

Deterioration in the nutritional status of young children and their mothers in Brazzaville, Congo, following the 1994 devaluation of the CFA franc

Y. Martin-Prével,¹ F. Delpeuch,² P. Traissac,³ J.-P. Massamba,⁴ G. Adoua-Oyila,⁵ K. Coudert,² & S. Trèche²

The effects of the January 1994 devaluation of the African Financial Community (CFA) franc on the nutritional situation of the populations concerned has been little documented. We report in this article on two nutritional cross-sectional surveys that were conducted before and after this devaluation (1993 and 1996) in two districts of Brazzaville, Congo. The surveys involved a representative sample of 4206 households with a child aged 4–23 months. Complementary feeding practices and the anthropometric indices of the children and their mothers were compared, adjusting for changes in household socioeconomic characteristics. The results show a decline in the quality of the first complementary foods offered to the infants, i.e. less frequent use of special transitional foods and imported complementary flours (of higher nutritional quality), and preparation of less nutritious local gruels. Overall, the nutritional situation had deteriorated, with greater levels of stunting and wasting among children, mothers with lower body mass index, and infants with reduced birth weights. Increased food prices would appear to be the direct cause of the decreased quality in complementary feeding, but factors other than the devaluation have also had an impact on household welfare. The influence of these factors on nutritional status is discussed.

Keywords: Congo; devaluation; feeding behaviour; nutrition surveys; socioeconomic factors.

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Introduction

The African Financial Community (CFA) franc was devalued by 50% on 12 January 1994 in 14 sub-Saharan African countries. Such monetary action, not uncommon in developing countries, is aimed at re-establishing a macroeconomic balance and stimulating domestic production. Generally, considerations focus on the reasons for and pertinence of the devaluation, and its effects are assessed in terms of the economic performance of the countries involved (e.g. reference (1)). The potential impact on the health of the population is rarely considered and often remains undocumented.

Questions about the consequences of the 1994 devaluation of the CFA franc for the most vulnerable populations, particularly in terms of health and education, were raised immediately (2, 3) for the following reasons: the magnitude of the devaluation;

the number of countries involved; and the fact that the populations concerned were rendered particularly vulnerable because of several years of economic crisis. Furthermore, the welfare of these populations, notably those in urban areas, primarily depended on their access to imported staple products.

A study conducted in Brazzaville, Congo, and Dakar-Pikine, Senegal, in December 1994 (i.e. a few months after devaluation) found a marked diminution in the quality of the first solid foods given to infants as a complement to breastfeeding (4) — poor quality complementary feeding is an important risk factor for malnutrition among young children, and negatively affects their health and development (5). Several questions then arose. Was the decreased quality in complementary feeding temporary, to be considered as related to the devaluation shock, or was it to be long-lasting? Would the changes observed be associated with a deterioration in the nutritional status of the children? Was the nutritional situation of the adults (the mothers of these children) also affected?

The present epidemiological survey was conducted in 1996 to address these questions. Its primary objective was to evaluate the changes in the feeding practices for infants, the quality of complementary foods, and the nutritional status of the children and their mothers following a survey undertaken in 1993, prior to devaluation. It involved a representative sample of young children and their mothers in the same two districts of Brazzaville as the earlier survey.

¹ Epidemiologist, Nutrition Unit (WHO Collaborating Centre for Nutrition), Institut de Recherche pour le Développement (IRD), 911 avenue Agropolis, B.P. 5045 Montpellier cedex 1, France. Correspondence should be addressed to this author. E-mail: yves.martin-prevel@mpl.ird.fr

² Nutritionist, Nutrition Unit, IRD, Montpellier, France.

³ Statistician, Nutrition Unit, IRD, Montpellier, France.

⁴ Nutritionist, Direction Générale de la Recherche Scientifique et Technique (DGRST), Brazzaville, Congo.

⁵ Nutritionist, Bureau d'Études et d'Enquêtes (BEE), Brazzaville, Congo.

Subjects and methods

Context, study zone, sampling

For the nutritional, questionnaire-based, cross-sectional survey carried out between March and May 1993 in the Poto-Poto and Bacongo districts of Brazzaville, the sample consisted of 2623 households, including 2807 children (aged 4–23 months) and their mothers ($n = 2746$). The primary aim of this survey, which included anthropometric measurements, was to provide preliminary data for the evaluation of a programme intended to improve complementary feeding (6). The study zone had been defined to be consistent with the objectives of this programme and fitted the “sociohealth areas” determined by the National Plan for Health Development. The study zone therefore contained a homogeneous population of roughly the same size in each district (ca. 60 000 inhabitants).

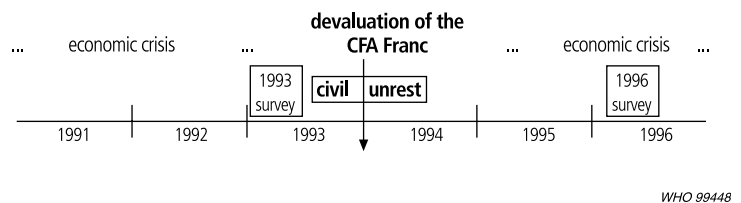
Since the beginning of the 1990s, the Congo has been the scene of social and political instability, which degenerated into civil war in 1997 (7). However, Brazzaville was the scene of much more limited civil unrest from November 1993 to February 1994, which prevented programme development. It was in the middle of this period that the CFA franc was devalued (January 1994). The second survey was conducted 3 years after the first, i.e. in April–June 1996, in the same zone and the same age group. The children included had all been born after the civil unrest and the devaluation (Fig. 1). The survey was carried out at the same time of year, to avoid any seasonal bias, and using the same methodology as the first, but involved a slightly smaller sample (1584 households with 1695 children aged 4–23 months and 1670 mothers).

Both surveys used random cluster sampling, each cluster corresponding to a block of houses. The sampling base relied on the maps of the sociohealth areas defined for the two districts, updated for each survey. Each household selected at random within the blocks, and with a child aged 4–23 months, was included in the sample on condition that free and informed consent was obtained. The families were interviewed at home, with each household being visited in the order in which the clusters had been randomized. The same team supervised all the fieldwork.

Data collected and indicators

The same questionnaires were used in both surveys. The first section concerned the socioeconomic characteristics of the household: duration of residence, quality of dwelling, electricity and water supplies, possessions and usual appliances (radio, television, household appliances), and daily food expenditure. Information was also collected about the head of the household and the mother: age, educational level, type of occupation, additional incomes, nationality and number of children. A summary index reflecting the economic level of the household was determined based on a methodology

Fig. 1. Chronology of the investigation



described elsewhere (8). Briefly, a correspondence analysis (9) was performed on an indicator matrix that coded the initial variables characterizing dwelling quality, utilities (water, electricity) and appliances. The coordinate of a given household on the first principal component of the correspondence analysis is interpreted as a summary indicator (of medium term in view of the nature of the initial variables) of its economic level. This summary indicator was then used either as a continuous variable or, after breakdown into terciles, to group the households into different economic levels (“rich”, “medium” and “poor”).

The second section of the questionnaire was devoted to the child, and recorded, inter alia, breastfeeding and complementary feeding practices. The corresponding indicators were established using internationally recognized definitions; the term “special transitional foods” was used for complementary foods specifically designed to meet the particular nutritional or physiological needs of the young child (5). However, within this definition the questionnaire distinguished “gruels” (semisolid foods) from other “special foods” (more solid foods, with special enrichment for infants). The same section of the questionnaire also recorded whether or not the child presented with diarrhoea the day before the survey, and covered information about monitoring the child’s health: existence of a health-monitoring document, number of growth-monitoring sessions and immunization status. These three variables were used to establish an empirical health-monitoring score taking account of the child’s age. One point was attributed for the presence of a health-monitoring document, one point if the child had been weighed at least twice every 3 months during the first year of life, and one point if the child had received all the vaccines according to its age. The children were then grouped into three health-monitoring categories: “good” (3 points), “medium” (2 points) and “poor” (0 or 1 point).

Anthropometric measurements were made under standardized conditions according to WHO recommendations (10). The children were weighed on SECA mechanical baby scales (precision, ± 10 g) and the mothers were weighed on TEFAL electronic scales (precision, ± 100 g). The recumbent length of the children and the height of mothers were measured to the nearest millimetre. The measuring equipment used during the survey was checked each morning. Particular care was taken to verify the date of birth of each child, on the basis of official

documents when possible. Length-for-age and weight-for-length indices were calculated for each child using the EpiNut module of Epi Info software, version 6.03 (11), and expressed as z-scores with respect to international National Center for Health Statistics (NCHS)/Centers for Disease Control and Prevention (CDC)/WHO reference values. A threshold of -2 z-scores was used to define stunting and wasting (12). Body mass index ($\text{weight}/\text{height}^2$) was used to assess the nutritional status of the mothers, and thresholds of $18.5 \text{ kg}/\text{m}^2$ and $25 \text{ kg}/\text{m}^2$ defined thinness and overweight, respectively (12).

Statistical analysis

In the statistical tests, the null hypothesis was that no change had occurred between the two surveys. This hypothesis was tested using the χ^2 test for qualitative variables and changes were quantified by odds ratios (considering 1993 as reference). Interactions with other variables were tested using the Breslow & Day test (13). For quantitative variables, the year effect and interactions were tested by ANOVA.

The social characteristics of household members in the study zone had changed slightly between 1993 and 1996. These changes, which concerned the mean age, nationality, educational level or occupation of the head of household and/or the mothers,^a were considered to have resulted mainly from the civil unrest at the end of 1993 and the population movements occurring at that time. All the comparisons of feeding and nutritional indicators between 1993 and 1996 were therefore adjusted for the variables used to describe the social characteristics of household members (but not for those characterizing the economic level of the household).^b For this purpose, the analysis included embedded regression models derived either from general linear models (ANOVA) (14) for continuous response variables or from the generalized linear model (logistic regression) (15) for categorical response variables. The type I error was set at 0.05 for all the tests. The statistical analysis was conducted using SAS software, version 6.12 for Windows (16).

Results

Changes in the population's economic and health situation

The economic level of the households, as estimated by the summary economic index, decreased from 1993 to 1996 (Table 1). However, after adjusting for changes in the social characteristics of the household members, the distribution of the households into rich, medium and poor terciles was not significantly modified ($\chi^2 = 2.97$, $P = 0.085$); but the mean index still decreased significantly ($F = 4.66$, $P = 0.031$). At

the same time, the daily food expenditure expressed in current CFA francs increased markedly.^c

Monitoring of child health had deteriorated considerably by 1996, with fewer visits to health centres (Table 1). The changes concerned all the factors used to build up the composite index: fewer children were in possession of a health document, had been taken to growth-monitoring sessions, and had received vaccines (details not shown). The low rate of visits to health centres was unchanged after adjustment for the social characteristics of household members. Finally, diarrhoea was significantly more prevalent among the children in 1996.

Changes in breastfeeding and complementary feeding practices

Breastfeeding remained the rule in infants, since total breastfeeding rates exceeded 90% in both surveys. Similarly, neither the bottle-feeding rate in infants nor the continued breastfeeding rate at 1 year changed between 1993 and 1996 (Table 2). In contrast, the continued breastfeeding rate at 2 years increased significantly from 3.4% to 9.0% (adjusted χ^2 test = 9.6, $P = 0.002$).

Complementary feeding continued to be introduced early since both surveys showed that more than 90% of the infants were already receiving complementary food at 4–5 months of age. The complementary feeding rate was the same in both surveys for all age categories (Table 2). In contrast, the type of complementary food given in 1996 was far more frequently a family food and consequently less often a special transitional food (48.1% in 1996 compared with 58.9% in 1993, infants aged 4–11 months considered all together). The difference after adjustment was highly significant ($\chi^2 = 14.6$, $P = 0.0001$).

The gruel given in 1996 was less frequently prepared using imported flour (22.2% compared with 31.8%). Here again, the difference after adjustment was highly significant ($\chi^2 = 14.9$, $P = 0.0001$). The reduced use of imported flours was most pronounced in the poorest households of the sample (Fig. 2a) but the interaction between survey year and economic level was not statistically significant (Breslow & Day test; $P = 0.11$).

The number of the ingredients added to local gruels in an attempt to increase their nutritional value decreased significantly from an average of 1.29 in 1996 to 1.45 in 1993 ($F = 14.9$, $P = 0.0001$). Mothers also added milk to the gruel less often, and used powdered milk more often than sweetened condensed milk (Table 3). Here again, the decreased rate of gruel enrichment with sweetened condensed milk was more pronounced in the poorer households (Fig. 2b). Finally, the mean number of gruels received

^a Data available upon request.

^b For each comparison, a list of the relevant variables used for adjustment is given in the corresponding table.

^c Unfortunately, price changes were insufficiently documented or detailed to establish expenditures in terms of the quantity and quality of the food purchased.

Table 1. Economic and health environment: changes in the study population from 1993 to 1996

Indicator	Raw data				Comparison (1996 to 1993)	
	1993		1996		Adjusted values ^a	
	<i>n</i>	Value	<i>n</i>	Value	Test statistic ^b	<i>P</i> -value
Household summary economic index	2481		1549			
Mean index		-0.01		-0.11	$F = 4.66$	0.031
Distribution of index	2481		1549			
Lower tercile ("poor")		34.1%		39.5%	$\chi^2 = 2.97$	0.085
Median tercile ("medium")		31.9%		31.7%		
Higher tercile ("rich")		34.0%		28.8%		
Household food expenditures (CFA franc^c/day)	2484		1557			
Distribution of expenditures						
≤ 1000		39.9%		9.6%	$\chi^2 = 942$	<0.0001
1001-1500		32.1%		26.0%		
1501-2000		15.1%		23.3%		
>2000		12.9%		41.2%		
Children's health monitoring index	2596		1627			
Distribution of health index						
"Low"		11.1%		28.4%	$\chi^2 = 354$	<0.0001
"Medium"		26.0%		37.6%		
"High"		62.9%		34.0%		
Diarrhoea within the previous 24 hours	2605		1625			
Prevalence among children		8.0%		11.0%	$\chi^2 = 10.7$	<0.0011

^a Adjustment for social characteristics of household members, i.e. for economic level and food expenditures: district, sex, age and occupation of head of household, nationality, educational level and occupation of mother; for health monitoring index and diarrhoea prevalence in children (in addition to the above variables): sex and age of child, mother's age, parity, familial relationship of mother and child to head of household.

^b Null hypothesis of no difference between surveys: *F* test for continuous indices, likelihood ratio χ^2 test for categorical variables.

^c Current CFA francs.

daily by the infants was unchanged (1.79 in 1996 compared with 1.77 in 1993, $F = 1.17$, $P = 0.28$).

Changes in the nutritional status of the children and their mothers

The nutritional status of children and their mothers clearly deteriorated between 1993 and 1996. In children, the prevalence of stunting increased from 12.1% to 15.5% (Table 4). This increase remained significant after adjustment for the social characteristics of household members ($\chi^2 = 5.13$, $P = 0.024$). Mean length-for-age decreased by 0.22 z-scores, a difference that remained after adjustment ($F = 35.6$, $P < 0.0001$). At the same time, the prevalence of wasting increased from 6.0% to 8.8% and the mean weight-for-length index decreased by 0.21 z-scores. Here again, the differences persisted after adjustment.

The deterioration in nutritional status was the same for all age groups (Fig. 3). However, the increase in the prevalence of stunting was not spread equally across the economic categories of the sample: prevalence remained stable in the richest households but showed a clear increase in the poorest (Fig. 4a), although the interaction was not statistically sig-

nificant ($P = 0.21$). For wasting, no relationship could be established with the economic index since the increase in prevalence was roughly the same in all household categories (Fig. 4b). A study of the changes in mean anthropometric indices, stratified in the same manner, led to the same conclusions (results not shown).

The rate of low birth weight (< 2500 g) did not increase significantly between 1993 and 1996. However, birth weight distribution shifted towards lower weights (Table 4). This shift remained after adjustment ($\chi^2 = 13.0$, $P = 0.0003$), as did the 72-g decrease in mean birth weight ($F = 17.3$, $P < 0.0001$).

The mean body mass index of the mothers decreased by 1.28 kg/m² (Table 4). This is statistically highly significant and corresponds to a weight loss of nearly 3.3 kg in 3 years for a woman of average height (1.60 m in this population). As a consequence, the number of women exhibiting thinness (body mass index < 18.5 kg/m²) increased very significantly from 11.3% to 15.6%, and the number of overweight women decreased considerably (from 30.1% to 20.2%). Thinness increased most among the rich economic category of the sample (Fig. 5), although

Table 2. Feeding practice indicators in children: changes in the study population from 1993 to 1996

Indicator	Age category (months)	Raw data				Comparison (1996 to 1993)					
		1993		1996		Raw values			Adjusted values ^a		
		<i>n</i>	%	<i>n</i>	%	χ^2 value	<i>P</i> -value	Odds ratio	LR χ^2 value ^b	<i>P</i> -value	Odds ratio
Almost exclusive breastfeeding rate ^c	4–5	299	2.7	173	4.1	0.67	0.41	1.54	0.23	0.63	1.38
Total breastfeeding rate	4–11	1241	93.5	711	95.1	2.08	0.15	1.35	1.79	0.18	1.33
Bottle-feeding rate ^c	4–11	1236	11.5	711	13.4	1.48	0.22	1.19	2.07	0.15	1.24
Continued breastfeeding rate (1 year) ^c	12–15	491	68.2	327	70.6	0.54	0.46	1.12	1.07	0.30	1.19
Continued breastfeeding rate (2 years) ^c	20–23	477	3.4	323	9.0	11.48	0.0007	2.84	9.60	0.002	2.85
Complementary feeding rate ^c	4–5	299	93.7	173	90.2	1.88	0.17	0.62	1.16	0.28	0.66
	6–9	610	89.8	316	91.8	0.91	0.34	1.26	0.55	0.46	1.21
	10–11	332	88.9	218	90.4	0.32	0.57	1.17	0.17	0.68	1.14
	4–11	1241	90.5	707	91.0	0.13	0.72	1.06	0.10	0.75	1.05
Transitional complementary feeding rate ^d	4–5	280	95.0	156	91.0	2.63	0.11	0.53	1.48	0.22	0.58
	6–9	548	56.8	290	44.5	11.45	0.0007	0.61	8.45	0.004	0.64
	10–11	295	28.5	197	19.3	5.34	0.020	0.60	5.01	0.025	0.60
	4–11	1123	58.9	643	48.1	19.20	<0.0001	0.60	14.6	<0.0001	0.63
Use of imported complementary food (versus local gruel) ^e	4–5	276	37.3	152	30.9	1.76	0.18	0.75	1.75	0.19	0.73
	6–9	432	29.2	205	18.1	9.02	0.0027	0.53	10.2	0.001	0.50
	10–11	179	29.6	112	17.9	5.06	0.024	0.52	6.44	0.011	0.41
	4–11	887	31.8	469	22.2	14.40	0.0003	0.61	14.9	<0.0001	0.58

^a Adjustment for social characteristics of household members: district, sex, age and occupation of head of household, nationality, educational level and occupation of mother, sex and age of child (when several age categories involved), mother's age, parity, familial relationship of mother and child to head of household.

^b Likelihood ratio (LR) χ^2 test for null hypothesis of no difference between surveys, adjusting for above confounders.

^c According to the WHO definition (5).

^d Special transitional foods versus familial foods.

^e Type of the last gruel received by child (among children receiving gruel at the time of the survey).

this interaction was not statistically significant ($P = 0.11$). A study of changes in mean body mass index, again stratified according to household economic category, led to the same conclusions (results not shown).

Discussion

This study shows that the quality of the complementary feeding received by infants and young children in Brazzaville has declined since the devaluation of the CFA franc. It also shows a deterioration in the nutritional status of the children and their mothers. Over the period of the study, Congo was still enduring the economic crisis that began in the mid-1980s and the succession of related economic adjustment measures that culminated in the 1994 devaluation. As far as the population movements due to civil unrest are concerned, comparison of adjusted and non-adjusted values showed that the effect of adjustment on the changes in the indicators of complementary feeding and nutritional status is marginal. However, since statistical procedures

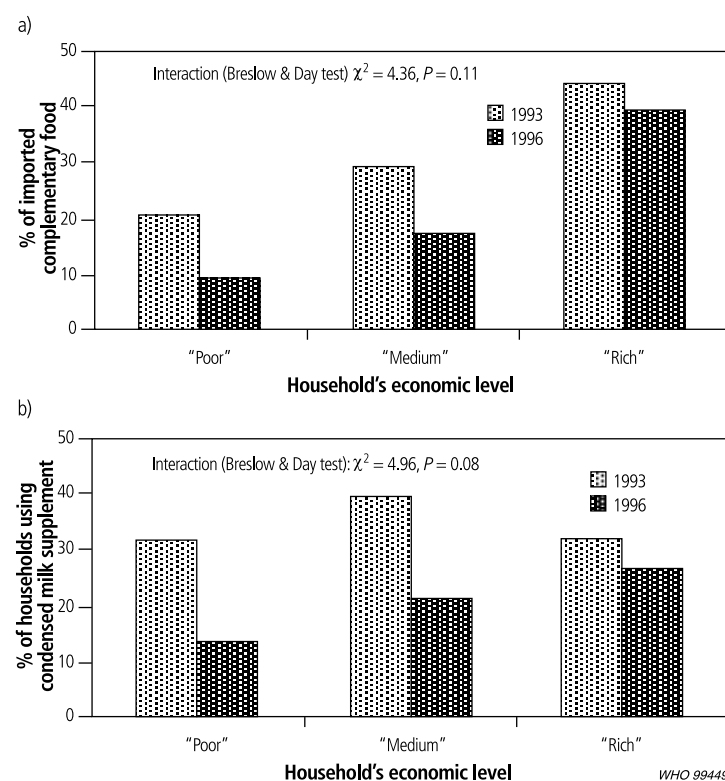
cannot entirely allow for the complex changes occurring in the welfare of whole populations, there is a residual risk of under- or over-adjustment. Nevertheless, it can be assumed that the modifications observed in the nutritional situation from 1993 to 1996 were not due to changes in the sample characteristics related to the civil disturbances.

The devaluation of the CFA franc has had pronounced effects on the dietary habits of households in the urban centres of the countries involved. This has been described for Abidjan, Côte d'Ivoire (17), and Bamako, Mali (18). In Brazzaville, a study by the World Bank showed that food expenditure decreased by nearly 40% between 1993 and 1995 when calculated in constant CFA francs, but increased by 6.7% in current CFA francs (19). In our study, the daily food expenditure declared by households (i.e. in current CFA francs) increased considerably between 1993 and 1996. Numerous households declared that they had entirely abandoned certain foods that had become too expensive (e.g. chicken for 51% of households, bush meat for 50% and freshwater fish for 30%). However, these figures concerned the overall household diet; the

question was therefore raised as to whether the households would adopt alternative strategies after the initial devaluation shock to conserve the feeding of the young children.

The results of this study show that, if such strategies had indeed been put into practice, they were not sufficient, as the decreased quality noted just after the devaluation in 1994 has continued (4). Breastfeeding and complementary feeding rates have remained stable but the complementary foods given to infants have declined in quality. Three main arguments lead to this conclusion. First, infants tend to receive family foods rather than special transitional foods that better meet their physiological needs. For older infants, family foods might be better than some poor gruels. However, it appears that, particularly for infants in the age categories 6–9 months and 10–11 months, the shift to family foods is mainly a reduced use of “special foods”, which are usually prepared with meat or fish enrichment (data not shown). The mothers therefore seem to be intent on bringing the child as rapidly as possible to a diet based mainly on family foods, probably because this saves both time and money. Second, fewer of the gruels were prepared using imported flour. Gruels made from local ingredients (mainly *poto-poto*, a home-made fermented maize dough) exhibit a very low energy density, around 60 kcal/100 g (20); those prepared using imported flours (mainly Blédilac, Cérélac and Phosphatine) show an average energy density of 100–120 kcal/100 g when prepared under local conditions (27). Third, while imported flours are likely to be fortified with micronutrients and have a higher protein content, local gruels are less often enriched and had fewer added ingredients, often with

Fig. 2. **Complementary feeding stratified by household's economic level** a) Percentage of imported complementary food, among infants aged 4–11 months receiving gruel ($n = 1347$); b) Use of sweetened condensed milk supplements, among infants aged 4–11 months receiving local gruel ($n = 959$)



local gruels is less than half of the corresponding quantity of sweetened condensed milk.^d

Table 3. **Types of ingredient added in the last local gruel received (for infants aged 4–11 months receiving local gruels at the time of the survey): changes in the study population from 1993 to 1996**

Indicator	Raw data				Comparison (1996 to 1993)						
	1993		1996		Raw values			Adjusted values ^a			
	<i>n</i>	%	<i>n</i>	%	χ^2 value	<i>P</i> -value	Odds ratio	LR χ^2 value ^b	<i>P</i> -value	Odds ratio	
At least one ingredient added to the gruel	605	98.5	364	99.5	1.78	0.18	2.70	2.40	0.12	3.47	
Type of ingredient added											
Sugar	605	80.8	361	81.2	0.02	0.90	1.02	0.02	0.89	1.03	
Milk (any type)	605	43.3	361	34.4	7.56	0.006	0.69	6.12	0.013	0.70	
Sweetened condensed milk	605	34.2	361	19.4	24.3	<0.0001	0.46	22.8	<0.0001	0.46	
Powdered milk	605	9.1	361	15.0	7.8	0.0053	1.76	8.61	0.0033	1.91	
Groundnut butter	605	7.9	361	6.4	0.81	0.37	0.80	2.05	0.15	0.67	

^a Adjustment for social characteristics of household members: district, sex, age and occupation of head of household, nationality, educational level and occupation of mother, sex and age of child, mother's age, parity, familial relationship of mother and child to head of household.

^b Likelihood ratio (LR) χ^2 test for null hypothesis of no difference between surveys, adjusting for above confounders.

a switch from sweetened condensed milk to powdered milk, the quantity of which is more easily reduced. Data gathered in Brazzaville in 1994 indicate that the average quantity of powdered milk added to

^d Mean of 3.87 g of powdered milk (1.4–8.0 g, $n = 24$) added in 100 g of local *poto-poto* preparation compared to a mean of 8.49 g of sweetened condensed milk (1.7–26.1 g, $n = 82$) for the same quantity of the same gruel.

Table 4. Anthropometric status of children and their mothers: changes in the study population from 1993 to 1996

Indicator	Raw data				Comparison (1996 to 1993)					
	1993		1996		Raw values			Adjusted values ^a		
	<i>n</i>	Value	<i>n</i>	Value	Test statistic ^b	<i>P</i> -value	Effect measure ^c	Test statistic ^b	<i>P</i> -value	Effect measure ^c
Children										
Length-for-age										
Mean (z-scores)	2581	-0.74	1576	-0.95	<i>F</i> = 48.6	<0.0001	Diff. = -0.21	<i>F</i> = 35.6	<0.0001	Diff. = -0.19
Prevalence of stunting (<-2 z-scores)	2581	12.1%	1756	15.5%	$\chi^2 = 9.8$	0.0017	OR = 1.33	$\chi^2 = 5.1$	0.0024	OR = 1.26
Weight-for-length										
Mean (z-scores)	2581	-0.50	1582	-0.71	<i>F</i> = 45.1	<0.0001	Diff. = -0.21	<i>F</i> = 38.7	<0.0001	Diff. = -0.20
Prevalence of wasting (<-2 z-scores)	2581	6.0%	1582	8.8%	$\chi^2 = 11.3$	0.0008	OR = 1.51	$\chi^2 = 8.1$	0.005	OR = 1.45
Birth weight										
Mean (g)	2429	3076	1351	3004	<i>F</i> = 18.6	<0.0001	Diff. = -72	<i>F</i> = 17.3	<0.0001	Diff. = -71
Distribution	2429		1351							
<2500		11.6%		12.4%						
2500-2999		28.5%		34.2%						
3000-3499		39.8%		36.8%	$\chi^2 = 14.3$	0.0002	OR ^d = 1.26	$\chi^2 = 13.0$	0.0003	OR ^d = 1.26
3500-3999		17.0%		14.7%						
≥4000		3.1%		1.9%						
Mothers										
Body mass index										
Mean (kg/m ²)	2429	23.40	1524	22.12	<i>F</i> = 83.3	<0.0001	Diff. = -1.28	<i>F</i> = 54.7	<0.0001	Diff. = -1.06
Distribution										
Thinness (<18.5)		11.3%		15.6%						
Normal (18.5-24.9)		58.6%		64.2%	$\chi^2 = 49.5$	<0.0001	OR ^d = 1.57	$\chi^2 = 39.6$	<0.0001	OR ^d = 1.53
Overweight(>25)		30.1%		20.2%						

^a Adjustment for social characteristics of household members: district, sex, age and occupation of head of household, nationality, educational level and occupation of mother; for children (in addition to the above variables): sex and age of child, checking of birth date, age and height of mother, parity, familial relationship of mother and child to head of household; for birth weight (in addition to the above variables): sex of child, age and height of mother, parity, familial relationship of mother and child to head of household; for mothers (in addition to the above variables): age, parity and familial relationship to head of household.

^b Null hypothesis of no difference between surveys: *F* test for continuous indices, χ^2 test (raw data) or likelihood ratio χ^2 test (adjusted values) for categorical variables.

^c Difference (Diff.) of means (1996 minus 1993) for continuous indices, prevalence odds ratio (OR) (1996 versus 1993) for categorical variables.

^d Proportional odds assumption.

The predominant factor in the decreased quality of complementary feeding would appear to be economic, as evidenced by the less frequent use of the highest-cost foodstuffs (imported infant flours, sweetened condensed milk), in particular in the poorest households. This is corroborated by the changes between 1993 and 1996 in the daily expenditure of households on gruel: this increased by 131% for infants receiving imported complementary flour (from 938 to 2171 CFA francs) and by only 30% for infants receiving local gruel (from 226 to 294 CFA francs). Although the development of local production of improved complementary foods at more affordable prices was envisaged in 1994, efforts to that end have been hindered by the social and political instability.

Although the rate of continued breastfeeding at 2 years of age remained low according to international recommendations, the increase from 3.4% in 1993 to 9.0% in 1996 was highly significant (odds ratio (OR) = 2.85, *P* = 0.002). However, the literature contains numerous references to the fact

that poor nutritional status is noted in children receiving prolonged breastfeeding. Some workers consider the phenomenon as reverse causality, where mothers in developing countries prolong breastfeeding because they perceive that their children are not growing adequately (22, 23). For others, the inverse association is not causal; it is simply that the children receiving prolonged breastfeeding automatically receive poorer complementary feeding (24).

The anthropometric indicators show that young children have undergone a substantial deterioration in their nutritional status. Between 1993 and 1996, mean length-for-age and weight-for-length decreased by more than 0.2 z-scores, and the prevalence of stunting and wasting increased significantly (adjusted OR = 1.26 and 1.45, respectively). In addition, as far as linear growth is concerned, the age range evaluated corresponds to a period in which the malnutrition is only beginning to become established but its prevalence has not reached its peak.

Fig. 3. **Children's mean nutritional indices by age group**
 a) Mean length-for-age, adjusted for the social characteristics of the household's members ($n = 4157$); b) Mean weight-for-length adjusted for the social characteristics of the household's members ($n = 4163$)

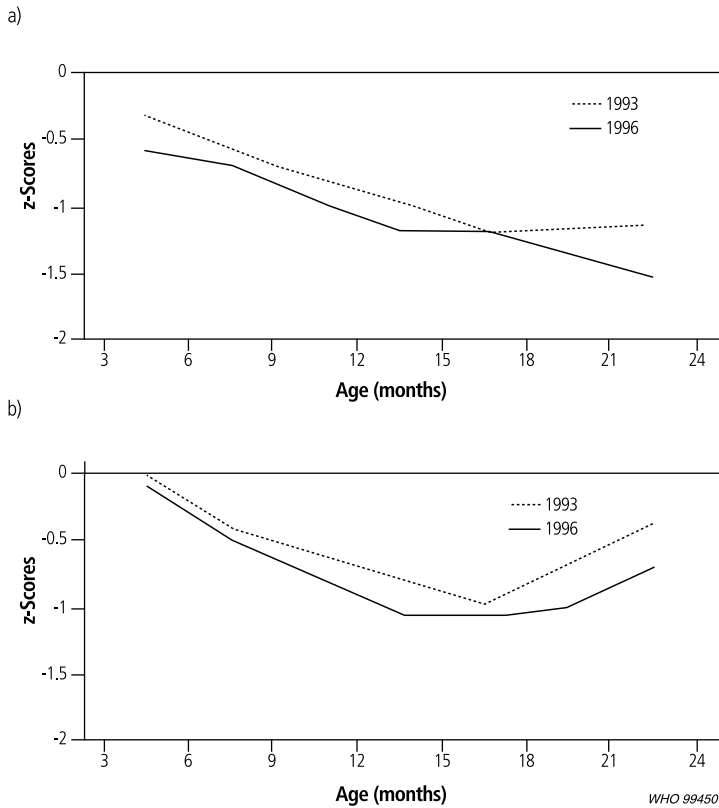
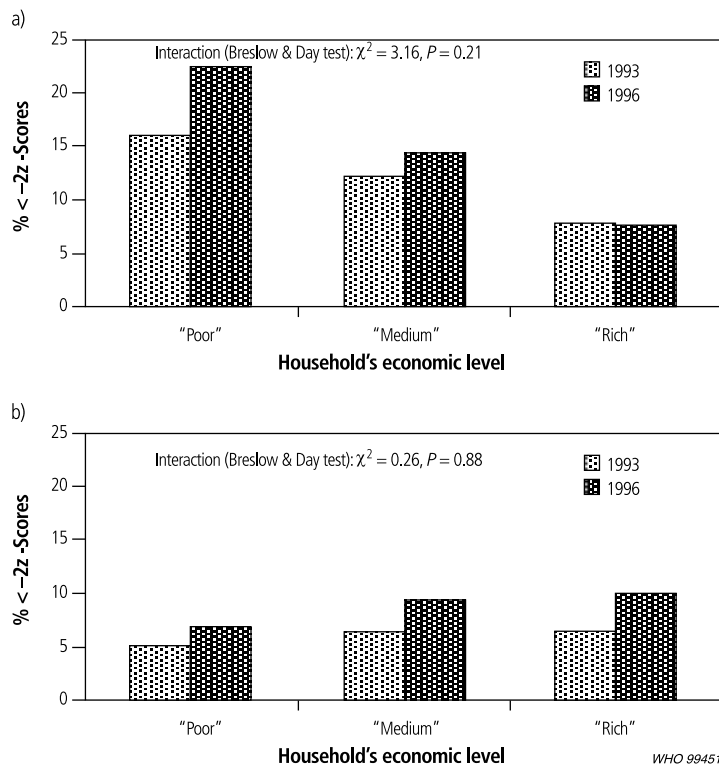


Fig. 4. **Children's nutritional status, stratified by household's economic level** a) Stunting ($n = 4134$); b) Wasting ($n = 4140$)



Over the same period, thinness in the mothers also increased markedly (adjusted OR = 1.43) with mean body mass index lower by nearly 1.3 kg/m². This reflects a significant weight loss and could be responsible for at least part of the mean birth weight decrease of 72 g, which in turn may contribute to the more pronounced malnutrition in the children. However, these mother-related factors are insufficient to explain entirely the deterioration of nutritional status observed in the children.^e

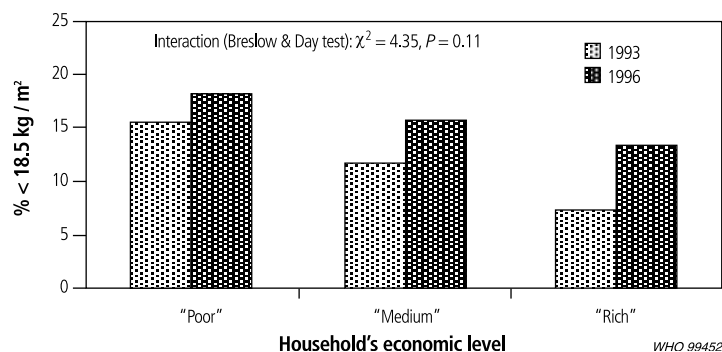
It is beyond the scope of this article to discuss the respective roles, at the household level, of the potential causal factors of the observed deterioration of the nutritional situation. Nevertheless, some of the results suggest that each of the three major underlying causes of malnutrition defined by the conceptual model generally recognized internationally (25) are involved here: food security, health and environment, and caring.

Food has been highlighted above by the decreased quality of the complementary feeding, reduced food expenditure (in constant CFA francs) and qualitative changes in some types of food consumed. The significant increase in the incidence of diarrhoea between 1993 and 1996 underlines a deterioration in hygiene conditions and increased morbidity in the children. There is also a considerable decrease in the health-monitoring index, which expresses a decreased health care supply (3), as well as worse health-seeking behaviours from the mothers. The latter could be considered as one of the frequent consequences of the economic crisis in Africa. It was demonstrated by a recent study in Conakry, Guinea, conducted prior to the CFA franc devaluation (26), that when women become increasingly engaged in income generation, the beneficial effects for the children of a supplementary income did not entirely offset the negative effects of the decreased time devoted to them.

Whatever the pathways involved, it remains that the global nutritional situation in Brazzaville has deteriorated since the devaluation of the CFA franc. This contrasts with the globally positive impact of the devaluation on the economies of the countries involved (27), although the effects were more in some countries, e.g. Côte d'Ivoire, than others, e.g. Niger. It is also true that, because of the social and political unrest in the Congo, the devaluation was not accompanied by any compensatory measures. A more accurate assessment of the specific effects of the devaluation on the nutritional status of urban populations would be provided by comparing the results obtained here with those in another large capital in the CFA zone. To our knowledge, no such studies have yet been published. Moreover, although it is generally admitted that a better macroeconomic situation will improve the overall nutritional status of

^e This has been checked in this study using embedded regression models with and without the mother-related factors (details not shown).

Fig. 5. **Mother's thinness, stratified by household's economic level (n = 3930)**



the population over the long term, this should be assessed for the devaluation of the CFA franc and for

variations across all socioeconomic categories of the population. ■

Acknowledgements

The 1993 survey was funded in part by the *Ministère de la Recherche et de l'Espace de la République française* (grant no. 92.L.0620). The 1996 survey was cofunded by the *Mission de Coopération et d'Action culturelle* of the French Embassy in Brazzaville, UNICEF-Congo and the *Equipe pluridisciplinaire de Recherche en Alimentation et Nutrition* (EPRAN Congo, funded by *Aire Développement*). The other funds were provided by the *Institut de Recherche pour le Développement* (IRD, formerly ORSTOM). The authors thank all the persons interviewed in the course of the study, and particularly the mothers and children for their kindness and cooperation.

Résumé

Détérioration de l'état nutritionnel des jeunes enfants et de leurs mères à Brazzaville (Congo) à la suite de la dévaluation du franc CFA en 1994

Peu après la dévaluation du franc de la Communauté financière africaine (CFA) intervenue le 12 janvier 1994 dans 14 pays africains, des inquiétudes se sont exprimées quant aux conséquences qu'elle pourrait avoir, notamment en matière de santé, pour des populations déjà fragilisées par plusieurs années de crise économique d'ajustement. On prévoyait en particulier que les populations urbaines seraient très touchées. Jusqu'à présent, cette question n'a pas vraiment été analysée.

Une étude préliminaire faite à Brazzaville (Congo) un an après la dévaluation a montré que la qualité des aliments de complément donnés aux nourrissons commençait se dégrader. L'étude présentée ici visait à répondre à plusieurs questions : cette dégradation allait-elle s'inscrire dans la durée ? L'état nutritionnel des enfants allait-il lui aussi se détériorer ? La situation nutritionnelle des adultes était-elle menacée ?

L'étude se fondait sur deux enquêtes nutritionnelles faites en 1993 et 1996 dans deux quartiers centraux de Brazzaville auprès d'un échantillon représentatif des ménages ayant un enfant âgé de 4 à 23 mois ($n = 2623$ et $n = 1583$, respectivement). Les deux enquêtes ont été réalisées par passage à domicile, avec la même méthodologie et le même questionnaire. On s'est servi de mesures anthropométriques normalisées pour calculer les indices poids/taille et taille/âge pour les enfants et l'indice de Quételet pour les mères. Pour tenir compte de certaines modifications des caractéristiques sociales des ménages en raison des troubles civils survenus à Brazzaville à la fin de 1993, nous avons ajusté les comparaisons entre les deux enquêtes pour les variables correspondantes.

La dégradation de la qualité de l'alimentation de complément amorcée en 1994 s'est poursuivie en 1996 : l'aliment de complément donné aux nourrissons âgés de 4 à 11 mois était moins souvent un aliment de transition spécial (48,1 % en 1996 contre 58,9 % en 1993, $p = 0,0001$). Les aliments de complément importés, de

qualité nutritionnelle supérieure, étaient moins utilisés (22,2 % contre 31,8 %, $p = 0,0001$) et les bouillies locales étaient moins bien enrichies. Les modalités de l'allaitement au sein étaient les mêmes pendant les premiers mois et les aliments solides de complément étaient encore introduits assez tôt, mais le taux d'allaitement prolongé à 2 ans avait augmenté. Il semble que la dégradation persistante de la qualité des aliments de complément soit avant tout d'origine économique (coût des produits importés), les ménages les plus pauvres étant les plus vulnérables.

En même temps, l'état nutritionnel des jeunes enfants s'est détérioré, puisqu'on a noté une prévalence accrue tant du retard de croissance (taille/âge inférieure à $-2 z$: 15,5 % contre 12,1 %, $p = 0,024$) que de l'émaciation (poids/taille inférieur à $-2 z$: 8,8 % contre 6,0 %, $p = 0,005$). En outre, le taux d'insuffisance pondérale s'est accru chez les mères (indice de Quételet $< 18,5 \text{ kg/m}^2$) (15,3 % contre 11,4 %, $p < 0,0001$) et la distribution des poids de naissance s'est décalée vers le bas ($p = 0,0003$).

Cette détérioration de la situation nutritionnelle a touché, à des degrés divers, toutes les couches économiques. Parmi les principaux déterminants figuraient les habituelles causes sous-jacentes de malnutrition : insécurité alimentaire (aliments de complément de moindre qualité), manque d'accès aux soins et à l'hygiène du milieu (incidence accrue de la diarrhée, diminution du nombre de vaccinations) et diminution du temps consacré aux enfants. Toutefois, il semblerait que la situation au Congo soit relativement atypique par rapport à celle des pays concernés par la dévaluation du franc CFA. En fait, la dégradation de la situation due à des difficultés économiques parmi les ménages urbains a été exacerbée à Brazzaville par l'instabilité sociale et politique récurrente. Il serait donc intéressant de comparer les données présentées ici avec les résultats d'études analogues faites dans d'autres villes de la zone CFA.

Resumen

Deterioro del estado nutricional de los niños pequeños y sus madres en Brazzaville (Congo) después de la devaluación del franco CFA en 1994

Poco después de que el franco de la Comunidad Financiera Africana (CFA) fuese devaluado en 14 países africanos, el 12 de enero de 1994, cundió la preocupación sobre las posibles repercusiones de esa decisión, sobre todo en materia de salud, para poblaciones que ya se habían convertido en vulnerables tras varios años de crisis económica y políticas de ajuste. En particular, se previó que las poblaciones urbanas se verían considerablemente afectadas. Esta cuestión no se ha abordado hasta ahora como debiera.

Un estudio preliminar realizado en Brazzaville (Congo) al cabo de un año de la devaluación reveló que la calidad de los alimentos complementarios suministrados a los lactantes estaba empezando a deteriorarse. El estudio aquí presentado abordó varios interrogantes adicionales: ¿duraría mucho tiempo esa disminución de la calidad de los alimentos complementarios? ¿Acabaría afectando al estado nutricional de los niños? ¿Se deterioraría también el estado nutricional de los adultos?

El estudio se basó en dos encuestas nutricionales realizadas en 1993 y 1996 en dos distritos centrales de Brazzaville en una muestra representativa de hogares con niños de 4-23 meses de edad ($n = 2623$ y $n = 1583$, respectivamente). Los dos estudios se hicieron mediante encuestas a domicilio, utilizando una metodología y un cuestionario idénticos. Se emplearon mediciones antropométricas normalizadas para calcular el peso para la talla y la talla para la edad de los niños y el índice de masa corporal (IMC) de las madres. Para tener en cuenta las posibles repercusiones sociales en los miembros de la familia de los desórdenes públicos acontecidos en Brazzaville a fines de 1993, procedimos a ajustar las comparaciones entre las dos encuestas para las variables correspondientes.

El deterioro de la calidad de los alimentos complementarios, iniciado en 1994, persistía en 1996: los alimentos complementarios suministrados a los lactantes de 4-11 meses eran con menor frecuencia alimentos especiales de transición (48,1% en 1996,

frente a 58,9% en 1993, $P = 0,0001$). Los alimentos complementarios importados, de mayor calidad nutricional, eran menos frecuentes (22,2% frente a 31,8%, $P = 0,0001$) y las papillas locales estaban menos enriquecidas. Las pautas de lactancia materna eran similares durante los primeros meses de vida y los alimentos sólidos complementarios se introducían todavía muy tempranamente, pero la tasa de lactancia materna prolongada a los 2 años había aumentado. Al parecer, las razones de la disminución persistente de la calidad de los alimentos complementarios eran principalmente económicas (costo de los productos importados), siendo los hogares más pobres los más afectados.

Paralelamente se deterioró el estado nutricional de los niños pequeños, aumentando la prevalencia tanto del retraso del crecimiento (talla para la edad $< -2Z$: 15,5% frente a 12,1%, $P = 0,024$) como de la emaciación (peso para la talla $< -2Z$: 8,8% frente a 6,0%, $P = 0,005$). Además, también se agravó la delgadez de las madres (IMC $< 18,5$ kg/m²) (15,3% frente a 11,4%, $P < 0,0001$), y la distribución del peso de nacimiento se desplazó hacia la izquierda ($P = 0,0003$).

Este deterioro de la situación nutricional afectó a todos los estratos económicos de la población, pero en diversa medida. Entre los principales determinantes destacan las causas habituales de malnutrición relacionadas con la seguridad alimentaria (peor calidad de la alimentación complementaria), el acceso a los servicios de salud y la higiene (mayor incidencia de diarrea, menos inmunizaciones) y el cuidado de los niños. Sin embargo, la situación observada en el Congo parece relativamente atípica entre los países que devaluaron el franco CFA. En realidad, el deterioro de la protección social resultante de las dificultades económicas arrostradas en los hogares urbanos se vio exacerbado en Brazzaville por los reiterados periodos de inestabilidad social y política. Por consiguiente, sería interesante comparar los datos aportados por este estudio con resultados similares obtenidos en otros centros urbanos de la zona CFA.

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