Community and International Nutrition

Poor Maternal Schooling Is the Main Constraint to Good Child Care Practices in Accra[1]

Margaret Armar-Klemesu, Marie T. Ruel,*[2] Daniel G. Maxwell,[†3] Carol E. Levin* and Saul S. Morris*

*The Noguchi Memorial Institute for Medical Research, University of Ghana, Legon, Ghana; *International Food Policy Research Institute (IFPRI), Washington, DC 20006; and [†]CARE-International, East Africa/Middle East Regional Management Unit, Nairobi, Kenya*

ABSTRACT   Life in urban areas presents special challenges for maternal child care practices. Data from a representative quantitative survey of households with children < 3 y of age in Accra, Ghana were used to test a number of hypothesized constraints to child care including various maternal (anthropometry, education, employment, marital status, age and ethnic group) and household-level factors (income, availability of food, quality of housing and asset ownership, availability of services, household size and crowding). Three care indices were created as follows: 1) a child feeding index; 2) a preventive health seeking index; and 3) a hygiene index. The first two indices were based on data from maternal recall; the hygiene index was based on spot-check observations of proxies of hygiene behaviors. Multivariate analyses (ordinary least-squares regression for the child feeding index and ordered probit for the two other indices) showed that maternal schooling was the most consistent constraint to all three categories of child care practices. None of the household-level characteristics were associated with child feeding practices, but household socioeconomic factors were associated with better preventive health seeking and hygiene behaviors. Thus, poor maternal schooling was a main constraint for child feeding, health seeking and hygiene practices in Accra, but the lack of household resources was a constraint only for health seeking and hygiene. The programmatic implications of these findings for interventions in nutrition education and behaviors in Accra are discussed.   J. Nutr. 130: 1597–1607, 2000.

KEY WORDS: • *child care practices* • *child feeding practices* • *Ghana* • *hygiene* • *female education* • *urban nutrition*

In Africa, about one third of the population currently lives in urban areas, and this percentage is expected to increase to over one half by the year 2033. The population of Accra, the capital of Ghana, is increasing more quickly than anywhere else in the country (Ghana-MLG 1992). Commensurate with this increasing urbanization is an increase in poverty and a decline in living standards, which stands in contrast to a general decrease in the level of poverty nationwide (World Bank 1995). Between 1987 and 1993, the absolute number of poor households and undernourished children in urban areas of Ghana has increased and is accounting for a growing share of the overall burden of poverty and malnutrition in this country (Haddad et al. 1999). Registered unemployment increased by 20% from 1987 to 1993, and those otherwise unable to find employment continued to crowd into marginal self-employment, mostly petty trade, in the city's informal sector

(ISSER 1995). At the same time, women continue to be heavily involved in work outside the home, particularly in the low paying occupational categories of petty trading and street food vending (Levin et al. 1999).

The conditions of urban poverty, most importantly the high proportion of women working away from home, the dependence on cash income and the deteriorating environmental conditions pose special challenges to the care of children. The nutrition, growth and development of infants and young children depend not only on sufficient food, but also on adequate health services and appropriate care behaviors (UNICEF 1990). A household's capacity to provide care is dependent on the availability of resources (or the absence of constraints) within the household and the wider community. Engle and Lhotska (1999) describe various maternal and household resources for care and group them into three main categories, i.e., human, economic and organizational resources. This paper addresses the first two categories of care resources as follows: 1) the human resources, particularly the caregivers' characteristics such as nutrition, education, ethnic group, employment characteristics and time constraints; and 2) the household economic resources including household income, food availability, demographics, availability of water, hygiene

and sanitation services, and availability of child care substitutes.

The main purpose of this research was to examine specifically within the context of an urban African center (Accra) which of the maternal and household characteristics were more severe constraints to the provision of good child care in this environment. The care practices studied were child feeding, preventive health seeking behaviors and hygiene practices. We showed previously that these care practices were strong determinants of child nutritional status in this population, particularly among children from poorer families and children whose mothers had less than secondary schooling (Ruel et al. 1999). A crucial question then, which is addressed here, is the following: what are the main constraints to optimal child care practices in this population? Answers to this question can provide useful insights for the design of interventions to improve care practices because the success of education interventions depends not only on targeting the right practices, but also on addressing the constraints to their adoption.

SUBJECTS AND METHODS

Source of data

The data were from a representative survey of households with children ≤3 y of age in Accra, Ghana. The overall objective of the study was to understand the nature of urban poverty and the relationships among urban poverty, food insecurity and malnutrition in a major urban center in Africa. The study combined qualitative and quantitative methods. Most of the data presented here are drawn from the quantitative survey carried out between January and March 1997. Information on the design and the major findings of the overall study have been published (Maxwell et al. 2000).

Survey sampling strategy and data collection methodology

The basic sampling units for the survey were households with children <3 y of age. A two-stage sampling strategy was adopted, with "enumeration areas" mapped out by the Ghana Statistical Service as the primary sampling units. Sample size calculations were made on the basis of ±3% precision in prevalence estimates of low anthropometric status, and to detect significant differences of 0.5 Z-scores among groups with 90% power. The required sample size was 36 households in 16 enumeration areas, for a total of 576 households. The achieved sample size was 556 households, distributed among 16 enumeration areas.

The survey included the following questionnaire modules: household roster, employment and self-employment, adaptive strategies, credit, transfers and other income, urban agriculture, livestock and fishing, food habits and coping strategies, meals roster, household consumption and expenditure, maternal sociodemographic and employment characteristics, child feeding practices and the use of preventive health services, child morbidity, a hygiene spot check, and maternal and child anthropometry. All modules were based on an interview (self-reporting), except anthropometry (measurements were taken) and the hygiene spot check, which was done by observation. Field workers were hired locally and trained for 8 wk by the project principal investigators (DGM, MAK and CEL). All questionnaires were field checked by the immediate supervisor as well as the principal investigators, and supervisors made random checks on all enumerators every week. All data were double entered to minimize data entry errors. Systematic data cleaning was conducted and discrepancies were corrected by reference to the questionnaire. Additional information on the study methodology is available elsewhere (Accra Study Team 1998).

All households gave their verbal consent to participate after the study objectives and methodology were read to them. Ethical clearance was obtained from the Health Research Unit of the Ministry of Health of Ghana.

Variables used and index creation

The maternal characteristics examined as potential constraints (or resources) to care giving included age, body mass index (BMI, kg/m²)[4] and schooling, which were hypothesized to be positively associated with child care practices. The direction of the association with other characteristics such as marital status, head of householdship, maternal employment and use of alternative child care was more difficult to predict because the literature on these topics is largely inconclusive. For example, there is no general consensus about whether maternal employment is beneficial or detrimental for young children in developing countries. The controversy stands because this is a complex issue that must be examined in the context of all other factors that may have conflicting influences on the final outcomes, care practices and children's well-being (Engle et al. 1997, Leslie and Paolisso 1989). We also did not have any specific hypothesis about ethnicity, but it was assumed that some ethnic groups may have specific traditional or cultural beliefs that would affect their caring practices, either positively or negatively. The use of prelacteal teas and liquids as a ritual or to cure or prevent specific ailments is an example of such practices that have strong cultural roots.

The household level constraints to care that were examined were the following: household size; crowding (number of rooms/person); household income (proxied by household consumption expenditure for food and nonfood items); food budget share (percentage of household expenditure spent on food); household food availability (energy) per adult equivalent [derived from the food consumption expenditure module in which adult equivalent units are based on standards for the United Kingdom (Gibson 1990)]; type of dwelling, availability of water, sanitation and garbage disposal services, and ownership of assets. Except for crowding and household size, all household characteristics were hypothesized to be positively associated with care practices, with the view that household resources may facilitate the provision of care and the maintenance of a safe and healthy environment.

Three care indices were created, i.e., a child feeding index, a preventive health seeking index and a hygiene index. A household socioeconomic index was also created using information on assets, housing quality and availability of services. The methodology used to derive these indices is summarized below.

Child feeding index. The list of variables used to create the child feeding index is presented in **Table 1**, as well as the scoring system used to grade each question. The index was created only for children ≥4 mo old (n = 512) because only two variables were available to construct the index for infants below this age. These two variables are the first ones presented in Table 1, i.e., whether the mother reported having used prelacteal feeds before initiating breast-feeding and whether the mother reported currently breast-feeding the child. Because the number of variables for this age group was so small and because there was very little variability in breast-feeding (98% of children in this age group were breast-feeding), it was decided to exclude this age group from the child feeding index.

The general scoring system for the index was to allocate a score of −1 for a negative practice and a score of 0 for a positive practice (Table 1). When a practice was particularly good, such as using fortified cereals for complementary feeding, a score of +1 was given. Practices were considered positive or negative on the basis of current child feeding recommendations (WHO 1995) and available scientific evidence about their benefits or risks. For example, not breast-feeding a child 4–9 mo of age was given a score of −1 because it is known to be potentially harmful for the child, and breast-feeding is a recommended practice for this age group. For older children, however, not breast-feeding was given a score of 0 because it is not clear whether failure to breast-feed at this age really has a negative effect on children's health and growth. Scientific evidence on this issue is controversial (Brown et al. 1995). The other practice that was used differently in the index depending on the age of the child was whether anyone helped the child to eat. Before 9 mo of age, all children were receiving help, and therefore the variable was excluded

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[4] Abbreviations used: BMI, body mass index; DPT, diphtheria, pertussis and tetanus; OLS, ordinary least squares.

TABLE 1

Practices and scoring system used, by age group, to create the child feeding index (n = 512)[1]

Practices included in the index	Results[2]	Scores allocated to different practices, by age group (mo)		
		4–8.9	9–17.9	≥18
Prelacteal feeds used	Yes: 33%	Yes: −1 No: 0	Yes: −1 No: 0	Yes: −1 No: 0
Still breastfeeding*	Yes: 51%	No = −1 Yes = 0	No = 0 Yes = 1	
Water: gave to child (0–4 mo old)	Yes: 69%	Yes: −1 No: 0	Yes: −1 No: 0	Yes: −1 No: 0
Sugar-based liquids: gave to child (0–4 mo old)	Yes: 26%	Yes: −1 No: 0	Yes: −1 No: 0	Yes: −1 No: 0
Infant formula: gave to child (0–4 mo old)	Yes: 32%	Yes: −1 No: 0	Yes: −1 No: 0	Yes: −1 No: 0
Cow's milk: gave to child (0–4 mo old)	Yes: 17%	Yes: −1 No: 0	Yes: −1 No: 0	Yes: −1 No: 0
Solid foods: gave to child (0–4 mo old)	Yes = 58%	Yes: −1 No: 0	Yes: −1 No: 0	Yes: −1 No: 0
First food offered to child	a) Unfortified cereals (koko): 60% b) Fortified cereals: 30% c) No special weaning food: 10%	a) 0 b) +1 c) −1	a) 0 b) +1 c) −1	a) 0 b) +1 c) −1
Does anyone help the child eat*	No: 28%		No: −1 Yes: 0	No: −1 Yes: 0
What does caregiver do when child refuses to eat	a) Nothing (child left alone), forces: 36% b) Other (coax, play with, change food, not a problem): 64%	a) −1 b) 0	a) −1 b) 0	a) −1 b) 0

[1] The asterisk indicates practices for which the variables or the scoring system differ by age group.

[2] The column entitled "results" indicates the percentage of all mothers who had the particular behavior. For example, for the question about "prelacteal feeds," 33% of mothers answered "yes," that they did give prelacteal feeds to their child.

from the index because it had no variability. The index was created for each age group by adding up the scores obtained for the different practices. The maximum possible score was +2 and the minimum was −9 for each age group. The variable was normally distributed and had a mean and a SD of −2.24 and 1.81, respectively.

TABLE 2

Variables and scoring system used to create the preventive health seeking index (n = 512)

Practices Included in the Index	Results[3]	Scores allocated to different practices, by age group (mo)[2]		
		4–8.9	9–17.9	≥18
Attendance at growth monitoring (past month)	Yes: 63%	No: −1 Yes: 0	No: −1 Yes: 0	No: −1 Yes: 0
DPT immunization (>3 months)[1]	Yes: 91%	No: −1 Yes: 0		
Measles immmunization (>9 months)[1]	Yes: 85%		No: −1 Yes: 0	No: −1 Yes: 0

[1] Practices in which the variables or the scoring system differ by age group.

[2] mo = month(s)

[3] The column entitled 'results' indicates the percentage of all mothers who had the particular behavior. For example, for the question about 'attendance at growth monitoring,' 63% of mothers answered 'yes,' that they had taken their child to growth monitoring in the previous month.

Preventive health seeking index. This index included only three variables, i.e., whether the child had been taken to growth monitoring in the previous month, and whether the child had received diphtheria, pertussis and tetanus (DPT) and measles immunizations (**Table 2**). A score of −1 was given for children who had not received the immunization or had not attended growth monitoring in the previous month, and 0 for those who have done so. Because immu-

TABLE 3

Hygiene behaviors observed and used to create the hygiene index (n = 512)[1]

Observation	Households with good hygiene		Missing or not observed
	n	%	n
*Mother clean	353	69.6	5
*Index child clean	348	69.3	10
*Diaper clean	342	68.8	15
*Compound swept	247	49.5	13
*No poultry feces	337	69.8	29
*No stagnant water	446	89.6	14
No human feces	475	97.5	25
No unwashed utensils	262	69.3	134
Drinking water covered	94	68.6	370
House swept	201	77.9	254

[1] The variables preceded by an asterisk (*) were used in the construction of the index.

nizations are expected to occur when the child reaches a certain age, these variables were included in the index only for the relevant age groups. Information was gathered on other preventive health seeking behaviors such as giving multivitamins and minerals to the child or using malaria prophylaxis drugs. Findings from our qualitative research, however, revealed that these products were not used for prevention, but rather they were used when the child had no appetite or was sickly (in the case of vitamins) or when the child actually had malaria (as opposed to using it to prevent malaria). Thus, these behaviors were not included in the preventive health seeking index. The index scores ranged from −3 to 0. Because few cases scored −3, the values of −3 and −2 were grouped to form the "poor health seeking" group (18% of the sample); values of −1 formed the "average health seeking" group (40% of the sample); and values of 0 constituted the "good health seeking" group (42% of the sample).

Hygiene index. Hygiene behaviors were measured using a "spot-check" approach, whereby field workers were trained to observe and grade a list of predetermined hygiene-related aspects of the caregiver, index child, house and compound in which they lived. This method is generally used in cross-sectional surveys that do not allow for conducting day-long observations in the homes. The aspects observed in the spot check are usually proxies for positive or negative behaviors (such as whether the mother's hands are dirty or clean), rather than observations of the behaviors themselves (whether the mother washes her hands or not). The list of aspects observed in our study is presented in **Table 3**. Field workers were carefully trained and standardized on each aspect to be observed, in making subjective, yet consistent, judgements. Standardization was carried out until perfect concordance between pairs of field workers, and with their supervisor, was obtained.

The hygiene index was constructed using all variables that had <50 missing or nonobserved data (7 variables; see Table 3), and for which there was sufficient variability in the data (the variable "presence of human feces in compound" was excluded from the index because up to 98% of the sample had a positive behavior, and hence the variable did not discriminate). Each positive behavior received a value of 1 and a negative behavior, a value of 0. Thus, the index was the sum of six variables, and scores ranged between 0 and 6. On the basis of the frequency distribution of the index, we created the following three categories of hygiene practices: *1*) poor: scores 0–3 (30.5% of the sample); *2*) average: scores 4–5 (39% of the sample); and *3*) good: score of 6 (30.5% of the sample).

Quality of housing and assets index. This index was created using principal components analysis. First, a "possession" index was created by summing up ownership of four assets: refrigerator, electric stove, tape deck and television set (owned = 1; not owned = 0). Then, factor analysis was used to derive one factor that would summarize variables related to the quality of housing (construction material for roof, walls and floor), the "possession" index, the source of drinking water, and the availability of sanitary facilities and garbage disposal. The principal components factor extraction method was used. Loadings smaller than 0.5 were excluded from the initial model. The final model had five variables (floor, walls, water source, possession index and sanitary facilities) and explained 46% of the total variance in the constituent variables.

Analytical methodology

Means and SD are reported for continuous variables, and frequency distributions for categorical variables. Associations between care resources (maternal and household characteristics) and care practices were tested using ANOVA for the child feeding index, which was a continuous and normally distributed variable. The chi-square test was used for the health and hygiene indices, which were both categorical variables. Differences among groups as well as linear trends were tested for significance.

Principal components analysis was used to create the quality of housing and asset index as described in the previous section. Socioeconomic quintiles were created from this variable for use in bivariate analyses. Expenditure quintiles were also created from the household per capita annual expenditures.

Multivariate analysis was used to confirm the results of the biva-

riate analyses. The main objective was to determine whether the factors identified as potential constraints to child care remained significant after controlling for potentially confounding factors. Ordinary least squares (OLS) regression analysis was used to model the child feeding index as a dependent variable because it was a continuous variable with a normal distribution. For the health seeking and hygiene indices, which were categorical and nonnormally distributed variables, maximum likelihood ordered probit estimation was used. For both multivariate approaches, all covariates were tested for nonlinearity in their association with the outcomes and none was found. For categorical variables, joint *F*-tests were used to test the significance of differences among categories.

In the regression analysis, a number of the explanatory variables were potentially endogenous; that is, they may be correlated with the error term of the regression model, which would bias the OLS regression coefficients. One can avoid this potential problem by using only exogenous explanatory variables, or by using instrumental variable regression techniques such as two-stage least-squares regression. We rejected the first strategy because we were interested in the association of our selected explanatory variables with our care indices. We rejected the second strategy because of the difficulty in identifying the large number of instruments necessary to generate the unbiased instrumental variables required to estimate our potentially endogenous variables. Future research in this area is warranted.

The probability level considered significant was < 0.05 for all analyses; the statistical programs used were SPSS, version 8 (Chicago, IL) and Stata, version 6 (College Station, TX).

The data presented in this paper are based on a final sample size of 479 for the child feeding index, 509 for the preventive health seeking index and 468 for the hygiene index. These numbers result from the exclusion of children 0–4 mo old (n = 44) for the child feeding index (see previous description) and some missing values in the variables included in the respective indices.

RESULTS

Child feeding, preventive health seeking and hygiene practices. The second column of Table 1 presents basic descriptive statistics for the child feeding variables included in the index. Approximately half of the sample of 4- to 36-mo-old children were being breast-fed at the time of the survey. Although breast-feeding is almost universal in this population, very little exclusive breastfeeding was observed. Up to 33% of mothers reported using prelacteal feeds before full breast-feeding was established, and extensive use of water, infant formula and other liquids during the first 4 mo was reported. Even solid foods were given to more than half of the children before they had reached 4 mo of age. The most popular complementary food for infants was "koko," a traditional, thin porridge of low energy and low nutrient density, which is prepared from fermented maize dough. Sixty percent of the mothers reported using it as opposed to other fortified products, even the locally formulated cereal-legume mixture called "weanimix." The median age of inclusion of complementary foods in the children's diet was 5.2 mo, earlier than the recommended 6 mo. The median age of inclusion of family food was 9.2 mo and the median duration of breast-feeding was 18.2 mo (median ages were adjusted for truncated data by survival analysis) (results not shown).

Children were usually fed by their primary caregivers in 66% of the cases, whereas 28% fed themselves and 6% were fed by an alternate caregiver. When asked what they did when their child refused to eat, 24% of mothers claimed that they did not have this problem, but among those who did, 14% reported trying to force their child to eat, 25% coaxed or played with their children, 16% changed the food and 20% did not do anything. Helping feed and stimulate the child during meals is recognized as an important component of psychosocial

TABLE 4

Maternal sociodemographic characteristics (n = 512)

Characteristics	n	%
Age, y		
<20	18	3.5
20–35	395	77.8
36–45	76	15.0
>45	19	3.7
Body mass index, kg/m²		
<18.5 (underweight)	29	5.7
≥27 (overweight or obese)	130	25.4
Education		
None	60	11.7
Some Primary	116	22.7
Some middle school or Islamic	90	17.6
Finished middle school	114	22.3
Some secondary school	132	25.8
Ethnic origin		
Ga, Adangbe	183	35.7
Ashanti, Fanti, other Akan	148	28.9
Ewe	117	22.9
Other	64	12.5
Marital status		
Single (cohabiting)	35	6.8
Single (not cohabiting)	48	9.4
Married (only wife)	341	66.5
Married (senior wife or other)	53	10.4
Separated, divorced, widowed	35	6.8
Female head of household	180	35.2
Receives financial support from father	395	77.3

care, which has been associated with improved nutrient intake and growth (Bentley et al. 1995).

Table 2 shows that immunization rates were high (>85%), as is typical of urban areas in developing countries (Ruel et al. 1998). Growth monitoring, on the other hand, was attended by only 63% of children in the previous month.

Hygiene practices, as measured by the spot-check observations, showed that for all 11 aspects observed, at least 50% (and often 70% or more) had good hygiene scores (Table 3). This suggests that families achieved a relatively good level of hygiene, in spite of the generally precarious conditions in which they lived.

Care resources. Maternal sociodemographic and employment characteristics are presented in **Table 4**. Women in our sample were relatively young (the majority were between 20 and 35 y of age) mainly because of our sampling criteria that excluded households who did not have a child ≤3 y old. In terms of nutritional status, the majority were in the normal BMI range, but as many as 25% were either overweight or obese (BMI ≥ 27 kg/m²). Only 6% of the women were underweight (BMI < 18.5 kg/m²). The majority of mothers (63%) had some form of basic education; 26% had high school or higher education and 12% had no schooling at all. Ethnic origin showed a fair split between ethnic groups. A large proportion of women in our sample were married, but up to 35% were head of household. Most mothers reported receiving some financial support from the child's father.

More than half of the mothers (58%) were working full time, whereas 30% were not working (**Table 5**) at the time of the survey. Of those working, 49% were selling in the markets or on the streets, 34% were working from home and only 17% were in salaried employment as office, factory or shop workers; almost all worked at least 4 h, and more than half worked 8 h or more. Up to 56% of mothers worked and looked after their child at the same time, and only one third used alternate child

care. Of these, 28% used creches and 61% used single-person alternate care. Although the majority of alternate caregivers were older than 15 y of age, 15% were between 6 and 15 y of age.

Household-level care resources are presented in **Table 6**. The statistics generally reflect a low socioeconomic status and poor living conditions. The majority of households lived in rooms (90%) rather than houses or apartments. More than half of the households bought their drinking water from vendors (54%), used public latrines (54%) and used public dumping bins for waste disposal (67%). In terms of ownership of assets, only a few households owned a car (8%). Ownership of television, tape deck, radio and refrigerator was common in spite of the generally precarious living conditions. Median household size was 5 persons and families had on average approximately one third of a room available per person. Median expenditure per capita per year was equivalent to $394 and household-level energy availability was 2585 kcal (10.8 MJ) per adult equivalent unit. Households spent 55% of their resources on food, an indication of limited resources.

Association between care resources and child feeding, health seeking and hygiene practices. **Table 7** summarizes the results of the bivariate analysis of the association between selected care resources on the one hand, and the child feeding, health seeking and hygiene indices, on the other hand. None of the resources studied was significantly associated with all three care indices. Maternal education was significantly associated with both the child feeding and the hygiene index, and household income was associated with both the health and the hygiene index. The associations were in the expected direction, i.e., more educated mothers and households with greater income had higher care practices scores. Maternal education was the only care resource associated with the child feeding index. Child feeding practices were not associated with house-

TABLE 5

Maternal employment characteristics (n = 512)

Characteristics	n	%
Current employment		
Not working	153	29.9
Working part time	50	9.8
Working full time	298	58.2
Unemployed (looking for work)	11	2.1
Place of employment		
Home	120	34.5
Market/streets	170	48.9
Factory/office/shop	58	16.7
Among those who worked (n = 348)		
Usual time worked, h		
0	6	1.7
0.5–3.5	19	5.5
4–7.5	132	38.2
≥8	188	54.5
Child care use (n = 348)		
Primary caregiver works and also looks after child	194	55.7
Primary caregiver uses child care alternative (n = 155):		
Single person	100	60.6
Multiple persons	18	10.9
Creche	47	28.5
Age of alternate caregiver (n = 103), y		
6–15	15	14.6
16–49	49	47.6
≥50	39	37.9

TABLE 6

Household-level care resources (n = 512)

Characteristics	*n*	%
Type of dwelling		
Room(s)	459	89.8
Apartment	19	3.7
House	33	6.5
Toilet facilities		
None (open space)	83	16.2
Public latrine	277	54.1
Private latrine	103	20.1
Flush toilet	49	9.5
Waste disposal		
Gutter/empty lots/other	73	14.3
Bury/burn on compound	38	7.4
Public dumping bin	341	66.6
Household collection	60	11.7
Source of drinking water		
Vendor/well	276	55.0
Piped outside	187	37.3
Piped inside	39	7.8
Ownership		
Car	39	7.6
Refrigerator	183	35.7
Gas or electric stove	102	19.9
Kerosene stove	121	23.7
Television	258	50.4
Tape deck	292	57.1
Radio	243	47.6
Medians [lower–upper quartiles][1]		
Expenditure per capita per year, *cedis*[2]	768,670	[529,075–1,210,440]
Energy availability per adult equivalent unit, *kcal (MJ)*	2585 (10.8)	[1883–3393] (7.9–14.2)
Household size, *individuals*	5	[3–6]
Crowding, *number of rooms/person*	0.33	[0.25–0.50]
Food budget share, % *budget spent on food*	55%	[44–66%]

[1] Numbers below are medians (second column) and upper and lower quartiles (third column)

[2] Exchange rate during the survey (1997) was 1950 cedis for US$1.

hold food availability, income or wealth, nor with any other maternal or household characteristics.

The preventive health seeking index was associated only with household income. The hygiene index, on the other hand, was positively associated with various household characteristics, namely, the quality of housing and asset index, the expenditure quintile and the availability of services such as waste disposal, toilet facilities and water source. Maternal schooling was also positively associated with better hygiene. In addition, women working in shops, factories or offices were more likely to have the six good hygiene practices than women working at home or in the markets or the streets.

Because many of the bivariate associations were likely to be confounded by socioeconomic factors or other characteristics, multivariate models were used to confirm these findings.

Ordinary least-squares regression was carried out to model the determinants of the child feeding index. All maternal and household characteristics hypothesized to be potential constraints to child feeding practices were included in the regression model (**Table 8**). The results confirm that none of the household characteristics was associated with the child feeding index scores. As documented in the bivariate analysis, mater-

nal schooling was the only factor associated with child feeding, aside from age of the child, which was negatively associated with child feeding. The adjusted R^2 of the model was only 0.10, which suggests that the model had a poor prediction power. Thus, except for maternal schooling, the maternal and household characteristics that were hypothesized to be resources or constraints to appropriate child feeding practices were not found to be associated with child feeding practices in this population.

For the health seeking and hygiene indices, ordered probit models were used. The factors that were significantly and positively associated with the preventive health seeking index were child age, household income and the use of public bins for waste disposal. The ethnic group category "other" was also associated with a higher health seeking score. Maternal schooling did not quite reach significance, but the *P*-value of the coefficient was 0.08. In the bivariate analysis, the only factor that was associated with the health index was income.

As found in the bivariate analysis, maternal schooling and household socioeconomic status (quality of housing and asset index) were positively associated with hygiene, and being a female head of household was negatively associated with the hygiene index scores. Working women who worked <4 h/d also had significantly lower hygiene index scores. It may be that women who were head of households had more severe time constraints, which impeded their ability to maintain a clean environment. Mothers who worked only a few hours per day may not have been as well organized as those who worked full time, or may not have had the resources necessary to afford household help and thus had poorer hygiene scores.

The general lack of association between maternal working patterns and child caregiving practices in both the bivariate and multivariate analyses was somewhat unexpected considering the young age of our sample of children. In an effort to understand this finding, we did additional exploratory analysis of the characteristics of mothers' employment by age of their child. The results, presented in **Figure 1**, indicate a strong association between children's age and mothers' employment patterns and the use of child care alternatives. For example, mothers of young infants (0–4 mo of age) were much less likely to work (only 23% worked, compared with 76% among mothers of children ≥ 18 mo of age); they were less likely to work full time, and they were more likely to take their child to work with them if they worked (100% among the 0- to 4-mo-old group compared with 46% among the oldest age group). The use of child care substitutes was much more popular among mothers of older children (53% compared with only 9% of mothers of young infants) (not shown). Even the type of substitute child care selected varied by child age, i.e., the use of multiple caretakers and of day care centers increased gradually with child age, from 0% among mothers of young infants to 47% among mothers of children ≥18 mo of age (not shown). These findings suggest that mothers understood the need to, and were able to modify their working patterns and their use of child care substitute gradually as their child became older. This allowed them to respond to the special caring needs of their young children.

DISCUSSION

Main findings. Our study confirms that in Accra, maternal education is a crucial asset for good caregiving practices related to child feeding, the use of preventive health services and hygiene practices. Limited household resources such as low income, poor housing quality, few assets, and limited access to water, sanitation and garbage collection services, on the other

TABLE 7

Association between selected care resources and care practices scores[1]

Care resources	Feeding index (n = 479)		Preventive health seeking index (n = 509)			Hygiene index score (n = 468)		
	Mean Score	SD	% with poor score (−2)	% with average score (−1)	% with good score (0)	% with 0–3 good practices	% with 4–5 good practices	% with 6 good practices
Maternal education								
None	−2.61*	(1.56)	15.6	42.2	42.2	45.6*	24.6	29.8
Primary and middle	−2.34	(1.81)	9.7	36.7	53.6	33.8	42.0	24.2
≥ Secondary	−1.86	(1.85)	7.1	37.1	55.7	20.3	34.7	44.9
Ethnic group								
Ga/Adangbe	−2.21	(1.96)	12.4	36.1	51.5	38.4	33.5	28.0
Ashanti/Fanti/Akan	−2.32	(1.87)	6.6	42.4	51.0	22.0	42.4	35.6
Ewe	−2.15	(1.61)	13.0	34.3	52.7	35.7	40.2	24.1
Other	−2.35	(1.57)	2.9	36.2	60.9	28.3	36.7	35.0
Gender of household								
Head: Male	−2.22	(1.80)	15.8	40.3	43.9	23.5*	40.8	35.7
Female	−2.27	(1.83)	21.3	38.5	40.1	43.2	36.9	19.9
Employment status								
Does not work	−2.18	(1.84)	12.8	30.3	56.9	28.0	35.0	37.1
Works part time	−2.22	(1.82)	7.7	34.6	57.7	26.5	34.7	38.8
Works full time	−2.26	(1.77)	8.3	41.4	50.3	34.5	40.8	24.7
Looking for work	−2.80	(2.48)	9.1	63.6	27.3	44.4	22.2	33.3
Workplace								
Home	−2.17	(1.66)	12.4	41.3	46.3	33.6*	41.6	24.8
Markets/streets	−2.33	(1.74)	7.5	39.9	52.6	41.2	36.6	22.2
Shop/factory/office	−2.20	(2.09)	1.7	40.0	58.3	8.0	46.0	46.0
Cares for child at all								
times: Yes	−2.21	(1.71)	9.8	36.1	54.1	31.1	38.8	30.1
No	−2.35	(1.93)	9.9	39.8	50.3	32.7	37.0	30.3
Takes child to work								
Yes	−2.23	(1.68)	8.5	41.8	49.7	32.4	42.9	24.7
No	−2.28	(1.89)	7.8	38.6	53.6	34.3	35.8	29.9
Hours usually work, h								
0	−2.16	(1.83)	12.7	30.7	56.7	26.3	42.1	31.6
0.5–3.5	−2.40	(2.50)	4.5	31.8	63.6	47.4	36.8	15.8
4–7.5	−2.15	(1.80)	4.9	39.6	55.6	30.1	42.9	27.1
≥8	−2.42	(1.70)	11.8	39.9	48.3	34.5	35.1	30.5
Quality of housing and asset index (quintiles)								
Lowest	−2.55	(1.66)	14.0	39.2	46.7	44.1*	35.4	20.2
2nd	−2.17	(1.96)	10.0	34.5	55.4	35.6	42.5	21.8
3rd	−2.08	(1.70)	11.2	39.2	49.5	37.5	39.8	22.7
4th	−2.44	(1.72)	5.6	38.3	56.1	25.8	36.6	37.6
Highest	−2.23	(2.02)	5.5	37.6	56.9	11.1	37.8	51.1
Expenditure (quintiles)								
1	−2.08	(1.60)	18.0*	39.6	42.3	45.3*	35.8	18.9
2	−2.27	(1.74)	9.1	36.4	54.5	40.7	31.9	27.5
3	−2.53	(1.78)	12.6	36.0	51.3	30.0	43.3	26.7
4	−2.21	(1.85)	5.4	35.4	59.1	29.5	38.9	31.6
5	−2.15	(2.05)	3.7	40.4	56.0	14.7	38.9	46.3
Waste disposal								
Gutter/empty lots	−2.48	(1.63)	11.5	47.4	41.0	27.8*	41.7	30.6
Bury/burn	−2.46	(1.66)	9.3	39.5	51.2	38.2	38.2	23.5
Public bins	−2.11	(1.85)	10.6	33.9	55.6	35.4	37.7	26.9
Household collection	−2.60	(1.79)	3.2	44.4	52.4	14.0	35.1	50.9
Toilet facilities								
Open space	−2.01	(1.63)	14.4	38.9	46.7	36.4*	39.0	24.7
Public latrines	−2.30	(1.86)	11.1	38.0	50.8	38.7	33.6	27.7
Private latrine	−2.37	(1.82)	4.5	33.9	61.6	23.7	49.5	26.9
Flush toilet	−2.07	(1.83)	5.6	38.9	55.6	2.2	37.8	60.0
Water source								
Vendor	−2.22	(1.84)	9.5	34.3	56.1	34.7*	43.0	22.3
Piped outside house	−2.35	(1.74)	10.5	43.1	46.4	32.4	30.6	37.0
Piped inside house	−1.81	(1.87)	2.6	33.3	64.1	2.9	40.0	57.1

[1] An asterisk (*) and numbers in bold indicate that *P* < 0.05 (results of ANOVA for care index; and of chi-square test for health and hygiene indices).

hand, were constraints only for preventive health care use and hygiene practices. These and other household-level characteristics such as food availability did not appear to limit mothers' ability to feed their children appropriately. Thus, in this population, child feeding practices were more dependent on mothers' education than on household food availability and economic resources. The "obese mother/malnourished child" phenomenon commonly observed in this sample supports this hypothesis and suggests that inequitable use of resources rather than severe poverty or absolute lack of resources are main constraints to adequate nutrition among preschoolers in Accra (Maxwell et al. 2000).

TABLE 8

Determinants of child feeding, preventive health services use and hygiene index scores (results of multivariate analysis)[1,2]

Variable	Child feeding index		Preventive health index		Hygiene index	
	Coefficient	t-test	Coefficient	Z-test	Coefficient	Z-test
Constant	−1.31	−0.43				
Age of child (mo)	**−0.07***	**−6.94**	**0.04***	**6.62**	−0.01	−1.70
Sex of the child	0.04	0.24	−0.06	−0.61	−0.03	−0.29
Age of care-giver (y)	0.00	0.27	0.00	−0.37	0.00	−0.70
Body mass index of care-giver (kg/m^{2})	−0.00	−0.23	−0.01	−1.21	−0.01	−1.32
Education of care-giver (years of schooling)	**0.04***	**2.06**	0.31	1.72	**0.02***	**2.04**
Ethnic group (Ashanti, Fanti, other Akan)[3]	−0.02	−0.09	−0.14	−1.01	0.06	0.41
Ethnic group (Ewe)[3]	0.02	0.09	0.27	1.69	0.04	0.26
Ethnic group (other, but not Ga nor Adangbe)[3]	0.12	0.42	**0.40***	**2.12**	0.18	1.02
Father helps financially	0.23	0.99	−0.26	−1.90	0.20	1.46
Female head of household	−0.23	−1.06	0.06	0.44	**−0.51***	**−4.05**
Care-giver works 0.5–3.5 h/d[4]	−0.23	−0.53	0.39	1.36	**−0.55***	**−2.04**
Care-giver works 4–7.5 h/d[4]	0.22	0.96	0.07	0.50	0.02	0.12
Care-giver works ≥8 h/d[4]	0.13	0.60	−0.08	−0.56	0.02	0.15
Per capita income	−0.06	−0.20	**0.44***	**2.49**	0.14	0.78
Log of calories per adult equivalent units	0.07	0.22	−0.43	−1.94	0.09	0.43
Household size	−0.02	−0.45	0.00	−0.02	−0.04	−1.66
Crowding (rooms/person)	−0.04	−0.24	0.02	0.21	−0.07	−0.65
Food share (% total budget spent on food)	−0.19	−0.22	0.96	1.83	−0.17	−0.33
Quality of housing and asset score (factor scores)	−0.00	−0.02	0.05	0.34	**0.30***	**2.18**
Toilet facilities (public latrine)[5]	−0.36	−1.22	0.11	0.64	−0.12	−0.68
Toilet facilities (private latrine)[5]	−0.59	−1.55	0.45	1.92	−0.16	−0.67
Toilet facilities (flush toilet)[5]	−0.45	−0.76	0.13	0.36	−0.12	−0.32
Waste disposal (bury, burn)[6]	0.29	0.71	0.14	0.56	−0.28	−1.17
Waste disposal (public dumping bin)[6]	0.50	1.76	**0.40***	**2.32**	−0.24	−1.45
Waste disposal (household collection)[6]	−0.13	−0.34	0.28	1.23	0.17	0.76
Water source (piped outside house)[7]	−0.06	−0.24	−0.23	−1.57	−0.11	−0.78
Water source (piped inside house)[7]	0.36	0.60	0.08	0.22	0.02	0.06
Adjusted R^2 (pseudo R^2 for ordered probit model)	0.10		0.08		0.07	
Root mean square error	1.72					
F-test (LR chi-square for ordered probit)	2.70		91.86		111.98	
n	434		496		457	

[1] Ordinary Least Squares regression analysis was used for the child feeding index, and maximum likelihood ordered probit was used for the health and hygiene indices. The dependent variables were the child feeding index scores (continuous), the preventive health seeking index scores (4 categories) and the hygiene index scores (6 categories).
[2] The asterisk (*) and bold indicate a significant coefficient ($P < 0.05$).
[3] Reference category for ethnic group: Ga or Adangbe.
[4] Reference category for hours worked: none.
[5] Reference category for toilet facilities: none (open space).
[6] Reference category for waste disposal: gutter, empty lots.
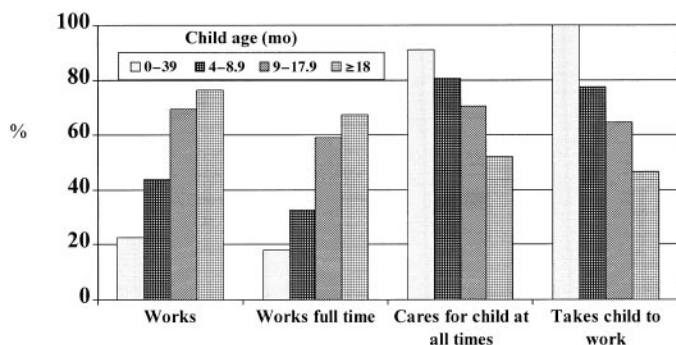[7] Reference category for water source: vendor or well.

FIGURE 1 Differences in maternal work patterns and child care arrangements by age of the child ($n = 512$). Values on the y-axis represent the percentage of mothers who have different work and child care patterns, and the columns represent different child age groups (in mo). All differences between age groups were significant ($P < 0.05$).

Maternal education has been shown consistently to be critically important for child health, nutrition and survival (Alderman 1990, Caldwell and McDonald 1982, Cebu Study Team 1991, Cleland and van Ginneken 1988). Although the precise mechanisms by which maternal education affects child outcomes are not fully understood, evidence from various countries indicates that knowledge and practices are key pathways. Our findings from Accra show that, keeping income and other child, maternal and household characteristics constant, maternal education is strongly and positively associated with better child feeding, health seeking ($P < 0.10$) and hygiene practices. These good care practices, in turn, have a large positive effect on children's nutritional status (Ruel et al. 1999), particularly among children from poorer families and among children whose mothers have less than secondary schooling. Thus, in this population, it appears that the positive effect of maternal education on child outcomes is mediated largely by improved care practices.

Household income did not appear to be a major constraint to adequate child feeding practices among the age group studied (0–36 mo). This may not be so surprising, considering that

at least up to 6 mo of age, adopting the recommended practice of exclusive breast-feeding is less expensive than buying baby bottles and breast-milk substitutes. In Ghana, the cost of feeding infant formula in 1997 was estimated to be almost five times the cost of providing the additional maternal diet required to produce the equivalent amount of breast milk through lactation (PROFILES estimates; J. Ross, Academy for Educational Development, personal communication). These estimates did not even take into account the time cost of buying and preparing the substitutes, the fuel to boil the water, the time and water to clean the bottles and, even more importantly, the time and cost required to handle the health consequences of using substitutes. Thus these estimates grossly underestimate the real cost of using breast-milk substitutes. Even after 6 mo of age, when special foods have to be purchased, the proportion of the family budget that is required to provide the child with an adequate diet is likely to be relatively small; thus one would not expect household income to be a major limiting factor in providing an adequate diet to children at this age. What seems to be of utmost importance for the choices that mothers make regarding child feeding in this population is their level of education.

With respect to health seeking and hygiene behaviors, household socioeconomic factors were important resources. As could be expected, higher income and better housing quality, which are closely linked to greater availability of water, sanitation and waste disposal services, all contributed to improved hygiene. As documented in other environments, maternal education, even when controlling for socioeconomic factors, was also a strong determinant of good hygiene practices (Gorter et al. 1998). Women-headed households and families in which mothers worked only a few hours per day had poorer hygiene. Women heads of households are likely to have more severe time constraints if they have to work to generate income. For those women who worked only a few hours per day, it may be that their income was insufficient to allow them to hire help and that they had difficulties balancing their work, household and child care responsibilities.

The specific issue of maternal work was not the main focus of this study and will be explored in future analyses of the data. Our preliminary findings, however, showed that maternal employment was not a major constraint to child care or hygiene practices, apparently because mothers modified their work patterns to attend to their young infant's special caring needs. These "adaptive strategies," by which mothers stop working, or work fewer hours, or even take their infant to work if they do work, may be successful in protecting their infant, but may seriously jeopardize the mothers' ability to generate income for the family. In the informal work environment, characteristic of our Accra sample, women had to create their own unpaid maternity leave. The qualitative work carried out as part of the overall study also highlighted the acute trade-offs that mothers had to face between their productive and reproductive roles, particularly around the time of birth. Mothers in focus groups and qualitative case studies clearly indicated that the two major factors that determined when they returned to their income-generating activities after delivery were how rested they felt and how strongly they felt the imperative to earn income (Maxwell et al. 2000). Programs and policies are urgently needed for women working in the informal sector to assist them during the early postnatal period, to relieve some of the burden of their dual role of income earner and principal caretaker. Some countries are experimenting currently with subsidized community day care center programs, particularly in Latin America, but these programs often limit enrollment of young infants because of their need for intense care during the 1st y.

Strengths and weaknesses of the study. This study is the first one to our knowledge that has measured and quantified care practices into three indices, using cross-sectional survey data. We are also unaware of any other studies that have used appropriate statistical modeling to examine the associations between a variety of maternal and household care resources and the actual care behaviors.

It is important to highlight that the care indices constructed for this study reflect only three of a large number of aspects related to the overall concept of care (Engle et al. 1997). The indices also capture only a few practices related to child feeding, preventive health seeking and proxies for hygiene behaviors, largely because of the limitations of interview and recall techniques. Care is better measured through observations in households and through longitudinal studies that allow the timing and the nature of changes and transitions to be captured (Engle and Ricciuti 1995). This was not possible in the context of our survey, which had a wide range of other objectives and for which care was only one of many components. Another limitation, which applies mainly to the child feeding index, was the fact that the recall period varied with the age of the child. This was particularly true for the questions about feeding practices during the period soon after birth and during the first 4 mo of the child's life. There is no reason to believe, however, that this would introduce any systematic bias. For example, it is unlikely that poor memory would result in systematically more "No" or "Yes" answers among mothers of older children to questions such as whether they used prelacteal liquids. Thus, the type of bias likely to be introduced by the unequal recall period is a random, nonsystematic type of error, which does not affect the internal validity of the results but tends to reduce the power to detect differences.

In spite of these limitations, this study showed that it is possible to measure at least some dimensions of care through large, cross-sectional surveys, with relatively simple interview instruments and using maternal recall information. Much more research is required to refine the methodologies to measure and quantify care appropriately, but this study was a first attempt in that direction.

Implications of programs. Our study identified two main elements that can assist in the design of effective programs and interventions to improve caregiving practices in Accra, particularly with regard to feeding practices. First, it highlighted which specific feeding practices are deficient in this population; second, it identified the main constraints to the adoption of optimal feeding practices. This section reviews and builds on these findings, and discusses ways to address both the problems and constraints to child feeding in Accra. It also suggests potential vehicles for effective delivery of interventions to improve care in this setting.

Our study identified various child feeding practices during the 1st y that could be improved. First, use of prelacteal feeds and complementary liquids and foods during the first 4 mo of life was widespread, although breastfeeding was the norm. Second, most mothers used nonfortified, traditional complementary foods and up to 10% introduced family foods directly into the child's diet without using any type of transitional foods. Finally, a large proportion of children were not helped or encouraged to eat, even those who refused to eat. These nonoptimal feeding practices, when combined into a care index, were found to be strongly associated with poor nutritional status, after controlling for a variety of maternal and household characteristics (Ruel et al. 1999). The prevalence of stunting among children whose mothers were in the lowest

care practices tercile was >3 times higher than among children whose mothers were in the highest care terciles (7% stunting prevalence compared with 24%). Thus, efforts to improve child feeding practices and to relieve the constraints to the adoption of optimal practices could have a significant effect on child nutritional status in this population. Carefully designed intervention studies should be implemented to confirm this hypothesis using a probability approach that would allow inferences of causality to be made.

Maternal education was the most consistent constraint to child care identified in this urban population. Maternal education is both amenable to change in the long term and, in the short term, nutrition education interventions can be used as an alternative, although an imperfect one. Promotion of girls' schooling must be high on the priority list of policy makers in Accra, particularly because it will have long-term benefits that go far beyond the effect on child care. In our study, maternal schooling was associated with a range of positive outcomes in addition to good care practices, namely, higher household income, food availability, diet quality, better paid employment and lower child malnutrition and morbidity (Maxwell et al. 2000). Education of girls is a long-term strategy but, fortunately, some of the benefits of maternal schooling can be simulated by effective nutrition education and behavior change strategies (Caulfield et al. 1999). The success of these interventions depends largely on a clear understanding of which practices should be modified and what are the main constraints to the adoption of the recommended practices. This study developed a methodology to carry out this type of analysis.

Another key aspect to the success of nutrition education efforts is timeliness. Mothers need to receive the education before the child is born to ensure that they will be motivated to initiate breast-feeding at birth, avoid prelacteal feeds during the first few weeks and maintain exclusive breastfeeding for 4–6 mo. In Accra, attendance at prenatal clinics was extremely high (97%), even in the first trimester of pregnancy (44%) (Maxwell et al. 2000). Thus, prenatal clinics could be used as a vehicle to establish a first contact with mothers and to start discussing issues related to child feeding and care. Childhood immunization was also high as is common in urban areas, and the education strategy should build on this contact with the health services as well in order to strengthen the messages about early infant feeding. The DPT immunizations, which require three visits during the first 3 mo of the child's life, could be an excellent opportunity to promote continued exclusive breast-feeding and to establish a support system for mothers who experience difficulties with breast-feeding. Additional contacts with the mother should be planned such that mothers could be trained on the use of complementary foods before the child reaches 6 mo of age. Measles immunization, which is due at 9 mo of age, could be yet another opportunity to strengthen mothers' knowledge about appropriate complementary feeding practices at the end of the 1st y.

Finally, an additional key question is who should be the target of the education and behavior change strategy. In Accra, we have seen that mothers largely take on the responsibility for child care particularly in the 1st y of their child's life. After that period, however, substitute caretakers gradually start taking a more important role in feeding and caring for children, and education strategies should consider ways to reach them as well. Additional information is needed on who the substitute caretakers are and where and how they can be reached. We know that many of them are older siblings, grandmothers and other female relatives. This again highlights the importance of girls' schooling and suggests that specific nutrition training at school could be useful for young girls who are currently taking care of their younger siblings, but even more importantly, it would prepare them for their future role as mothers and even grandmothers. Recent experiences with nutrition education and behavior change programs targeted to school girls show promising results [see for example Smitasiri and Dhanamitta (1999) in Thailand), but no evidence is available yet of the long-term effect of these programs on adult women's nutrition knowledge and practices.

The potential for nutrition education and behavior change interventions to have a major effect on child care in Accra is great. This is mainly because socioeconomic factors are not such overwhelming constraints in this population. Evidence shows that in contexts in which resources are too limited, maternal education and knowledge are simply not enough (Bairagi 1980, Doan 1988, Reed et al. 1996, Ruel et al. 1992). In these circumstances, nutrition education and behavior change interventions must be accompanied by poverty reduction strategies so that the recommended practices can be adopted (Ruel et al. 1992). This is not to say that income generation and poverty reduction activities are not also needed in Accra, but rather that the success of nutrition education and behavior change strategies in this context is not contingent on the synergism between the two approaches.

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