FACTORS ASSOCIATED WITH NUTRITIONAL STATUS AMONG YOUNG CHILDREN IN ST. VINCENT

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A survey was undertaken in 1975 in St. Vincent, West Indies, among the mothers of nearly all children from one to two years old in two towns. The mean weight for age was 85 percent of the Boston Standard and the mean weight for height was 92.5 percent of the standard. Levels of malnutrition were similar to those found in a national survey eight years earlier.

Using multiple regression analysis, the variable which had by far the greatest impact on nutritional status (weight for age) was economic level of living. Next in importance came length of breastfeeding, attendance at postnatal clinics, and (with a negative association) the number of siblings.

Efforts to solve the EPM problem must seek to eradicate poverty, but should not neglect the importance of breastfeeding, child spacing, and appropriate health care.

KEY WORDS: infant nutrition, socioeconomic status, weaning, St. Vincent, malnutrition, breastfeeding, fertility, West Indies.

INTRODUCTION

There appears to be a growing consensus that the problem of energy-protein malnutrition (EPM) among infants and young children in developing countries cannot be solved until there is a substantial improvement in the economic well-being of the poorest segment of society (Hakim and Solimano, 1976; Field, 1977). However, observations in some areas suggest that breastfeeding also is a prerequisite for infant health under less than optimal environmental conditions. If a rapid decline in breastfeeding occurs, sudden improvements in economic well-being may fail to bring the expected improvements in infant health (Plank and Milanesi, 1973; Pellett, 1976). There are several possible reasons for this. First of all, breastfeeding has profound economic implications of its own (Greiner, Almroth and Latham, 1979). Secondly, it appears that a great deal of time and material input is necessary for bottle feeding to be practiced with even relatively satisfactory hygiene. The relatively sophisticated understanding of the microbial causes of disease and the commitment to tedious hygienic practices needed for safe bottle feeding are likely to lag behind any rapid economic improvements. Bottle feeding cannot, under any conditions, provide the substantial immunological benefits of breastfeeding, some of which may continue for as long as intensive breastfeeding is prac-

ticed (Mata and Wyatt, 1971; Reddy, *et al.*, 1977). Thirdly, the substantial psychological advantages of breastfeeding, long underrated, may have a significant impact on physical as well as mental development (Sosa, *et al.*, 1976; Lozoff, *et al.*, 1977). Furthermore, economic improvements, if accompanied by a decline in breastfeeding, may be associated with shorter birth spacing, as the substantial contraceptive effect of breastfeeding is lost (Mosley, Osteria and Huffman, 1977).

The present paper reports an analysis of the relationships between economic level of living, breastfeeding and nutritional status among young children in St. Vincent, a small developing country in the eastern Caribbean.

St. Vincent suffers from some of the severest problems of any country in the Western Hemisphere. The 1973 per capita gross national product (market prices) was U.S. \$300, lowest in the Caribbean except for Haiti. While land distribution is among the most equitable in the region, the high population density of 224 per square mile translates to 544 per square mile of "farm land" (about 80 percent of the arable land is included in this definition) (Cross, 1979). This is further compounded by a 1970 dependency ratio[†] of 128,

[†] "Formed by dividing the age group from which economically active are drawn into the remaining population" according to Cross (1979: 61).

highest in the Caribbean. Unemployment is very high. The 1970 Census of the Commonwealth Caribbean estimates unemployment in St. Vincent as the highest among the smaller islands at 12.5 percent, which "almost certainly under-estimates" the actual rate (Cross, 1979: 52).

The infant mortality rate (deaths before one year of age per 1000 live births) of 63.4 and the toddler mortality rate (deaths between one and four years of age per 1000 population of that age) of 4.6 are the highest in the English-speaking Caribbean (Caribbean Food and Nutrition Institute, 1977).

METHODOLOGY

The research was carried out in 1975 with the cooperation of the Caribbean Food and Nutrition Institute (CFNI) and the permission of the Ministry of Health of St. Vincent. A survey of mothers of children between one and two years of age[†] was undertaken in two towns, Layou (population 5200) and Georgetown (population 6300). These towns were chosen because they were sites for a local Community Health Action Programme (CHAP). They were, respectively, from the leeward and windward sides of the island, the two major ecological zones.

During the early months of 1975, CHAP health aides had surveyed households with children under five years of age in the two towns. The data on socioeconomic status and household composition which were used in the present study were derived from records of their survey.

The CHAP survey included 200 children between one and two years of age. This appeared to be a complete sample in Layou, but in Georgetown the residents of a wealthier section of town did not participate. Hospital records showed that an additional 16 children of this age would have been in the sample if this section of the town had been included.

Mothers, or in a few cases other guardians of these children, were interviewed in their homes by the first author, always accompanied by a local aide. Eight mothers did not consent to this reinterview and data from three others were not used because they were relatives of health aides. The

[†] The sample actually included all children born from August 1, 1973, through August 31, 1974. A 13-month age range was used to achieve the desired sample size of about 200.

final sample thus consisted of 82 children from Layou and 107 from Georgetown.

The children were weighed in light clothing by the first author using a model PBW hanging scale from CMS Weighing Equipment, Ltd., London. Heights were measured with the assistance of the health aides using a wooden length board with a movable foot piece. Birth dates were verified with hospital records or baptismal certificates where possible.

Data were coded, punched and verified. Computer analysis was carried out using the Statistical Package for the Social Sciences (Nie, *et al.*, 1975) and the Statistical Analysis System (Barr, 1976).

At the time of the interview, 25 children were still breastfeeding. Their age at the time of the interview was recorded as their age of "sevrage"[‡] for regression analysis.

As a measure of the economic level of living, a linear summated composite index was created[§] and tested for reliability (Nunnally, 1967) and validity (Bohrnstedt, 1969). It included the following variables: type of housing construction, number of rooms, type of toilet facility, type of water supply, type of cooking fuel used, and ownership of a radio.

RESULTS

The families in the sample population were poor. The mean weekly household expenditure for the 150 households for which adequate data were obtained was about U.S. \$13.00. There were on average seven persons living in each house, with a mean of 2.7 rooms per house.

Thirty-six percent of the sample had gardens, 13 percent had livestock, and seven percent engaged in fishing. Seven percent had running water in their homes, and two percent had flush toilets. Only seven percent had gas stoves and the rest of the families used either kerosene cookers, coal pots or wood fires in about equal numbers.

Seventeen percent of the mothers were legally

[‡] We use the French word "sevrage" to indicate the complete cessation of breastfeeding. The word "wean" is often used in this sense, but can lead to confusion, since it actually refers to the entire process of replacing breast milk with solid foods.

[§] The method used was developed by Dr. J. D. Francis of the Rural Sociology Department at Cornell University based on the "domain sampling" model of Nunnally (1967).

|| The reliability of cross-sectional income and expenditure data in St. Vincent may be questioned because of the erratic nature of employment (Reddy, 1968).

married. Fathers lived with the mothers and children in 41 percent of the households.[†] The mean number of children per mother was 3.7 living plus 0.4 dead (data were not obtained on abortions and miscarriages). At the time of the interview, 16 percent of the mothers were known to be pregnant and 40 percent acceptors of family planning. During her pregnancy with the target child, the average mother had visited the antenatal clinic 4.2 times.

Although 38 percent of the mothers had some type of employment, only nine percent had a full-time job year round. Nearly all the mothers were literate, seven percent having completed secondary school and another 87 percent primary school.

The mean weight for age of the children for the entire sample was 85 percent of the Harvard Standard median (Jelliffe, 1966), sexes combined, with a standard deviation (SD) of 14.3 and a standard error (SE) of 1.04. In both towns, the weight for age clustered around 85 percent of the standard median for children at each month of age from 12–24. The mean weight for height was 92.5 percent of the standard (SD = 10.4, SE = 0.77).

Table I compares the levels of malnutrition found in the present study with those found in 1967 in a five-day rapid EPM survey conducted by the government of St. Vincent and the Caribbean Food and Nutrition Institute (CFNI, 1967). Of the 2490 children measured in the latter study, 538 fell between the ages of 1–2 years. Although the same total amount of malnutrition is reported by the two studies (66.5 percent), a higher prevalence of the more severe degrees was found in the present study.

In a study based on a 100 percent sample of Child Health Clinic attenders to 21 out of 29 centers for 1975 and 1976, Witter, Allen and Gueri (1976) found much lower levels of malnutrition. Reported according to Gomez classifications, and

[†] As in other Caribbean countries, family relationships in St. Vincent appear to move toward marriage in stages as men become more financially secure. Writing about the slavery system in Jamaica and St. Vincent in the early 1800s, Smith (1965) cites several practices which may be precursors of the current marriage patterns. First, white males usually took black concubines, preferably "free colored" women, who strove to become (house) "keepers," and thus tried to avoid marriage to free colored men. Free colored men sought to marry free colored women of lighter skin, paralleling the taboo on marriage between white men and colored women. Religion was not shared with slaves. As marriage was a religious sacrament, it was denied to them. Familial disorganization was intensified by the sale or transference of portions of family units.

TABLE I
Percent of children, aged 1–2, found to be malnourished in St. Vincent

Degree of malnutrition	Percent	
	CFNI (in 1967) (N = 538)	Present study (in 1975) (N = 200)
Mild (81–90% of standard weight for age)	33.1	28.5
Moderate (61–80%)	31.4	35.0
Severe ($\leq 60\%$)	2.0	3.0
Total malnourished ($\leq 90\%$)	66.5	66.5
Normal ($>90\%$)	33.5	33.5

Harvard Standards, sexes combined (Jelliffe, 1966).

also based on the Harvard Standards, their findings (N = 2290) were 69.5 percent normal, 22.7 percent mild malnutrition (75–89 percent of standard), 6.2 percent moderate malnutrition (60–74 percent of standard), and 1.6 percent severe malnutrition (<60 percent of standard). However, the authors were certain that this was a biased sample. In nearby St. Lucia a higher prevalence of malnutrition was found among non-clinic attenders. Also, mothers tend more to bring in younger children among whom malnutrition is less common.

Standard linear multiple regression analysis, using percent of standard weight for age as the dependent variable, identified the variables below as significantly associated with the nutritional status of the target child. Their levels of statistical significance and the magnitude of their effects are given in Table II.

Age of *sevrage* (SEVRAGE). The mean age of *sevrage* was 7.8 months (SD = 5.2, SE = 0.38). Longer breastfeeding was associated with higher nutritional status. The age of *sevrage* was by far the most statistically significant variable in its association with weight for age, and was second to LIVINGLEVEL in the average magnitude of its effect on nutritional status of the sample population. Many other studies have found the age of *sevrage* to have an important bearing on nutritional status (Welbourn, 1958; French, 1967; Wray and Aguirre, 1969; Grantham-McGregor and Back, 1970; Antrobus, 1971; Kanaaneh, 1972; Kanawati and McLaren, 1973; Shanghai CHCCG, 1974; Mata, 1978).

TABLE II
Significance and magnitude of effect of variables associated with nutritional status (weight for age) in St. Vincent^a

Independent variable ^b (1)	Level of significance ^c (2)	Change in r^2 (3)	Mean value ^d (4)	Regression coefficient (5)	Average magnitude of its effect ^e (6) (4 × 5)
SEVRAGE	0.00005	0.0440	7.8	+0.70	+5.5
HOSPITALIZED	0.005	0.0458	(0.080)	-11	-0.91
LIVINGLEVEL	0.008	0.1025	12	+1.0	+12
LIVINGSIBS	0.02	0.0435	3.7	-0.94	-3.5
DEADSIBS	0.03	0.0175	0.35	-2.6	-0.91
SEX	0.05	0.0086	(0.56)	+3.6	+2.0
CLINICATTENDANCE	0.05	0.0133	4.2	+1.2	+5.0
CHILDAGE	0.07	0.0005	6.0	-0.45	-2.7
MARRIED	0.08	0.0058	(0.17)	+4.9	+0.83
HOMEFATHER	0.13	0.0065	(0.41)	-2.8	-1.1

^a The mean weight for age for the entire sample of 189 children was 84.6 percent (SD = 14.3), while that for the subsample of 161 children used in this regression equation was 85.2 percent (SD = 14.8). The r^2 for this equation is 0.29. Weight for age is defined as percent of the median value from the Harvard Standards, sexes combined (Jelliffe, 1966).

^b See the text for definitions of the variable names.

^c $p \leq$ the value given, using Student's T Test for the null hypothesis, $\beta = 0$. One-tailed tests were used, since the direction of association had been hypothesized beforehand in every case.

^d For variables with only two categories, this represents the proportion of the sample involved, and is placed in parentheses. Values are for the entire sample rather than the regression subsample.

^e Arrived at by multiplying column 4 (the mean value for each independent variable) times column 5 (the regression coefficient). If the mean values had been calculated from the regression subsample, the figures in column 6, when added to the intercept (75.1) would equal the mean value of the dependent variable (85.2).

Hospitalized children (HOSPITALIZED). Thirteen of the sample children had been hospitalized for malnutrition within nine months of the survey. Their weight for age at the time of admission to the hospital was used, as a better reflection of their home environment than that found at the time of the survey. This hospitalization was of course associated with a lower nutritional status.

Economic level of living (LIVINGLEVEL). The index for economic level of living had by far the greatest average magnitude of effect on the nutritional status of the sample population. Numerous other studies have found that nutritional status is lower among families at a lower economic level of living (Desai, Miall and Standard, 1968; Wray and Aguirre, 1969; Desai, Standard and Miall, 1970; Kanawati and McLaren, 1973; Levinson, 1974; Westcott and Stott, 1977; Marchione, 1978; Mata, 1978; Taha, 1979; Almroth and Latham, 1980).

Number of living siblings (LIVINGSIBS). The

more siblings a child had, the lower was his or her nutritional status. This variable was relatively high in both its significance level and magnitude. Previous studies have had contradictory findings with regard to the effect of various measures of fertility or family size on nutritional status (Nicol, 1959; Desai, *et al.*, 1968; Morley, Bicknell and Woodland, 1968; Desai, *et al.*, 1970; Kanawati and McLaren, 1973; Grantham-McGregor, Desai, and Buchanan, 1977; Gibbons, 1977; Marchione, 1978; Almroth and Latham, 1980). One reason for this may be the fact that mothers with one or two children are likely to be teenagers (Antrobus, 1971). As they grow older, gain experience as mothers, and perhaps an improved economic level of living, their next few children may receive better quality care, although with even more children the extra burden of over extended resources will outweigh this factor.

Number of dead siblings (DEADSIBS). Weight for age declined as the number of dead siblings

increased. This is in agreement with other studies (Morley, *et al.*, 1968; Wray and Aguirre, 1969; Antrobus, 1971; Kanawati and McLaren, 1973).

Sex of child (SEX). Boys had a higher score than girls, but this was largely due to the use of a combined standard rather than a higher nutritional status for boys. Some other studies have found girls to be of lower nutritional status (DeChavez, *et al.*, 1974; Levinson, 1974).

Attendance at postnatal clinics (CLINIC ATTENDANCE). The number of times the child had been taken to the clinic was positively associated with weight for age. This was mainly a well-baby clinic where children were weighed and simple health and nutrition advice was given. The magnitude of effect of this variable was relatively large. However, in a cross-sectional study such as this, it is not possible to tell whether better nutritional status came before or after clinic attendance. Greater clinic attendance was found to be associated with better nutritional status in urban Jamaica (Grantham-McGregor, Desai and Buchanan, 1977), but not in rural Jamaica (Marchione, 1978).

Age of child (CHILDAGE). A decline in weight for age commonly begins in the middle of the first year of life in St. Vincent (Antrobus, 1971). This variable shows that nutritional status fell during the second year of life. In fact, CHILDAGE may be seen as a proxy for cumulative environmental stress or insult during this period.

Marital status of mother (MARRIED). The children of married mothers had a higher weight for age. Some studies in the West Indies have found a similar effect (Desai, Miall and Standard, 1968; Marchione, 1978), while others have found no such effect (Desai, Standard and Miall, 1970; Grantham-McGregor, Desai and Buchanan, 1977).

Presence of father in the home (HOME-FATHER). If the child's father lived at home (keeping in mind that the marriage variable is held constant), the child's nutritional status was slightly lower, at a marginal level of statistical significance. This may be due to fathers not living at home, having higher-paying jobs and sending home more money than they could have earned had they lived at home. In this case an absent father may have been associated with a slightly better economic status for the family.

Insignificant variables. The age of the target child's mother was not significantly associated with the weight for age. Desai, Standard and Miall

(1970) also found no association, though others have found a positive association (Desai, Miall and Standard, 1968; Antrobus, 1971; Marchione, 1978).

No significant association was found between nutritional status and the mother's employment. Lees (1966) in nearby St. Lucia found maternal employment to be associated with lower nutritional status of infants. Wray and Aguirre (1969) in Colombia found a trend toward higher levels of malnutrition among children of mothers who worked part time, and lower levels when the mothers worked full time. Popkin and Solon (1976) suggest that the higher malnutrition associated with maternal employment in the Philippines and elsewhere may result more from the mothers' poverty than from their working status. Reutlinger and Selowsky's data (1976) suggest that the main reason may be the high cost of replacing breast milk when the mother works. An unskilled woman in Calcutta who took a job during her infant's first six months of life would have to spend 53 percent of the money she earned just to replace 70 percent of her breast milk calories with cow's milk.

The age of introduction of supplemental milk was unrelated to weight for age. However, there would be little chance of seeing an effect in a sample such as this one, where bottle feeding was introduced rather uniformly at a very early age (median, two weeks), rather distant in time from the survey. Other studies have found an association between the early introduction of bottle feeding and low nutritional status (Welbourn, 1958; Antrobus, 1971; Kanaaneh, 1972; Kanawati and McLaren, 1973).

CONCLUSION

The findings of this research were in good agreement with other studies which suggest that income (Swanberg and Shipley, 1975) or other measures of wealth (Valverde, *et al.*, 1977) are likely to be major predictors of nutritional status. However, the implications of such findings must be carefully considered. Several authors have suggested that at a more macro-community or national level, not only economic status, but also degree of dependency must be taken into account (Hernandez, *et al.*, 1974; Laurell, *et al.*, 1977). In Jamaica, Marchione (1977) has linked nutritional status with government policies aimed at achieving food self reliance.

The results also affirm that while the major prerequisite for improving nutritional status is improvement in economic well being, the role of breastfeeding and late *sevrage* may also be important. The only other variables which had a sizeable average magnitude of impact on the nutritional status of the sample were the number of living siblings and the number of postnatal clinic visits. This suggests that measures to lengthen child spacing and the development of appropriate health care may also contribute to improving nutritional status. The interactions among these four key variables deserve closer scrutiny, as for example, the recent attention given to "Lactation, Fertility, and the Working Woman" (Jelliffe, 1979). Research and programs in this complex problem deserve a high priority. They should always be conducted, taking careful cognizance of local socio-cultural and economic factors.

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