. Most (7/9) correlations were with the six month infant outcomes. Moreover, the majority (6/9) were a result of maternal depression scores both at seven weeks and six months. Although the overall number of correlations was less than would be expected by chance, 5/9 significant correlations related to one home environment factor, ***Late Starting Family (Factor 5)*** and 4/5 of these were confirmed by two-way ANOVA. The pattern of means showed that mothers with high mood scores (more depressed) who were older at their first pregnancies (Z=0.73; n=15) had the heaviest babies. Mothers with low mood scores who were younger at first pregnancy (Z=0.49; n=25) also had babies who were significantly above average in weight. Two groups of mothers, those with elevated mood scores who were younger at their first pregnancies (Z=0.08; n=19), and those with low mood scores who were older at their first pregnancies (Z=-0.02; n=25), had average weight babies. We supplemented these findings by analyzing individual items contained within the ***Late Starting Family*** factor. We concluded that maternal age at her first pregnancy (not the age at the present pregnancy) was responsible for many, but not all, of the significant findings in this series of analyses.

(2) Feeding Practices Factors. We considered the possibility that mood, in combination with feeding practices, might be related to infant growth. To examine this possibility, we created 60 linear by linear interaction terms (Anxiety or Depression scores at two visits by 5 Feeding Factors at 3 infant ages). These terms were correlated with postnatal weights and lengths, corrected for birth size. In this set of analyses, we partialled out the effects of the nine home environment factors. We found that 12/180 (6.7%) correlations for weight were significant, which was higher than would have been expected by chance (17). In contrast, there were no significant correlations for length. Among the significant correlations, anxiety scores (8/12) were more prominent than depression scores (4/12). Among the individual feeding practice factors, the most significant relationships were between ***Relatives Help*** (7/12) and ***Father Helps*** (4/12), followed by ***Preference for Breastfeeding*** (1/12). However, follow-up ANOVAs confirmed significant relationships primarily for ***Relatives Help*** (four significant F-values).

Because of the variety of items included in this factor, we elected to supplement these findings by analyzing the component items. The interaction of mood with one component of ***Relatives Help***: *Baby Sleeps With Mother* accounted for most of the significant findings, and we therefore elected to present these data selectively. Eleven (30.6%) of 36 correlations with infant weight were significant at $p<0.05$. In contrast, only one correlation with length was significant. In addition, the interaction terms were more likely to predict six month weights (9/11 correlations) than weights at earlier infant ages. Anxiety and depression scores were equally represented, and the seven-week assessment was responsible for 8/11 correlations. Follow-up ANOVA confirmed that 8/11 effects remained significant when this procedure was applied. The pattern of means for these interactions showed that infants who slept with mothers having low mood scores (less anxiety and depression) weighed the most (Z= 0.65; n=18), followed by infants who *did not* sleep with mothers having high depression or anxiety scores (0.63; *n*=19). Infants who slept with mothers having high depression or anxiety scores had intermediate values (0.23; *n*=23). Finally, infants whose mothers reported few depressive or anxiety symptoms, but who *did not* sleep with their babies, were of average weight (0.03; *n*=32) and the smallest of the four groups.

(3) Maternal Anthropometry and Maternal Reproductive History. We also considered the possibility that combinations of maternal mood and maternal anthropometry and those between maternal mood and reproductive history might be favorable or unfavorable to infant growth. However, in both series of analyses, unequal N-ANOVAs did not support significant correlations between the interaction terms and infant size. We therefore concluded that interactions between these sets of variables were not meaningful in relationship to infant outcomes and did not add to those findings already reported as direct effects of maternal anthropometry and reproductive history on infant size.

DISCUSSION

In the current study, we report that mild depression was present to a similar extent at seven weeks and six months postpartum. Although a different instrument was used in the two studies, the percentage of Barbadian women experiencing mild depression was comparable to frequencies reported by Pop (19) in their study of the prevalence of postpartum depression in Dutch Caucasian women. In contrast to the Dutch study which reported peak depression scores at 10 weeks postpartum, we reported that mean depression and anxiety scores *increased* from the seven weeks to six month postpartum, and the frequency of moderate depression and anxiety disorders were higher at the later assessment. Of interest, Barbadian women with higher scores at the later testing were not generally those with higher scores at the earlier survey. Thus, the pattern of maternal moods differed in the two studies, which is likely attributable to diverse cultural practices and characteristics of the home environments of the women. In Barbados, government support and maternity leave are available in the first six weeks postpartum and do not continue beyond this time. Thereafter, an increase in symptoms associated with depression and anxiety may occur especially among women whose daily living conditions are compromised.

In the current study, depression and anxiety scores were closely associated with home environmental conditions. Thus, mothers with lower incomes, lower literacy levels, and more children had higher depression and anxiety scores. Mothers in poor general health were also more anxious than those in good health. Although these results may be confounded by the single source of both sets of information, namely the mother, this was unlikely because maternal reports of home conditions were corroborated by home visits. Moreover, the relationship between home environmental conditions and maternal moods were consistent over two infant ages, despite increased depression and anxiety scores at the six months assessment. In a previous study of a different sample of Barbadian women whose children we have followed for up to 25 years after a history of malnutrition, we also reported a significant relationship between maternal depressive symptoms, using a maternal morale scale, and disadvantaged conditions in the home environment (20). Our findings are consistent with the well-known study by Brown and colleagues (18,21) in London, England, who reported a large class difference in the prevalence of psychiatric disturbance. Working class women, especially those with children under the age of six, were more likely to suffer from depression than middle class women.

Even among women who were not clinically depressed, the relationship between depression scores and overweight in this population was of interest. Thus, maternal anthropometry was related to depression scores even after controlling for the influence of the home environment factors. At six months postpartum, mothers who had higher depression scores consistently weighed more than those who had lower depression scores. Lacking data on the women's weights before pregnancy, detecting whether these relationships were prospective was not possible.

A central finding in the current study was the lack of independent effects of depression and anxiety scores on infant growth. In contrast, feeding practices, especially the ***Preference for Breast Feeding*** and ***Feeding Intensity*** continued to be significantly correlated with infant growth even after correcting for the Zung Scores. Three interpretations of this finding are discussed. First, it was possible that maternal moods acted *indirectly* by modifying feeding practices at the earlier postpartum period. The feeding practices themselves may then become the primary mechanism impacting infant growth (5). This possibility is supported by the striking relationships between the seven-week Zung scores, especially depression scores, and feeding practices in the current study (***Table IIB***). Moreover, the two feeding factors most consistently associated with the Zung Scores, ***Preference for Breast feeding*** and ***Feeding Intensity,*** were also those most closely associated with infant growth (***Table V***). Even after correcting for differences in home environment conditions, higher depression scores at seven weeks predicted a lower ***Preference for Breast feeding*** at both seven weeks and three months. In contrast, no prosepective relationship was found between breast feeding at any age and maternal mood at six months. The relationship between maternal depression and the duration of breast feeding has been documented in other studies, including those by (22) in two samples of women followed in Oxford and Cambridge who were assessed between 2-3 months postpartum. Using a logistic regression model, these investigators showed that depressive disorder, low social class and educational achievement and young maternal age contributed to the early cessation of breast feeding. Another recent study in a U.S. inner city population failed to document any relationship between breast feeding and maternal depression (23). Of interest, these investigators evaluated depression at 6.5 months postpartum, when the impact of depression was no longer significant in our study, as well. The finding of a reduction in the preference to breast feed in mothers with higher depression scores recorded in the early postpartum period has important implications for public health programs.

In the current study, Zung scores were also positively correlated with ***Feeding Intensity,*** such that higher depression scores were associated with more interest by the baby in feeding, and stronger sucking. A study by Hellin and Waller(24) reported an association between maternal anxiety scores, but not depression scores, measured immediately after birth and the perception of infants as fussy, demanding and hungry. In the latter study, maternal scores measured after birth were correlated with earlier weaning of infants whereas moods measured at later infant ages did not contribute to infant feeding practices, similar to our findings. However, the effects of home environment were not controlled in these two studies. When we controlled for home environment, the independent effect of anxiety was virtually eliminated, whereas depression scores remained associated with feeding intensity and the preference for breast feeding at current and later ages.

A second auxiliary mechanism may have been the *interaction* between maternal mood and feeding practices to affect infant growth. This mechanism was less striking than the relationship between feeding practices and infant outcomes. A series of analyses using interaction terms between independent variables showed that the combination of Zung scores and feeding practices affected infant growth, especially in the case of *maternal age* and whether or not *the baby slept with its mother*. Infant weights exceeded NCHS average values when mothers who were younger at their first pregnancies and had lower Zung scores, and when mothers were older at their first pregnancies and had higher Zung scores. There were also significant interactions between the Zung scores and whether the baby slept with its mother. Thus, infants gained the most weight over the first six months when their mothers had lower depression and anxiety scores and slept with their babies, followed by infants whose mothers had higher anxiety and depression scores but who did not sleep with their babies. This latter group of findings is particularly intriguing because of the recent interest in the protective aspects of mother-infant contact in high risk infants (25). This intervention may be contraindicated in cases of maternal depression.

Third, the absence of independent effects on growth may be attributable to the lack of sensitivity of infant growth as an indicator of infant outcomes. Behavioral and cognitive measures are frequently disturbed in the absence of growth impairment following moderate-severe malnutrition (24,26-29). Moreover, we have previously documented independent effects of poor maternal morale on school attendance and grades in reading in Barbados, whereas IQ was not directly affected (20). In subsequent papers of this series, we will report on the relationship between early feeding practices and infant behavior.

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TABLE I. Factor Analysis Of Feeding Practices Interview Over Three Ages

Factor / Variable Content	**Factor Loadings**
Factor 1: Preference for Breast-Feeding ($\theta = 0.75$)	
Number of bottle feeds in 24 hours	-0.78
Number of breast feeds in 24 hours	+0.76
Mother rates baby more satisfied after breast	+0.68
Mother rates baby sucking better after breast	+0.64
Sufficient breast milk reported	+0.63
Extenders put in bottle feeds	-0.53
Baby eats other foods	-0.43
Factor 2: Father Helps ($\theta = 0.57$)	
Father/husband helps with baby	+0.80
Father/husband feeds baby	+0.66
Grandmother feeds baby	-0.52
Grandmother helps with baby	-0.48
Factor 3: Feeding Intensity ($\theta = 0.45$)	
Strong (vs. mild) interest in feeding	+0.68
Baby sucks nipple strongly (vs. weakly)	+0.62
Baby eats other foods	-0.51
At interruption, baby fusses	+0.50
Factor 4: Relatives Help ($\theta = .41$)	
Relative helps with baby	+0.61
Relative feeds baby	+0.58
Baby feeds on demand (vs. schedule)	+0.50
Baby sleeps with mother	+0.45
Recent change in feeding method	-0.44
Factor 5: Feeding Difficulty ($\theta = 0.37$)	
Baby is average (vs. easy) to feed	+0.59
Grandmother helps with baby	-0.55
Baby fusses during feeding	+0.47
Grandmother feeds baby	-0.46

TABLE II. Maternal Characteristics

Variable	N	Mean	SD	Range
Age (years)	226	25.3	5.3	16 - 43
Parity	226	2.3	1.5	1 - 9
Gravidity	226	2.6	1.6	1 - 10
Weight (kg)	198	63.5	13.3	36.2 - 104.0
Height (cm)	198	161.3	6.5	141 - 180
Arm Circumference (cm)	197	27.8	4.0	18 - 41
Body Mass Index (kg/m^2)	196	24.4	4.8	14.7 - 40.1

TABLE III a. Simple (r), Multiple (R), and Canonical (R_c) Correlations between Maternal Anthropometry and Infant Anthropometry Z-Scores (n=101)

	Infant Weight					**Infant Length**				
Mothers'	**Birth**	**7 week**	**3 month**	**6 month**	***R***	**Birth**	**7 week**	**3 month**	**6 month**	***R***
Weight	+0.22[b]	+0.21[b]	+0.12	+0.28[c]	0.35[b]	+0.14	+0.10	+0.03	+0.18[a]	0.22
Height	+0.16	+0.32[c]	+0.23[b]	+0.17[a]	0.33[b]	+0.19[a]	+0.20[b]	+0.06	+0.07	0.24
Arm	+0.30[c]	+0.22[b]	+0.08	+0.24[b]	0.38[c]	+0.20[b]	+0.09	+0.09	+0.11	0.21
R	0.34[c]	0.37[c]	0.23	0.29[b]	0.40[c] R_c	0.28[b]	0.22	0.15	0.20	0.33 R_c

Arm = Arm Circumference

[a] = $p < 0.10$; [b] = $p < 0.05$, [c] = $p < 0.01$

TABLE III b. Simple (r), Multiple (R), and Canonical (R_c) Correlations between Maternal Reproductive History and Infant Anthropometry Z-Scores (n=101)

	Infant Weight					Infant Length				
Mothers'	**Birth**	**7 week**	**3 month**	**6 month**	***R***	**Birth**	**7 week**	**3 month**	**6 month**	***R***
Age	+0.09	+0.04	+0.17	+0.25[b]	0.29	+0.10	+0.03	+0.17[a]	+0.16	0.22
Gravidity	+0.12	+0.08	+0.08	+0.18[a]	0.21	+0.13	+0.13	-0.13	+0.03	0.25
Parity	+0.22[b]	+0.13	+0.11	+0.18[a]	0.25	+0.15	+0.23[b]	-0.05	+0.06	0.27
R	0.30[b]	0.15	0.19	0.26[a]	0.31[a] R_c	0.15	0.30[b]	0.34[c]	0.19	0.37[b] R_c

[a] = $p < 0.10$; [b] = $p < 0.05$, [c] = $p < 0.01$

TABLE IV. Mean Factor Scores (SD) Derived from the Feeding Practices Interview as a Function of Infant Age (n=112)

Measure	Age			F Ratios		
	7 Weeks	3 Months	6 Months	F_{age}[a]	F_{sex}[b]	F_{AxS}[a]
Breast Feeding Scale (1-5)	+3.80 (0.92)	+3.25 (1.12)	+2.30 (1.36)	78.69[d]	---	---
Breast Feeding (Factor 1)	+0.56 (0.88)	+0.01 (0.99)	-0.58 (0.79)	80.62[d]	---	---
Father Helps (Factor 2)	-0.12 (0.91)	-0.06 (0.97)	+0.18 (1.09)	6.20[c]	---	1.59
Feeding Intensity (Factor 3)	+0.57 (0.77)	+0.04 (0.98)	-0.61 (0.88)	109.68[d]	---	---
Relatives Help (Factor 4)	-0.19 (0.91)	+0.11 (1.07)	+0.07 (1.00)	6.64[c]	2.69	1.37
Feeding Difficulty (Factor 5)	+0.37 (0.97)	+0.02 (0.97)	-0.39 (0.92)	28.79[d]	---	---

[a] Adjusted F-values based on 2, 109 df.

[b] Univariate F-values based on 1,110 df.

[c] = $p<0.01$

[d] = $p<0.001$

Table V a. Multiple-Partial Correlations (R_p) Between the Group of Feeding Practices Factors and Infant Weight and Length Z-Scores (n = 101)

Feeding Factors (grouped by age)	Infant Age							
	Birth[a]		7 Weeks[b]		3 Months[b]		6 Months[b]	
	Weight	Length	Weight	Length	Weight	Length	Weight	Length
7 Week Scores	0.16	0.15	**0.24**	**0.33**[d]	*0.13*	*0.16*	*0.17*	*0.33*[d]
3 Month Scores	0.29	0.27	0.19	0.24	**0.17**	**0.27**	*0.20*	*0.17*
6 Month Scores	0.32[d]	0.24	0.24	0.17	0.43[e]	0.11	**0.45**[e]	**0.31**[c]

[a] = The multiple-partial correlations (R_p) for birth-weight and birth-length held maternal weight, height, and parity constant.

[b] = The multiple-partial correlations (R_p) held birth-weight for weight measures and birth-length for length measures constant, in addition to maternal weight, height and parity.

[c] = $p < 0.10$, [d] = $p < 0.05$, [e] = $p < 0.001$, [f] = $p < 0.0001$

TABLE V b. Simple-Partial Correlations (r_p) between Feeding Practices Interview Factor Scores and Infant Weight and Length Z-Scores (n = 101)

Measure	Infant Age							
	Birth[a]		7 Weeks[b]		3 Months[b]		6 Months[b]	
	Weight	Length	Weight	Length	Weight	Length	Weight	Length
Feeding Scale								
7 Week	—[g]	—	**+0.12**	**+0.10**	+0.12	—	*+0.20[d]*	*+0.22[d]*
3 Month	—	—	+0.10	+0.16	**+0.11**	—	—	—
6 Month	—	—	—	—	+0.22[d]	—	**+0.22[d]**	**+0.12**
Breast Feeding (Factor 1)								
7 Week	—	—	—	**+0.25[d]**	—	—	—	*+0.26[d]*
3 Month	+0.14	+0.14	—	+019[c]	—	—	—	—
6 Month	—	—	+0.11	+0.11	+0.16[c]	—	—	**+0.11**
Father Helps (Factor 2)								
7 Week	—	—	—	**-0.10**	—	*+0.11*	—	*-0.17*
3 Month	—	—	+0.10	—	—	**+0.20[d]**	—	-0.12
6 Month	-0.14	—	—	—	—	—	—	**-0.25[d]**
Feeding Intensity (Factor 3)								
7 Week	—	—	—	**-0.10**	—	—	—	-0.19[c]
3 Month	-0.19[c]	-0.26[d]	—	—	—	—	+0.16	—
6 Month	-0.21[d]	-0.16	—	—	+0.23[d]	—	**+0.37[f]**	—
Relatives Help (Factor 4)								
7 Week	-0.11	—	**+0.15**	—	—	—	—	—
3 Month	-0.14	—	+0.16	—	—	**-0.18[c]**	—	—
6 Month	-0.11	—	+0.12	+0.13	—	—	—	**+0.14**
Feeding Difficulty (Factor 5)								
7 Week	—	-0.11	**-0.15**	**+0.13**	*-0.13*	—	*-0.16[c]*	—
3 Month	-0.13	—	—	—	—	—	—	—
6 Month	-0.14	-0.12	—	—	-0.12	—	**-0.14**	**-0.11**

[a] = The partial correlations (r_p) for birth-weight and birth-length held maternal weight, height, and parity constant.

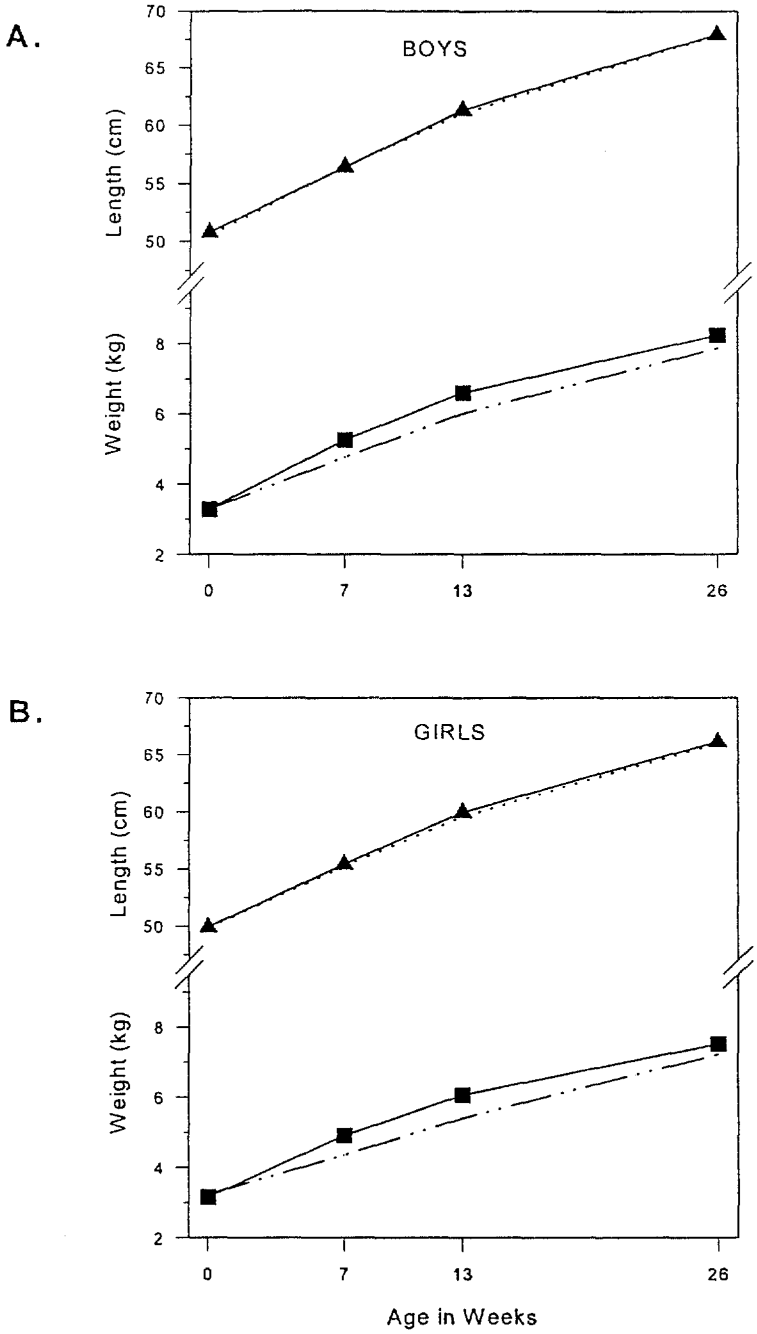
[b] = The partial correlations (r_p) held birth-weight for weight measures and birth-length for length measures constant, in addition to maternal weight, height and parity.

[c] = $p < 0.10$, [d] = $p < 0.05$, [e] = $p < 0.001$, [f] = $p < 0.0001$

[g] = "—" indicates correlations with values less than 0.10.

Figure 1. Infant length and weight compared to 50th percentiles (NCHS, 1977):

Length 50th percentile, (...); Centimeters (▲); Weight 50th percentile, (– · · –); Kilograms (■). (A) Boys (*n* = 48 and *n* = 51, respectively); (B) Girls (*n* = 53 and *n* = 59, respectively).


A.
BOYS
Length (cm)
Weight (kg)
70
65
60
55
50
8
6
4
2
0
7
13
26
B.
GIRLS
Length (cm)
Weight (kg)
70
65
60
55
50
8
6
4
2
0
7
13
26
Age in Weeks

WELLSTART INTERNATIONAL

Wellstart International is a private, nonprofit organization dedicated to the promotion of healthy families through the global promotion of breastfeeding. With a tradition of building on existing resources, Wellstart works cooperatively with individuals, institutions, and governments to expand and support the expertise necessary for establishing and sustaining optimal infant feeding practices worldwide.

Wellstart has been involved in numerous global breastfeeding initiatives including the Innocenti Declaration, the World Summit for Children, and the Baby-Friendly Hospital Initiative. Programs are carried out both internationally and within the United States.

International Programs

Wellstart's *Lactation Management Education (LME) Program*, funded through USAID/Office of Nutrition, provides comprehensive education, with ongoing material and field support services, to multidisciplinary teams of leading health professionals. With Wellstart's assistance, an extensive network of Associates from more than 40 countries is in turn providing training and support within their own institutions and regions, as well as developing appropriate in-country model teaching, service, and resource centers.

Wellstart's *Expanded Promotion of Breastfeeding (EPB) Program*, funded through USAID/Office of Health, broadens the scope of global breastfeeding promotion by working to overcome barriers to breastfeeding at all levels (policy, institutional, community, and individual). Efforts include assistance with national assessments, policy development, social marketing including the development and testing of communication strategies and materials, and community outreach including primary care training and support group development. Additionally, program-supported research expands biomedical, social, and programmatic knowledge about breastfeeding.

National Programs

Nineteen multidisciplinary teams from across the U.S. have participated in Wellstart's lactation management education programs designed specifically for the needs of domestic participants. In collaboration with universities across the country, Wellstart has developed and field-tested a comprehensive guide for the integration of lactation management education into schools of medicine, nursing and nutrition. With funding through the MCH Bureau of the U.S. Department of Health and Human Services, the NIH, and other agencies, Wellstart also provides workshops, conferences and consultation on programmatic, policy and clinical issues for healthcare professionals from a variety of settings, e.g. Public Health, WIC, Native American. At the San Diego facility, activities also include clinical and educational services for local families.

Wellstart International is a designated World Health Organization Collaborating Center on Breastfeeding Promotion and Protection, with Particular Emphasis on Lactation Management Education.

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