POVERTY AND FOOD CONSUMPTION IN URBAN ZAIRE

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LIST OF ABBREVIATIONS

CEPLANUT	-	Centre de Planification Nutritionelle
CU	-	consumption unit
INS	-	Institut National de la Statistique
MCE	-	monthly consumption expenditures
RDA	-	recommended dietary allowance

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FOREWORD

Zaire is one of the most resource rich countries in sub-Saharan Africa, and therefore, perhaps is the best illustration of the failure of state intervention in the economy, as manifested by economic decline and great social hardship. In addition, Zaire stands out in terms of the failure to pursue and sustain any serious effort at economic reform. Whatever start was made toward removing the distortions that discriminated against small-scale agriculture and manufacturing during the 1980s they were reversed, contributing to the present political, social and economic crisis that grips Zaire.

While the magnitude of Zaire's policy failures are greater than most African countries, there is nonetheless much to be learned by exploring not only the genesis of the crisis, but what are the appropriate adjustment policies to reverse the declining growth rates and deteriorating living standards. It is in this context that Zaire, one of the most populous and well endowed countries in Africa, is included in a multi-country research study of the Cornell Food and Nutrition Policy Program (CFNPP), exploring the impact of economic reform on growth, income distribution, and poverty.

Each of the country studies undertaken by CFNPP involve a combination of analytical approaches. These include a descriptive analysis of the evolution of policy, and complete understanding of the structure of the economy, including the functioning of markets and incentive structures. This provides a basis for understanding the contribution of structure, policy and external factors to economic performance and living standards. Such an effort for Zaire is found in CFNPP Monograph 16, by wa Bilenga Tshishimbi and Peter Glick. A second component of the research strategy involved a thorough analysis of the characteristics of poverty. In particular, the concern is identifying the incidence of poverty, and profiling who the poor are, including understanding issues such as the contribution of education, the sector of employment and gender of household head to consumption and poverty. This Working Paper, prepared by Hamid Tabatabai, presents the findings of such an effort.

The third component of the research strategy involved bringing together the work on the functioning of the economy as a whole, including various factor and product markets, and the poverty profile, into a more formal analytic framework for policy analysis. This is done for Zaire through the construction of a Social Accounting Matrix, and a input-output model, as discussed in the companion Working Paper 55, by Solomane Koné and Erik Thorbecke.

The research undertaken by CFNPP has been a collaborative effort. In the case of Zaire, this has involved a large number of contributors to the project, from a number of Zairian and international institutions. Special note of the assistance of the Institut National de la Statistique (INS) in Kinshasa is warranted. Furthermore, the author of this report, Hamid Tabatabai, while having

historical roots with Cornell University, is presently working at the Policies and Programmes for Development Branch, Employment and Development Department, International Labour Office (ILO). This research is the result of a collaborative effort bewteen CFNPP and the ILO and was financed from a grant received by CFNPP from the Africa Bureau anf Zaire Mission of the U.S. Agency for International Development.

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1. INTRODUCTION

Zaire is the second largest sub-Saharan African country by area (after the Sudan) and the third largest by population (after Nigeria and Ethiopia). Despite immense natural resources, its population is among the poorest in the region and in the world. Long beset with problems, the economy of Zaire has gone from bad to worse, despite perennial efforts at stabilization with the cooperation of international financial agencies. The changes in the exchange rate, to take a particularly sensitive indicator, illustrate the dramatic loss of control over the economy in recent years: in April 1990, the parallel market rate was 500 zaires to one US dollar; by early 1993, a dollar could be exchanged for several million zaires!

The deepening economic crisis and the patent failure of past attempts to contain it have roots that go far deeper than the economic sphere alone.[1] Whatever these roots may be, however, the most vulnerable victims of the crisis are the impoverished masses whose ranks have continued to swell in recent years. Their plight is of all the more concern as their abject poverty contrasts so sharply with the wealth of the country's natural resources and the ostentatious lifestyles of its élite.

This study is concerned with certain dimensions of poverty in urban Zaire: the extent of the poverty, the identification of the poor, and the factors associated with their poverty. As part of the larger Cornell project on Zaire, this study covers Kinshasa, the capital city, and Bandundu Town. The analysis is based mainly on data from two household surveys carried out by the Institut National de la Statistique in 1985/86.

The study is organized as follows. Section 2, which provides a selective review of the literature, begins by highlighting the salient features of the economy and the overall state of welfare of the population. The main emphasis in this section, however, is on an analytical review of the significant research studies now available relating to poverty, food consumption, and nutritional status in Kinshasa. The three sections that follow constitute the core of the study. Section 3 describes the survey data and the methodology used in the analysis of poverty. Section 4 is concerned with the initial stages of the analysis that involve the construction of key variables and the presentation of some descriptive preliminary results. Section 5 presents the poverty profiles of Kinshasa and Bandundu Town, which constitute the main results of the study.

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[1] Indeed the current economic crisis is accompanied by a profound political crisis that is probably even more intractable.

Some additional results based on multivariate techniques are also reported in this section as are some statistics of inequality in the distribution of expenditures. The final section offers the main conclusions of the analysis. The appendix briefly reviews the axiomatic approach to the construction of poverty indices, several of which are used in the study.

2. REVIEW OF THE LITERATURE

This section presents some general background observations on the Zairian socioeconomic situation before reviewing selected studies on poverty, food consumption, and nutrition. Given the scope of the study and the available literature, this review focuses primarily on Kinshasa, but relevant evidence relating to the country as a whole, its rural and urban areas, and smaller towns, especially Bandundu Town, will also be noted as appropriate.

GENERAL BACKGROUND

With a per capita income estimated at US$ 220 in 1990, Zaire is one of the lowest-income countries in the world (UNDP 1993, p. 139). This estimate is widely believed to be too low because of the inadequate coverage of subsistence production and informal sector activities, both of which are pervasive.[2] A more comprehensive accounting of the subsistence and informal sectors may raise the estimated per capita income by as much as 50 to 70 percent or more, as recent work by the Institut National de la Statistique suggests (INS 1990).[3] Even so, however, the country's level of poverty relative to other nations is unlikely to change significantly: the underestimation of such activities is not specific to Zaire, even if a case could be made that it is relatively larger in this country than in most other low-income countries. The economy of Zaire is a desperately poor economy.

One would not come away with this impression by observing the country's resource base. Indeed, few countries can boast of equally immense mineral and agricultural resources. The most important minerals are copper, diamonds, cobalt, zinc, and oil. Many other minerals are found there as well, although most of them are exploited only on a small scale. Mineral exports accounted, in 1988, for about two-thirds of foreign exchange earnings of the country and more than half of government revenues (Tshishimbi and Glick 1990, p. 13).

Agriculture is, of course, the dominant sector for employment, providing jobs to more than 70 percent of the economically active population in 1986-1989 (UNDP 1992). But its growth rate per capita has been poor (-0.7 percent a year during the 1980s). Despite this anaemic growth, the sector's share in GDP

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[2] See, for example, MacGaffey (1983) and several other studies by her mentioned in World Bank (1989b).

[3] According to one estimate, if informal and unrecorded activities are taken into account, GDP per capita in 1987 was US$ 360 rather than the official figure of US$ 160 (World Bank, 1989b, p. i, citing Cour, n.d.).

actually rose from 20 percent in 1965 to 30 percent in 1990 because the economy performed dismally, with GDP per capita declining at an average rate of 2.2 percent over the same 25-year period (World Bank 1992, pp. 218 and 222). Nature is not to blame for any of this. The agricultural sector in Zaire enjoys natural advantages that would be the envy of many other sub-Saharan African countries. The population density is low and about half of the land area is covered by forests. The climate is favorable and rainfall is always plentiful throughout the country. The northern and southern halves of the country, which is divided in the middle by the equator, enjoy complementary weather patterns with a warm/cool cycle in the north coinciding with a cool/warm cycle in the south (Tshishimbi and Glick 1990). This complementarity has long been regarded as a major stabilizing factor in ensuring food supplies throughout the year. Agricultural production pattern is dualistic: millions of subsistence farmers coexist with a plantation sector that produces primarily industrial and export crops. The potential for producing hydroelectric power is virtually unrivaled in sub-Saharan Africa.

The modern manufacturing sector is relatively small and relies largely on foreign capital and managerial skills. It coexists with a pervasive informal sector, which is more often than not revealingly referred to as the "second economy," the "underground economy," the "unrecorded economy," or the "parallel economy." The sector is notable both for its enormity and for its extensive range of doubtful practices. It is a refuge sector that figures prominently in the survival strategy of most Zairians.

Aggregate data in Table 1 provide a picture of the level of and trends in socioeconomic and welfare indicators in Zaire compared with those in sub-Saharan Africa and in developing countries in general. The differences in the rates of growth in per capita GNP point to the steadily declining position of Zaire in sub-Saharan Africa and, a fortiori, in the Third World: by 1990 Zaire's *real* GDP per capita was less than a third of sub-Saharan Africa's, which was itself only about half that of the developing countries as a whole. Nonincome indicators are not so unfavorable to Zaire and are at times better than those for sub-Saharan Africa. Some are on a par with the average for all developing countries (for example, the adult literacy rate). Some other indicators are broadly in line with the situation in sub-Saharan Africa (food production growth, food availability, and life expectancy) but a few are considerably worse (rate of inflation and access to health services).

Many Zairians in both rural and urban areas are poor by any standard. The existing literature, however, contains virtually no estimate of the incidence of poverty for the country as a whole or for any major part of it. Educated guesses aside, the sole available figure is one of 80 percent for the rural population in 1975 (Table 1). Food availability at the national level, measured in terms of calories per capita per day, amounted to 96 percent of requirements in 1988-1990, slightly higher than in the rest of sub-Saharan Africa. This figure falls far short of a minimum level of the 110-120 percent required (considering unequal distribution of food) to ensure adequate supplies of food for all the population. This suggests a very poor overall state of nutrition in Zaire. As a matter of fact, on the evidence of various nutrition surveys, the nutritional situation in

Table 1 – Socioeconomic and Human Welfare Indicators

Indicator	Year or Period	Zaire	Sub-Saharan Africa	All Developing Countries	Tables in Source
1. GNP per capita (US$)	1990	220	490	810	2, 51
Average annual growth rate (%)	1965-80	-1.3	1.5	2.9	27, 51
Average annual growth rate (%)	1980-90	-1.5	-1.1	2.5	27, 51
2. Real GDP per capita (PPP $)	1990	367	1,200	2,170	2, 51
3. Average annual rate of inflation (%)	1980-90	60.9	22.3	27.9	27, 51
4. Food production per capita (1979-81 = 100)	1988-90	97	95	115	13, 51
5. Food availability (kcals per capita per day)	1988-90	2,130	2,250	2,490	13, 51
As percent of requirements	1988-90	96	93	107	13, 51
6. Life expectancy at birth (years)	1990	53.0	51.8	62.8	2, 51
7. Adult literacy rate (% 15+)	1990	72	47	65	5, 51
Male	1990	84	58	75	5, 51
Female	1990	61	36	55	5, 51
8. Percent of population with access to health services	1987-90	26	48	64	2
Urban	1987-90	40	80	90	10
Rural	1987-90	17	36	49	10
9. Percent of population with access to safe water	1987-90	34	40	68	2
Urban	1987-90	59	65	82	10
Rural	1987-90	17	28	60	10
10. Under-5 mortality rate (per 1,000 live births)	1990	130	165	104	11, 51
11. Infant mortality rate (per 1,000 live births)	1991	96	103	71	11, 51
12. Incidence of poverty (%)					
Urban	1977-87	–	34	27	16
Rural	1977-87	80[a]	61	35	16

[a] This actually refers to 1975; see World Bank (1988b).

Source: UNDP (1993), except for items 8 and 9 (UNDP 1992) and item 12 (UNDP 1990).

Zaire might be even worse than in the rest of sub-Saharan Africa (World Bank 1989c, p. 12). The poorer state of access to health services (Table 1) may well be relevant in explaining this discrepancy.

POVERTY, FOOD CONSUMPTION, AND NUTRITION

This subsection reviews the findings of a few major studies on poverty, food consumption, and nutrition in order to set the stage for the detailed analysis that follows. The available literature is overwhelmingly concerned with Kinshasa.

Sources of Empirical Information

Detailed evidence on incomes and food consumption in urban areas is available in a series of studies by Joseph Houyoux and his collaborators that report the results of household budget surveys conducted in a number of cities. In the case of Kinshasa, time-series data are available from three household budget surveys carried out in 1969, 1975, and 1986. The INS also undertook a rather ambitious set of surveys in 1985/86 covering Kinshasa and Bandundu Town, the two urban areas in the present study, and other cities. Some preliminary results of the analysis of INS surveys have been published (INS 1989a, 1989b). A draft report by the World Bank (1989b) is the most comprehensive review to date of poverty in Zaire, although it does not incorporate the results of the 1985/86 INS surveys. Much of what follows in this review relies on the relevant material assembled in the World Bank report but the original Houyoux studies and other World Bank documents were also drawn upon as needed. This review is not merely descriptive: the use of evidence and the interpretations provided here differ, at times, from those of the studies being reviewed, particularly in the case of the World Bank's poverty report. These differences will be pointed out as appropriate. Also, this review will not include the recently published preliminary analysis of the INS survey data, as a full analysis of these data will be presented in later sections of this study.

The Evolution of Consumption Expenditures in Kinshasa

Following a pilot survey in 1968 covering 60 households (Houyoux and Houyoux 1970) a full-scale budget survey was conducted in Kinshasa in 1969 using a stratified random sample of 1,471 African households (Houyoux 1973). This was followed by a second full-scale survey in 1975 involving a similarly stratified random sample of 1,367 households. The third survey in the series in 1986 (Houyoux 1987), however, was far more modest in both scale (only 205 households) and sampling technique. The latter survey sought to ensure roughly equal numbers of households in each of six expenditure categories, taking into account such characteristics as the occupation and ethnic origin of the household head as well as the zone of habitation).

The World Bank poverty report (1989b, hereafter called the *Report*) relies heavily on the results of the first and third of these Kinshasa surveys, virtually ignoring the second one. The principal conclusions of the *Report*, which are essentially those arrived at by Houyoux himself (Houyoux 1973, 1987), are as follows (*Report*, pp. 27-30 and Annex I, pp. 3-9; see also World Bank 1989a, pp. iii-iv):

(a) There is a positive relationship between household size and total household expenditure, and an inverse relationship between household size and expenditure per person.

(b) Average expenditure differentials between all income levels seem to have narrowed from 1969 to 1986. The leveling-off between income levels is believed to arise from what Houyoux has referred to as the *dualisme culturel* of Kinshasa: the increase in economic level is systematically accompanied by an increase in obligations toward the extended family (whose poorer members will go to live with the better-off household, increasing its size and reducing the gap in expenditures between income levels).

(c) While the share of the food expenditure is inversely related to the level of income, the structure of expenditure (its division among food, housing, clothing, and miscellaneous items) remained the same for all income levels.

(d) Most households surveyed in Kinshasa spend between 60 percent and 80 percent of their total expenditure on food. (This was more or less the case in 1969 but not in 1986).

(e) Expenditures over the 17 years separating the two surveys (1969-1986) kept pace with variations in the Kinshasa consumer price index. Despite food price increases, however, the average person consumed the same quantity of food in Kinshasa in 1986 as in 1969 (about 17 kg per month).

(f) The Gini coefficients of per capita expenditure distribution are estimated to be 0.482 for 1969 and 0.490 for 1986. These estimates, which are based on grouped data from the Houyoux surveys, "indicate a moderately unequal size distribution of income in Kinshasa in 1969, becoming slightly more unequal in 1986" (*Report*, Annex I, p. 3). The *Report* notes that "this trend can be explained by the opening up of the extended family and higher undeclared earnings" (ibid., fn 2).

(g) The pattern of food consumption changed somewhat (consumption of the main sources of vitamins and of the traditional sources of protein decreased and consumption of bread, rice, and meat increased). The change has probably worsened the overall nutritional level of the poor who cannot, for instance, replace fish with meat as an alternative source of protein.

(h) Households headed by *cadres* or females had the highest per capita consumption expenditure and spent the lowest proportion of their income on food in both 1969 and 1986. By contrast, manual workers (both semiskilled and unskilled) and the unemployed appear to be worse off.

(i) Official wages in 1986 represented less than a third of reported income, with the largest share being derived from informal sector activities. "Undeclared earnings" match official wages as a source of income.

The analysis in subsequent sections will provide evidence from the INS Kinshasa survey that bear on some of the above findings. A few of these, however, appear to be based on erroneous calculations or a misinterpretation of the evidence from the Houyoux surveys. These are discussed below.

Table 2 presents some results of the Houyoux surveys at the sample level. While total household expenditures moved more or less in line with the consumer price index over the period from 1969 to 1986, real expenditures per capita in 1986 were 20 percent lower relative to 1969 and even lower relative to 1975. This decline is confirmed by the fact that the quantity of food consumed per capita also fell by 10 percent between 1969 and 1986. The *Report's* conclusions about the constancy of real expenditures and food consumption over this period (point [e] above) are therefore not supported by the Houyoux data.[4]

In view of such declines in real per capita expenditure and consumption levels, it may seem rather surprising that the share of total expenditures on food was in fact lower in 1986 than in 1969 (62.1 and 67.4 percent, respectively). This apparent contradiction could be explained, at least in part, by a deterioration in the distribution of expenditures, as seems to be suggested by the *Report's* estimates of the Gini coefficient (point [f] above) and particularly by the accompanying Lorenz curves (Annex I of the *Report*, p. 4). The latter actually indicate considerably greater deterioration. These estimates, however, are erroneous[5] and, if anything, the expenditure distribution was probably somewhat more equal in 1986 than in 1969 (see Section 5). The reduction in the

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[4] The Houyoux totals for 1969 and 1986 (16.671 and 16.927 kg) on which the *Report* relies as evidence for the constancy of per capita food consumption are in fact not comparable since the former excludes alcoholic and nonalcoholic drinks whereas the latter inexplicably does not (Houyoux 1987, Table TVI.1, p. A.95). Corrected figures are given in Table 2.

[5] The *Report* is not very clear about precisely what the Gini coefficients refer to. The Lorenz curves that accompany them are based on total expenditures *per person* and imply considerably lower figures for the Gini coefficients and a greater deterioration between 1969 and 1986 (they are drawn to scale). The curves, however, are mislabeled as to their reference years. The extent of inequality was in fact less than suggested by the *Report* and declined between the two years (see Section 5 for recalculation of the Gini coefficients based on the same Houyoux data).

Table 2 – Kinshasa: Evolution of Consumption Expenditures, 1969, 1975, and 1986

	1969	1975	1986
Average expenditure per household (current zaires/month)	31.42	79.59	8,563
Average expenditure per household (1969 = 100)	100	253	27,253
Consumer price index	100	244[a]	27,701[b]
Real average expenditure per household (1969 = 100)	100	104	98
Real average expenditure per capita (1969 = 100)	100	105	80
Food consumption per capita (kg per month) (ex. beverages)	16.671	16.051	15.048
Percent share in consumption expenditures	100.0	100.0	100.0
Food	67.4	59.6	62.1
Housing	14.9	15.9	15.8
Clothing	7.3	9.3	4.7
Miscellaneous	10.4	15.2	17.4
Elasticity of expenditures			
Food	0.78	–	0.62
Housing	1.21	–	1.02
Clothing	1.53	–	1.87
Miscellaneous	2.33	–	2.55
Number of sample households	1,417	1,367	205
Average number of members per household	5.9	5.8	7.3

[a] Refers to January-June.
[b] Refers to May.

Source: Houyoux (1987), Tables TII.3, p. A.44, TII.4, p. 45, and TVI.1, p. A.95.

food share in 1986 relative to 1969 is almost certainly due to the overrepresentation of the richer households in Houyoux's much smaller 1986 sample.

When incomes decline, the incidence of poverty will generally rise if the income distribution remains the same or becomes more skewed. It may also rise when income distribution improves (inequality declines) but not sufficiently.[6] As was argued above, per capita expenditures in Kinshasa were significantly lower in 1986 than in 1969 and 1975. Expenditure distribution, however, was probably somewhat more equal in 1986 than in 1969, as shown later in Section 5. The net effect on poverty is therefore difficult to establish although, in view of the magnitudes involved, it probably increased.

Houyoux does not try to estimate the incidence of poverty in Kinshasa in any of his studies even though his three surveys provided enough data to do so. The *Report* takes a small step in this direction by adopting the simple method of using the "food adequacy standard" as a proxy, i.e., the fraction of household budget spent on food. It defines those spending 70 percent or more of their expenditures on food as poor and those spending 80 percent or more as ultrapoor (p. 28). This approach, however, is not taken to its logical conclusion to estimate the incidence of poverty or of ultrapoverty. It nevertheless permitted the identification of household categories that were worse off. The *Report* identifies these, for 1986, as manual workers (semiskilled and unskilled) and the unemployed. An analysis of the 1985/86 INS data, however, suggests that the dispersion of expenditures within individual occupational groups is large and poverty groups cannot easily be identified by reference to a single characteristic (see below).

Food Consumption and Nutritional Status

According to the *Report* (p. 32), high food imports have helped to maintain per capita daily calorie intake at relatively constant levels in Kinshasa over the past two decades (even though levels fell significantly, by 9 percent: from 2,188 kcals in 1965 to 2,000 kcals in 1985). Curiously, however, drawing on data from Houyoux, the *Report* states that "as of 1986, only about two-thirds of daily required calories, proteins and phosphate intake was met in Kinshasa" (p. 32) in 1969, 1975, and 1986. This proportion is of course much too low to be credible and appears to result from a comparison of *per capita* availability figures with *per adult equivalent* requirements. It may nonetheless be true that the availability shortfall in Kinshasa is more severe than in the rest of the country. Between 1965 and 1985 when food availability in Kinshasa fell by 9 percent, the drop at the national level was less than 2 percent (World Bank 1988a, p. 11). The pattern of food consumption between 1969 and 1986 appears to have shifted from cheaper foods toward more expensive foods. The Houyoux survey data in Table 3 seem to indicate that the per capita consumption of starchy staples and fish has tended to decline whereas that of cereals, meat, and milk

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[6] These statements do not always hold but the exceptions are rare and only of theoretical interest.

Table 3 – Kinshasa: Consumption of Food Commodity, 1969, 1975, and 1986

Food Commodity Group	1969	1975	1986
	(Kilo per person per month)		
Cereals	2.644	2.342	2.990
Starchy staples	6.604	5.890	5.096
Sugar	0.351	0.496	0.437
Leguminous plants	0.635	0.652	0.510
Nuts (noix)	0.014	0.160	0.038
Vegetables (légumes)	2.715	2.394	2.412
Fruits	0.630	0.488	0.265
Fish	1.418	1.305	1.058
Condiments	0.171	0.284	0.339
Meat	0.726	0.801	0.819
Alcoholic beverages	1.904	3.699	1.535
Milk	0.143	0.143	0.236
Oils	0.620	1.096	0.848
Nonalcoholic beverages	0.426	0.791	0.344
Total (excluding alcoholic and nonalcoholic beverages)	16.671	16.051	15.048

Source: Houyoux (1986, p. 9).

has tended to rise. In a period of declining incomes and food consumption (see Table 2), such a shift would imply a significant deterioration in income distribution, which is unlikely (see above and Section 5). Once again, it is probably the overrepresentation of the richer households in the Houyoux's small 1986 sample that accounts for this apparent shift. Maton (1992) in fact argues convincingly that the shift was in the opposite direction. Maton suggests that as incomes declined, cassava has increased in importance as a source of calories in the diet of the Zairians, particularly in that of the poor. He estimates that cassava accounts for about 45 percent of calories consumed in the country, as well as in Kinshasa, and that this share exceeds 55 percent for the poor (Maton 1992, p. 32). The increasing reliance on cassava as a cheap source of calories has been taking place in the context of a gradual decline in average availability of calories in the country since the mid-1970s (Maton 1992, p. 8).

Concerning nutritional status, available indicators point to a major problem of malnutrition throughout Zaire. A 1975 national sample survey covering children below seven years of age indicated that 4.8 percent were wasted (acutely malnourished, defined as weight-for-height lower than 2 standard deviations below the median), 44.8 percent were stunted (chronically malnourished, as evidenced by height-for-age less than 2 standard deviations below the median) and 28.8 percent showed low weight-for-age (less than 2 standard deviations below the median) (WHO 1989, p. 28). Current national estimates suggest that a quarter of all young children are undernourished, although local surveys have often yielded even higher rates (World Bank 1989c, p. 11).

The evidence at subnational levels points to a wide regional variation and generally higher rates of malnutrition in rural than in urban areas (*Report*, pp. 33-34). In Kinshasa, however, rates are often as high as or higher than in rural areas (World Bank 1989c, p. 11). In the poorest parts of Kinshasa's extension areas, such as Kimbanseke, the prevalence of malnutrition has been found to approach 70 percent. Nutritional surveys in Kinshasa indicated that in 1986, 47.7 percent of children (up to five years of age) were mildly malnourished, 12.7 percent were moderately malnourished, and 2.3 percent suffered from severe malnutrition (Kalisa 1989, as cited in Kalonji et al. 1991, p. 33). Another study reports that a Centre de Planification Nutritionelle's (CEPLANUT) survey in the same year revealed that about 30 percent of children in Kinshasa were chronically malnourished, with a height-for-age below two standard deviations of WHO norms (Drosin 1988, as cited in Kalonji et al. 1991, p. 37). Comparable time-series data on nutritional indicators are not readily available, but indirect evidence suggests a strong likelihood of a deterioration in recent years (declines in incomes and food consumption as discussed earlier).

While in the rural areas covered by "Health Zones" the prevalence of malnutrition does not in general exceed 20-25 percent, it can be as high as 60 percent in areas outside of Health Zones. Various surveys in rural Bandundu have arrived at estimates of around 16 percent for the prevalence of low weight-for-age in the mid-1980s (WHO 1989, p. 30) and more than 36 percent for the prevalence of chronic malnutrition (height-for-age below 90 percent of international norm), again in the mid-1980s (*Report*, p. 34). In an interesting preliminary analysis of the pattern of differences over time and across

localities in the prevalence of malnutrition in the Kwilu, Bandundu, and its proximate causes, Rogers (1990) distinguishes among three types of factors that determine the prevalence: cyclical (including seasonal), transitional, and chronic. Based on available evidence from five health zones in the Kwilu, he arrives at a tentative breakdown of their respective contributions, which highlights the extreme volatility of rural malnutrition and its underlying factors. His evidence suggests that malnutrition could be significantly reduced if adaptive mechanisms were built into existing development activities. For example, primary health care needs to be complemented by greater efforts in the areas of family planning and nutrition education to increase child survival rates. Similarly, in addition to improved transport infrastructure that increases access to markets, farmers may require assistance in boosting production to adapt more quickly to the new marketing opportunities.

3. DATA AND METHODOLOGY

The analysis in this study relies mainly on data from two household surveys carried out in Kinshasa and Bandundu Town by the INS in 1985/86.[7] These surveys provide, for the first time, fairly comprehensive data on sufficiently large samples of households in these cities to permit a reasonably detailed analysis of poverty, expenditures, and food consumption. This section describes these surveys and the methods used in the ensuing analysis of poverty.

THE SURVEYS

The INS surveys of Kinshasa and Bandundu Town follow essentially the same methodological approach. The description below relates mainly to the Kinshasa survey, but the distinguishing features of the Bandundu survey will also be noted briefly.[8]

The sampling unit is a *parcelle*, which is a built-up piece of land that was inhabited at the time of the survey in 1985/86. Most *parcelles* comprise a single household, but some may be inhabited by two or more households. There were a total of 214,579 *parcelles* in the survey area, which encompassed the 22 of the 24 zones of Kinshasa that have the characteristics of urban areas. These zones were grouped into five strata:

1. Residential: Gombe, Ngaliema, and Limete;
2. Old neighborhoods: Kinshasa, Barumbu, Lingwala, and Kintambo;
3. New developments: Ngiri-Ngiri and Kasa-Vubu;
4. Planned developments: Bandalungwa, Kalamu, Lemba, Metete, and Ndjili); and
5. Extension areas: Mont-Ngafula, Selembao, Bumbu, Makala, Ngaba, Kisenso, Masina, and Kimbanseke.

Within each of the five strata, the sampling ratio was set at 1/200. The sample therefore consisted of 1,073 *parcelles*, of which 1,027 could be surveyed. There were 1,290 households in the surveyed *parcelles*, but comprehensive data could be obtained from only 83.7 percent of them, i.e., 1,080 households. The nonresponse rate tended to be higher in the better-off strata. Details are given in Table 4.

The Kinshasa survey was unique among the urban surveys carried out in Zaire in that the data were collected in four successive rounds over a full calendar

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[7] These surveys were part of a series covering several other cities as well.

[8] For details on how the surveys were conducted, see INS (1984).

Table 4 — Kinshasa and Bandundu Town: Distribution of the Sample by Strate

Strate	No. of Inhabited Parcelles (1)	Sampling Ratio (2)	No. of Parcelles		No. of Households (5)	Households Analyzed		Population Analyzed		Households Analyzed/ Households Interviewed (Percent) (10) = (6)/(5)
			Sampled (3)	Interviewed (4)		Number (6)	Percent (7)	Number (8)	Percent (9)	
Kinshasa										
Quartiers résidentiels	15,003	1/200	75	73	73	48	4.4	360	4.7	66
Anciennes cités	11,085	1/200	56	56	76	59	5.5	470	6.2	78
Nouvelles cités	21,024	1/200	105	105	164	133	12.3	927	12.2	81
Cités planifiées	25,218	1/200	126	126	205	132	12.2	1,111	14.6	64
Quartiers d'extension	142,249	1/200	711	667	772	708	65.6	4,735	62.3	92
Total	214,579	1/200	1,073	1,027	1,290	1,080	100.0	7,603	100.0	84
Bandundu Town										
Quartiers résidentiels	165[a]	1/11	15	15	n.a.	17	2.6	127	3.2	n.a.
Nouvelles cités	5,071[a]	1/11	461	461	n.a.	462	71.1	2,764	70.1	n.a.
Quartiers d'extension	1,870[a]	1/11	170	170	n.a.	171	26.3	1,054	26.7	n.a.
Total	7,106[a]	1/11	646	646	n.a.	650	100.0	3,945	100.0	n.a.

[a] Number of sample parcelles/sampling ratio.

Source: INS (1989a and 1989b).

year (February 1985 to February 1986). The average data for the year, therefore, are free from the influence of seasonal factors (although seasonality is not often a problem in a large city). The survey used two types of questionnaires. A demographic questionnaire gathered data on household size and composition and the occupational characteristics of the household head (sector of activity, type of employment, etc.), among other variables. A budget questionnaire in turn collected data, in four sections, on: (a) revenues (wages and salaries, net income from self-employment, capital income, and other regular and irregular sources of income); (b) nonconsumption expenditures (purchases for the family enterprise, repayment of loans, gifts in cash or kind, contributions to savings associations, and savings); (c) inventory of household durable possessions; and (d) consumption expenditures (on food, housing, clothing, and other items), both in terms of quantity and value. Only a part of these data (mostly related to household characteristics and expenditures) is available for the analysis in this study.

The Bandundu Town survey differed from the Kinshasa survey in the following main respects:

(a) Three strata were covered (Residential, New development, and Extension areas), each with a sampling ratio of 1/11;

(b) Three urban zones were included (Disasi, Mayoyo, and Basoko);

(c) The survey was carried out in a single round during the 30-day period from February 11 to March 12, 1985.

The sample consists of 650 households with full data. For more details, see Table 4.

THE METHODOLOGY

The methodology used in the subsequent analysis of poverty relies on expenditure rather than income data. The latter were not available for this study, but expenditure data are in any case normally preferred for poverty analysis because they tend to be more reliable and subject to less variability over time. Expenditures are also more relevant than income when the focus is on living standards. In order to improve comparability across households of different sizes and composition, household-level variables are normalized, as appropriate, by dividing them by the size of the household into "consumption units." A consumption unit is taken to be a 25-year-old male living in Kinshasa (see next section for details of calculation). The "poverty line" refers to the level determined for a consumption unit. The method of its estimation is described next.

Poverty Line

Using the available data, the poverty line can be estimated through several feasible methods. The one used here involves two stages. The first consists of deriving the level of food expenditures needed to provide an exogenously set level of calorie requirements. The second stage involves determining total needed expenditures by "grossing up" food expenditures to cover nonfood minimum needs. The procedure is applied separately to Kinshasa and to Bandundu Town. This subsection describes the method used and comments on the main alternatives that are available.

The setting of a poverty line involves, in the first instance, determining the minimum consumption requirements for food and nonfood items that would have to be satisfied if the individual (consumer) is not to be considered as poor. This line is expressed in monetary units (zaires per month per consumption unit) and represents the level of income (expenditure) that would permit the individual to meet his minimum consumption needs.

How are these minimum requirements to be set? For food items we shall specify a recommended dietary allowance (RDA) for a consumption unit in calorie terms. Using calories alone to represent all food (nutritional) requirements is a simple and, on the evidence of many studies, sufficient indicator of food consumption. Adequate calorie intake normally guarantees sufficient intake of other nutrients as well (with possible exceptions of small children and pregnant or lactating women). The more controversial aspect is the determination of a particular level of need. FAO/WHO guidelines often serve as benchmarks in this context with alternative levels also tried to test the sensitivity of the results to the choice of the RDA. We shall follow the same approach while considering some other factors to facilitate comparison of our results with those of other researchers on Zaire.

How is the cost of meeting the chosen level of calorie requirements to be determined? Calorie needs are normally met, fully or partially, by consuming a range of different foods, not just the staple(s) with the lowest cost per calorie. (Indeed, this is the only way to ensure that the need for other nutrients will also be met.) The method of calculating the minimum cost should therefore reflect this reality by considering the prevailing diets (influenced by tastes, relative prices, as well as income constraints). This can be ensured by relating actual levels of calorie consumed and the corresponding expenditures. In this case the (implicit) calorie price would reflect actual diet preferences, whereas the price of calories from the cheapest available food items may not. But there is a myriad of functional forms from which to choose. An operationally simple and methodologically satisfactory approach is to estimate a cost-of-calorie function by regressing household food expenditures on household calorie consumption (both expressed per consumption unit) and then to calculate the food expenditures required for the chosen level of RDA. A possible specification is the following (used by Greer and Thorbecke 1986):

$$\ln X_{F,i} = a + b\, C_i, \qquad (1)$$

where $X_{F,i}$ represents food expenditures per consumption unit for household i and C_i is calorie consumption per consumption unit. The log-linear specification implies that the cost per calorie not only rises as calorie consumption increases, but it does so at an increasing rate. Alternative specifications — for example, log- log, which implies constant elasticity of calorie consumption with respect to food expenditures- are also available and may fit empirical data better (as it in fact does in the present study; see next section). Once the appropriate form is established, the cost of the minimum calorie requirements can be determined from the estimated function.

One advantage of this method is that it heeds the actual diet of the population concerned (for example Kinshasa households). But diets are likely to be different among population groups at different levels of income. The log-linear specification already allows for this to a considerable extent. (The property of rising price per calorie at an increasing rate with an increase in calorie consumption is well-suited to a situation where the richer the household, the more expensive the calories consumed.) The procedure *can* be geared explicitly to the more relevant diets by limiting the sample to the poorer sections of the population (say the poorer half) for the estimation of calorie cost functions. In this case the "extravagant" diet of the richer households will not influence the determination of the minimum food expenditures required (or the poverty line). The best specification, of course, may depend on the sample used (whether full or limited to poorer households).

As noted above, the cost-of-calories function (in either log-linear or log-log form) is only one of several possible specifications. This specification was chosen because it reverses the dependent and independent variables, while the usual practice is to regress the calorie variable on expenditures (see, for example, Kyereme and Thorbecke 1987). Apart from its appealing intuitive interpretation, the cost-of-calories function is justified by the very purpose for which the relationship between the dependent and independent variables is being established, namely, to estimate the expenditure required to purchase the RDA level of calories. The expenditure thus depends on the exogenously set RDA, and in regression analysis the dependent variable is predicted for particular values of the independent variable. The treatment of expenditures as the dependent variable also opens up the possibility of estimating a confidence interval for its predicted value corresponding to the RDA. Taking the upper limit of this interval as the food poverty line then ensures that all but 5 percent of the households with at least that level of food expenditures would in fact reach the RDA level (if the confidence level is 10 percent). The predicted value at the center of interval ensures this possibility to only half the households.

What about the cost of nonfood requirements? There are several alternative ways of going from the minimum necessary expenditure on food to the poverty line, and they all amount to grossing up the former by dividing it by the ratio of food expenditure to the sum of food and nonfood expenditures. This ratio is sometimes assumed; more satisfactorily, it is derived from household budget survey data. In the latter case, variations would depend on exactly what was considered to be

nonfood (some nonfood items — for example, alcoholic beverages — may be excluded) and whether the data for all or only part of the entire sample are used (for example, the poorest half). The different alternatives may or may not be consequential in actually estimating the poverty line.

A short-cut method might involve relating calorie consumption directly to total expenditures rather than to food expenditures only. This approach bypasses the need to separately estimate nonfood expenditures and may be used to estimate minimum expenditures (income) needed to fulfill caloric RDA (explicitly) and the accompanying nonfood needs (implicitly). This short-cut method, however, is not as common as the two-stage procedure discussed above. The main reason may be that the estimated regression linking calories and total expenditure tends to be, as might be expected, weaker as a predictive tool (i.e., with a lower R^2) than the one that relates calorie consumption to food expenditure alone. This was indeed the case in this study.

In the specification where the expenditure appears as the independent variable, other explanatory variables may also be added to better account for the variations in calorie consumption. One main reason for doing so would be to account for the economies of scale at the household level (a household twice as large as another of the same age and sex composition would not need to spend twice as much to acquire the same level of calorie consumption if scale economies are present) (see, for example, van Ginneken 1980). Given our cost-of-calories specification, an attempt has been made to incorporate the economies of scale in a different way (to be explained later). However, because the underlying assumptions may not be valid, the main results are presented without taking such economies into account.

Poverty Indices and Profiles

Once the poverty line is determined, individual households (or their members) may be identified as poor or nonpoor depending on whether their expenditure per consumption unit falls below or above the poverty line. The incidence of poverty is then easily determined. But the generation of poverty profiles also involves other indices of poverty that do a better job of aggregating information on the poverty of individuals or households. (The appendix reviews the indices used in this study in the context of the progressive development of the axiomatic approach to the construction of poverty indices.) The emphasis in this subsection is on the relationships among the three measures used in this study.

The simplest, and most inadequate, of these indices is the headcount ratio, or the poverty incidence. This summary statistic retains very little of the information from the data used in its derivation. It also lacks a number of properties that are commonly viewed as desirable in a poverty index. From the standpoint of both theory and practical utility, a far more appealing way of aggregating information on the poverty of individuals or households is to employ a class of poverty measures suggested by Foster, Greer, and Thorbecke (1984).

If y_i stands for expenditure per consumption unit of the *ith* household, z is the poverty line per consumption unit, n is the number of households, and q is the number of poor, then the Foster, Greer, and Thorbecke (FGT) measure is given by:[9]

$$P_\alpha = (1/n) \sum_{i=1}^{q} \left([z - y_i)/z\right)^\alpha \qquad \alpha \geq 0, \tag{2}$$

in which α can take different values. If $\alpha = 0$, $P_0 = H$ $(=q/n)$ is the headcount ratio or the fraction of poor households in the sample. If $\alpha = 1$, $P_1 = HI$, where I $(= (1/q) \Sigma [(z-y_i)/z])$ is the poverty gap ratio (also referred to as the income gap ratio), i.e., the average shortfall of the income of the poor from the poverty line.

The latter index, P_1, is a more satisfactory index of poverty than the headcount ratio, P_0, as it combines information on both the number of the poor and the depth of their poverty. It is, however, indifferent to the redistribution of income among the poor. This insensitivity may be regarded as a shortcoming since the marginal utility of income is likely to be higher for the poorest of the poor than for the less poor and one may presume a social aversion to extreme levels of poverty. The choice of $\alpha = 2$ ensures this sensitivity to the redistribution of income among the poor with the poverty index falling as income is transferred from the less poor to the poorer households. P_2 is then interpretable as a normalized weighted sum of expenditure (income) shortfalls when the weights are the shortfalls themselves.

The principal advantage of these poverty measures is that, while they satisfy a number of desirable axiomatic conditions, they are also additively subgroup decomposable, i.e., the total poverty index is the sum of the poverty indices of the (mutually exclusive and exhaustive) subgroups of the population, each weighted by the share of the subgroup in total population. Hence, if $P_{j,\alpha}$ refers to the poverty index of the *jth* subgroup, we have:

$$P_\alpha = \sum_{j=1}^{m} w_j P_{j,\alpha}, \tag{3}$$

where w_j is the proportion of the population in subgroup j and m is the number of subgroups. The share or "contribution" of each subgroup to total poverty is given by:

$$SH_j = w_j P_{j,\alpha} / P_\alpha. \tag{4}$$

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[9] Equations (2), (3), and (5) appear in the appendix as equations (15), (17), and (18), respectively.

It is the property of decomposability that permits us to create a profile of poverty in each of the two areas under consideration. This profile provides a decomposition of total poverty by selected criteria, such as occupational category of the household head or his or her education, household size, etc.

The FGT index is now routinely employed in the literature on poverty. A similar index has recently been proposed by Ray (1989). It is written as:

$$P_a = (\bar{g}/nz) \sum_{i=1}^{q} (g_i / \bar{g})^a \qquad (5)$$

where $\bar{g} = (1/q) \sum g_i$ is the "mean poverty gap." It differs from the FGT index in that the income gap of the poor in the expression on the right-hand side of the summation sign is divided by the mean poverty gap rather than by the poverty line as in the FGT index. The Ray index satisfies the same axioms as the FGT index and some more besides (see the appendix). The poverty profiles of Kinshasa and Bandundu Town in Section 5 report both these indices side by side for a comparison (see Tables 14 and 15).

4. POVERTY AND FOOD CONSUMPTION: A PRELIMINARY ANALYSIS

This section is concerned with the preliminary stages of the analysis of poverty in Kinshasa and Bandundu Town. It describes the calculation of household size in consumption units, the estimation of calorie "consumption," and the choice of the recommended dietary allowance of calories. The section then presents some preliminary results focusing on differences in major household characteristics by expenditure category.

HOUSEHOLD SIZE IN "CONSUMPTION UNITS"

Households differ in size and composition. These differences have to be accounted for when comparing certain types of household data, for example expenditures. A common approach is to use conversion coefficients that express the needs of each individual member, normally in terms of calories, relative to that of a "consumption unit," typically an adult. These coefficients are then aggregated for each household to determine its size in "consumption units." The variables of interest can be normalized by dividing them by this indicator to improve interhousehold comparisons.

Houyoux (1973) made the first attempt to use such conversion coefficients in Zaire. He applied them in the analysis of his 1969 Kinshasa survey data. Houyoux derived the age- and sex-specific coefficients while estimating the appropriate level of the recommended dietary allowance (RDA) of calories in Kinshasa (see below). The procedure amounts to simply dividing the RDA of each type of individual, as specified by the FAO (1957), by that of the "consumption unit," a 25-year-old male of 65 kg (the average weight of male adults in Kinshasa). This procedure yielded the coefficients for individuals up to 19 years of age; for those 20 or more the coefficients were assumed. The results are presented in Table 5, top panel.

Because the FAO source from which some of the coefficients are derived dates back to the 1950s and the rest are assumed by Houyoux himself, it would be instructive to compare this set of coefficients with others that exist. Two of these are presented in the middle and bottom panels of Table 5. The former (Latham 1965) is recommended specifically for East Africa, and the latter (WHO 1990) is the latest in the series of official recommendations that are issued from time to time by the FAO or WHO.[10] The comparison is best made graphically.

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[10] WHO (1990) gives FAO (1987) as a source and provides recommended dietary intakes with respect to energy for various age groups. The coefficients are calculated by dividing the recommended intake of each group by that of a 25-year-old man weighing 65 kg, our consumption unit, which is 2,700 kcal.

Table 5 – Alternative Sets of Conversion Coefficients for the Calculation of Household Size in Consumption Units (Consumption Unit = 1.00 for a 25-year-old male)

	Sex		
Age Group (Years)	**Male**	**Both**	**Female**
0- 1		0.35	
2- 3		0.41	
4- 6		0.53	
7- 9		0.66	
10-12		0.78	
13-15	0.97		0.81
16-19	1.00		0.75
20-29	1.00		0.71
30-39	0.97		0.69
40-49	0.94		0.67
50-59	0.87		0.61
60 and more	0.79		0.56
0- 2		0.40	
3- 4		0.48	
5- 6		0.56	
7- 8		0.64	
9-10		0.76	
11-12	0.80		0.88
13-14	1.00		1.00
15-18	1.20		1.00
19-59	1.00		0.88
60 and more	0.88		0.72
Up to 1		0.30	
1- 2		0.43	
2- 3		0.50	
3- 5		0.58	
5- 7	0.68		0.65
7-10	0.78		0.67
10-12	0.81		0.72
12-14	0.89		0.78
14-16	0.98		0.80
16-18	1.06		0.80
18-30	1.00		0.81
30-60	0.96		0.81
60 and more	0.81		0.72

Source: For top panel, Houyoux (1973), Annex I.26, pp. 89-91, based on FAO (1957), for 0-19 age groups and assumed for others; for middle panel, Latham (1965), Appendix 1, as cited in Collier et al. (1986), p. 71; and for bottom panel, adapted from WHO (1990), with FAO (1987), as original source. In the last case, for groups involving those more than 18 years of age, the coefficients relate to weights of 65 kg for men and 60 kg for women, these corresponding to average weights in Kinshasa as estimated by Houyoux (1973), p. 89, footnote (4).

As may be seen in Figure 1, for children up to the age of 10 WHO coefficients are significantly higher than those of Latham and Houyoux, which are similar to each other. All three sets then tend to converge for males in higher age groups until 30 (apart from the exceptionally high coefficient for those in the 15-18 age group in the Latham scale) before beginning to diverge again slightly afterwards. The striking difference concerns women, for whom Houyoux's coefficients are substantially below those of WHO and particularly of Latham's. It is difficult to make a convincing case for one or the other of these sets as the most preferable. The WHO set has the advantage of being in the middle for adult women but its coefficients for children may be too high, as argued by Greer and Thorbecke (1986, p. 18ff). Latham's coefficients, on the other hand, may be excessive for adult women. As none of the sets appears to have a decisive advantage over the others, this study uses Houyoux's coefficients, which may be better adapted for use in urban Zaire.

CALORIE "CONSUMPTION"

The estimation of the poverty lines involves the household-level regression of food expenditures on calorie consumption, both expressed per unit of consumption. Calculating these variables is, in principle, straightforward, but in practice, calculating the latter gives rise to issues that will be dealt with later in this subsection.

The survey questionnaire in each town obtained household expenditure data relating to 139 food items. The quantities purchased were also collected but in traditional units (a bag, a glass, a pile, etc.). If these quantities could be converted into standard units of weight and volume, it would be simple to calculate household calorie consumption per consumption unit, the desired variable. However, a particular traditional unit does not always have a more or less exact equivalent in grams or liter. The commodity-specific average metric equivalents given for traditional units by the INS proved to be generally poor guesses; they were internally inconsistent and yielded rather absurd results.[11] The implicit commodity prices that were derived on the basis of these average figures, for example, were entirely implausible, both as to their levels and their variations across households. Hence, the survey data on food quantities were abandoned as unusable.[12]

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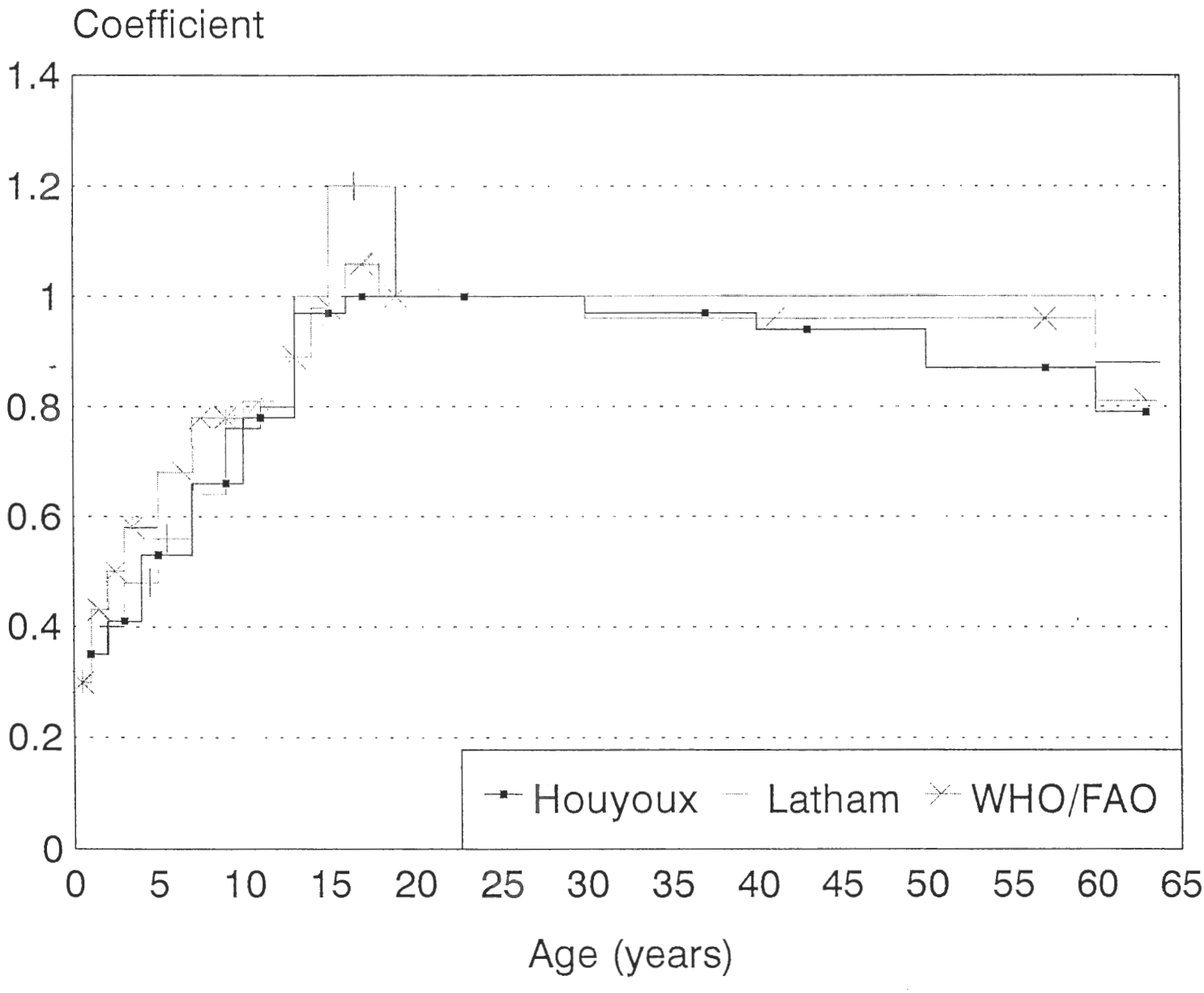
[11] The surveyors were rarely equipped to measure the quantities in standard units. Since the weight (or volume) of a traditional unit could vary widely for each commodity, accurate conversion would have required measuring every food item in every household in every interview round. This would have been a formidable, perhaps even impossible, task.

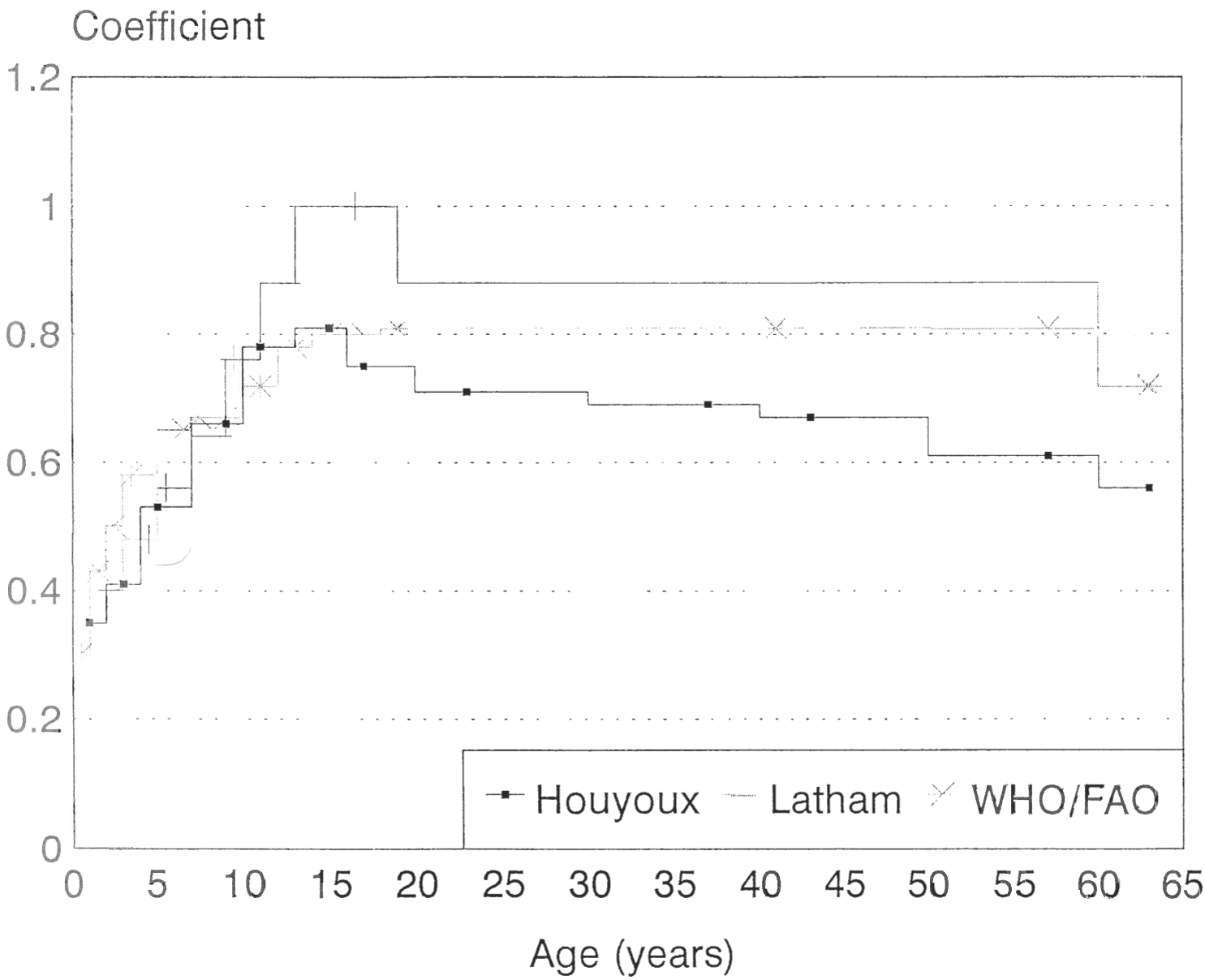
[12] This, it must be stressed, is not because these data are necessarily inaccurate but because they could not be converted into standard units. If traditional units cannot be converted into metric equivalents, then it is pointless to collect data on quantities in traditional units, however accurate

Figure 1a — Alternative Sets of Conversion Coefficients: Males



Source: Table 5.

Figure 1b — Alternative Sets of Conversion Coefficients: Females



Source: Table 5.

Parallel to the main surveys, the INS had also carried out price surveys in the main food markets of Kinshasa and Bandundu Town. The surveyors had systematically measured the quantities in standard units on site. The average price per kilogram or liter of each item in each town are reported in INS (1989c and 1989d). We have relied on these average prices to estimate the purchased quantities of various food items for each sample household. These quantities were then converted into calories,[13] summed over all food items, and divided by household size in consumption units to estimate the household calorie purchase per consumption unit.

The use of a citywide average price to arrive at the purchased quantity of each food is a common practice that would not bias the results unduly if all sample households paid more or less the same price. Where this is not the case, a bias is introduced in the derived quantity figures. Poorer households tend to pay less than average prices and richer ones more. For a given food expenditure, therefore, the use of a single average price for all households would understate the quantity (calories) purchased by the poor and to overstate that by the rich. The derived calorie distribution is, therefore, flatter and displays greater variation than the actual distribution. Thus, while exceedingly low or exceedingly high calorie figures are likely to suggest erroneous food expenditure data, a certain amount of underestimation at the lower end of the distribution and some overestimation at the higher end is to be expected and would not signify inaccuracy in the underlying data. This fact must be borne in mind in selecting an "acceptable" range for the calorie variable (see below).

Another source of bias is the difference between consumption and expenditure: all foods purchased during the surveys' reference periods are not necessarily consumed during that same period. This difference is less likely to be consequential in Kinshasa, where the survey period was a full year, than in Bandundu Town, where it was only one month. The question of seasonality, therefore, may arise in the latter case although not much can be done about it.

Table 6 and Figure 2 give the frequency distributions of calories per consumption unit per day for the full samples of Kinshasa and Bandundu Town. No particular anomaly appears in the Bandundu distribution: some values are extreme to be sure, but at *both* ends of the distribution. The mean of the distribution is 2,744 calories per consumption unit per day, an apparently reasonable figure. Any errors in the Bandundu survey data, therefore, appear to be random. In the case of Kinshasa, however, while few households have improbably low calorie figures, a large number of them have extremely high figures. The mean of the distribution is the impossible figure of 6,106 calories per consumption unit per

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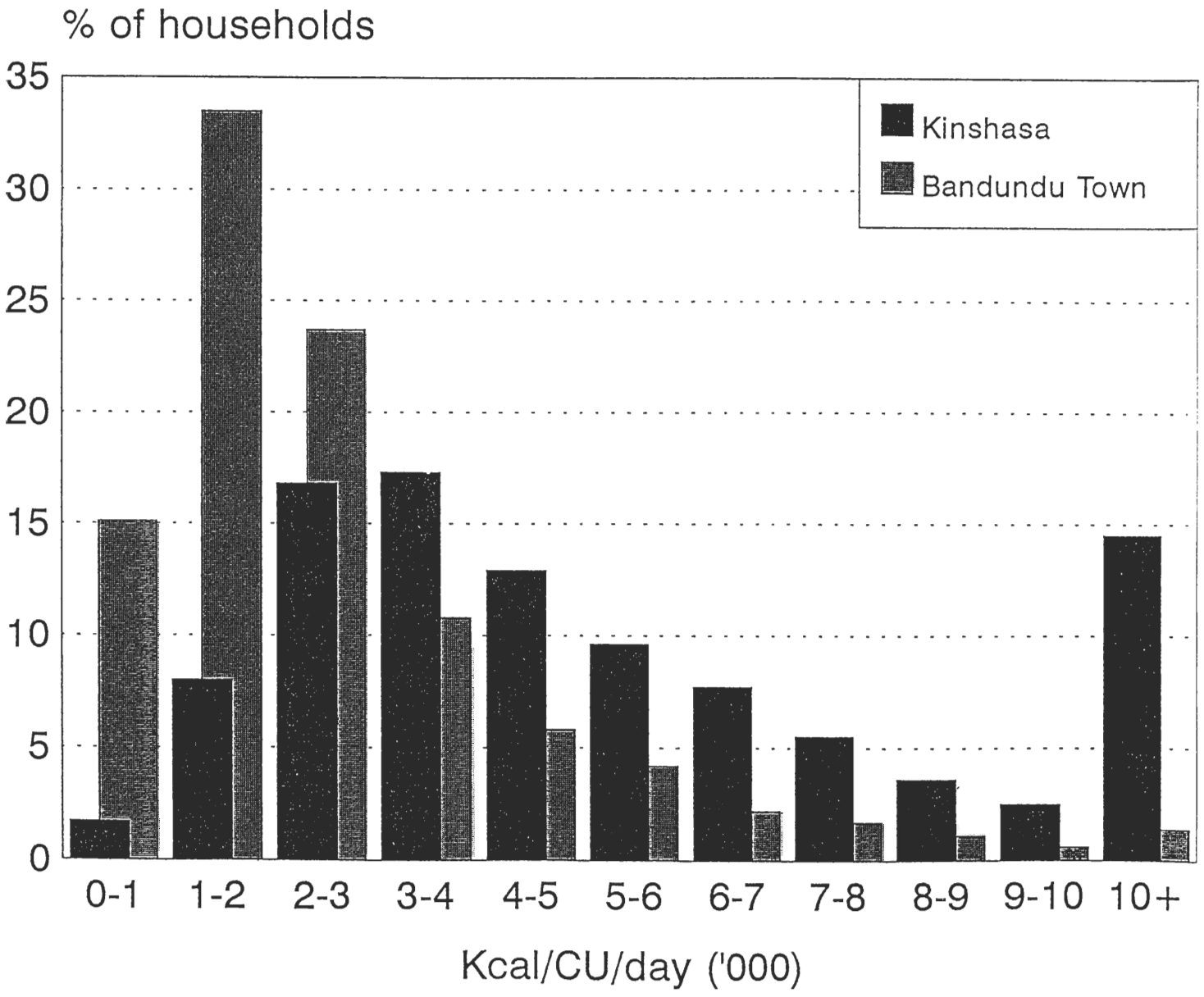
they may be. The INS indicated that they would keep this point in mind in the design of their future surveys.

[13] This was done using the food composition table in Université Catholique de Louvain (1977), pp. 167-172. A similar food composition table may also be found in Houyoux (1971), pp. 118-142.

Table 6 – Kinshasa and Bandundu Town: Frequency Distribution of Calories for Sample Households

Calories per Consumption Unit per Day	Kinshasa		Bandundu Town	
	Number	Percent	Number	Percent
Below 600	4	0.4	31	4.8
600-below 800	4	0.4	35	5.4
800-below 1,000	10	0.9	32	4.9
1,000-below 5,000	593	54.9	480	73.8
5,000-below 5,500	62	5.7	16	2.5
5,500-below 6,000	42	3.9	11	1.7
6,000-below 6,500	40	3.7	10	1.5
6,500-below 7,000	43	4.0	4	0.6
7,000-below 8,000	59	5.5	11	1.7
8,000 and more	223	20.6	20	3.1
Total	1,080	100.0	650	100.0

Figure 2 — Kinshasa and Bandundu Town: Frequency Distribution of Calories per Consumption Unit per Day



Source: Table 6.

day! Evidently, such a systematic bias in the Kinshasa data cannot be due to random errors.

What might be the reason(s) for this bias? The first possibility to consider is that the Kinshasa survey data (food expenditures and/or prices) may simply be less reliable than those of Bandundu. If average prices, for example, are biased downward in Kinshasa, the calorie figures would have a bias in the opposite direction.[14] This possibility, however, can safely be dismissed as improbable since all indications regarding the conduct of the surveys suggest that, if anything, the contrary is likely to be the case. Kinshasa data are at least as reliable as Bandundu data.

We can also rule out another apparent explanation having to do with the time lag, as mentioned above, between the food expenditure and the food consumption. While the link between the two may be tenuous over short spans of time (when expenditures can systematically exceed consumption as households take advantage of low seasonal prices), a longer survey period would tend to diminish this discrepancy. Food expenditure and consumption would average out over a longer time span. The Kinshasa survey covered a period of one year but the Bandundu one concerned only one month. Ceteris paribus, therefore, one would expect the former to be less biased, if at all, by seasonal discrepancy between expenditure and consumption than the latter.

A more plausible explanation has to do with cultural obligations: many richer households would assist the poorer members of the extended family, particularly the children, by bringing them over to live with them. They also employ servants. Both these categories share in the consumption of foods purchased by the household but would not have counted as its bona fide members by the survey.[15] This possibility, which would give an upward bias to the calorie variable at the high end of the income scale, accords rather well with the observation that only the Kinshasa sample suffers significantly from inflated calorie figures. (Both practices are likely to be far more common in the capital city than in the poorer Bandundu.) We have no indication, however, of the extent of such a bias.[16]

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[14] Average prices for the major food items were almost always higher in Kinshasa than in Bandundu, often substantially.

[15] I am grateful to wa Bilenga Tshishimbi who suggested this fact as a possible explanation.

[16] In an attempt to understand how the poor in Kinshasa survive when the "official" economy has collapsed and aggregate statistics appear to be incompatible with the survival of the poor, Maton (1992) looks in detail at the possible clues to this puzzle. Of the several possibilities that he considers, two are relevant in the present context: (a) survey prices, in particular for cassava, may be higher than what the poor actually pay; and (b) mechanisms of redistribution between the rich and the poor are varied and widespread. While we have noted the presence of these and discussed the direction of the biases due

Survey data of the kind under consideration often yield values of calories per consumption unit per day, which are outside of a "reasonable" range. In a similar study of rural Kenya, for example, some 23 percent of the observations had to be excluded because the resulting values of this variable were outside of a 1,000-5,000 range, or the implied consumption of some major food items were excessive (Greer and Thorbecke 1986, Appendix A). Another study on Ghana imposed a range of 800-5,500 as realistic from a nutritional viewpoint but did not specify the proportion of the observations that were thereby excluded (Kyereme and Thorbecke 1987, p. 1198).

In our case, the choice of any "reasonable" range would eliminate an overwhelming proportion of higher-income sample households in Kinshasa. In Bandundu Town households at both ends of the scale would be eliminated more or less equally. In the less problematic case of Bandundu, where there is nothing unusual about the frequency distribution, a range of 800-6,000 calories per consumption unit per day has been selected to identify usable observations. This range was chosen after a series of experimental runs and consultations with Zairian experts. It is slightly larger than is normally allowed on nutritional grounds alone (see above) because two additional factors, working in opposite directions, were also considered in setting the limits. On the one hand, as mentioned earlier, our use of average commodity prices leads to calorie figures whose distribution is more spread out than is actually the case. A wider range retains some of the observations with accurate data that would otherwise have been unjustifiably excluded because of the inherent bias in the method of calculating the calorie variable. On the other hand, the range cannot be allowed to be too wide because of the risk of including observations for which food purchases do indeed differ from consumption during the survey period (a potentially serious problem in Bandundu where the survey period was only one month). The selected range is therefore a compromise, intended to strike a balance between the need to retain accurate observations and the necessity of excluding erroneous observations or observations with significant divergence between expenditure and consumption. The choice of the 800-6,000 range retained 539 observations out of a total sample size of 650 in Bandundu Town (a "loss" of 17 percent of the sample).

Similar considerations also influenced the selection of the range in Kinshasa, but the upper limit is set at the higher level of 7,000 on account of the greater diversity of prices,[17] hospitality given to poorer members of the

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to them, these factors are probably insufficient to account for the excessive level of average calorie figure in Kinshasa and particularly for its distribution in the sample.

[17] Prices in Kinshasa for the same item are likely to vary much more than in Bandundu Town because, among other reasons, of the greater diversity in the type and quality of foods available (Kinshasa being many times larger than Bandundu Town). Tollens et al. (1992), for example, found a wide divergence in the prices of a key staple food, cassava, in the different markets of Kinshasa (cited in Maton 1992, p. 2).

extended family and the employment of servants. The 800-7,000 range retained 790 households out of a sample of 1,080 in Kinshasa (a "loss" of 27 percent). The modification of the acceptable range within reasonable limits would, of course, change the "loss" rate but the essential difference remains: there are relatively many more "outliers" in Kinshasa than in Bandundu.

A legitimate question that may be posed at this stage is whether the restriction of calorie "consumption" levels to a "reasonable" range would change, in any significant way, the principal characteristics of the sample of households in each town. Some relevant results are presented in Table 7. As may be seen, imposing a range in Kinshasa leads to a drastic reduction in average household expenditure and the means of all four of its components (food, housing, clothing, and other items, mainly services). This reflects the fact that the limits imposed cut off a far larger proportion of households at the higher end of the expenditure distribution than at the lower end. In Bandundu Town, imposing the range also reduces average household expenditure and most of its components, but comparatively very little. The means of the calorie variable are affected similarly. In both towns, however, the effect on the patterns of expenditures are marginal.

The lower parts of Table 7 present the distributions of the full and restricted samples in both towns by a number of criteria that are typically associated with the poverty status of households. The average Kinshasa household is larger in the restricted sample than in the original one but there is little change in Bandundu. Female-headed households are less well represented in the restricted sample of Kinshasa, as are all households whose head is not a wage worker. In Bandundu, again, the differences are too small to matter. In conclusion, it may be surmised that the particular restriction that has been applied to the calorie variable has, somewhat unjustifiably, excluded a disproportionately large section of the better-off households in Kinshasa. This is far less likely to be the case in Bandundu Town. The main effect of the restriction in Kinshasa is that it would tend to exaggerate the extent of poverty. In order to avoid distortions arising from the restriction of the sample the parts of the study that do not involve calorie consumption will use the full sample.

THE CHOICE OF RDA

The determination of the recommended dietary allowance (RDA) is a task for nutritionists and should pose no particular problems as long as the environmental conditions, physical characteristics of the individual (sex, weight, etc.), and his or her level of activity are known and taken into account. FAO and WHO have recommended RDA levels, as have national health agencies and scientific studies. It appears that in the case of Zaire, only Houyoux (1973) has calculated a recommended level of calorie intake per consumption unit, using the FAO standards and accounting for conditions in Kinshasa. The calculated level of the RDA is 2,960 calories for a 25-year-old Kinshasa male with a normal level of activity, the consumption unit (CU) adopted in this study. Its calculation is described in the next paragraph.

Table 7 – Kinshasa and Bandundu Town: Comparison of Full and Restricted Samples

	Kinshasa		Bandundu Town	
	Full Sample	Restricted Sample	Full Sample	Restricted Sample
Number of households	1,080	790	650	539
Average expenditure per household (zaires per month)	10,446	7,968	2,607	2,451
Food	6,677	5,143	1,936	1,798
Housing	1,680	1,149	288	293
Clothing	722	675	167	162
Other	1,367	1,001	216	198
Percent share in total expenditures	100.0	100.0	100.0	100.0
Food	63.9	64.5	74.3	73.4
Housing	16.1	14.4	11.0	12.0
Clothing	6.9	8.5	6.4	6.6
Other	13.1	12.6	8.3	8.1
Calorie per consumption unit per day	6,106	3,780	2,744	2,410
Protein per consumption unit per day (gram)	96.6	58.9	51.9	46.5
Average household size				
Number of members	7.04	7.62	6.07	6.01
Consumption unit	5.19	5.65	4.58	4.52
Sex and education of household head				
Percent female	11.0	8.7	13.4	13.4
Percent with no or only primary education	41.3	43.0	47.2	46.2
Socio-professional category of head	100.0	100.0	100.0	100.0
Percent inactive and other	6.2	5.6	9.1	9.1
Percent cadres	6.5	6.1	4.8	4.6
Percent salaried employees	33.0	32.8	30.8	31.2
Percent self-employed	24.5	23.5	35.2	34.5
Percent wage workers	29.8	32.0	20.2	20.6

Note: Restricted sample is limited to observations for which the calorie variable lies in the range of 800-7,000 calorie per consumption unit per day in Kinshasa and 800-6,000 in Bandundu Town.

The point of departure for Houyoux's procedure (1973, Annex I.26, pp. 89-92) is to adopt the FAO-specified level of 3,200 kcals per day for a 25-year-old male of 65 kg living in an area with a mean temperature of 10°C and engaged in "normal" activities. The average weight of male adults in Kinshasa, he estimated, was 65 kg but the mean temperature was 25°C. The adjustment for temperature difference was made by reducing calorie requirements by 0.5 percent for each 1°C rise in temperature (a total of 7.5 percent in this case). A 25-year-old male in Kinshasa is therefore estimated to require 2,960 kcals per day. A similar procedure for a 25-year-old female weighing 59 kg yielded, starting from the FAO figure of 2,269 kcals per day, an RDA of 2,099 kcals in Kinshasa (71 percent of the corresponding figure for a male counterpart).

Is the level of RDA for a consumption unit as calculated above, 2,960 kcals per day, an appropriate level for use in this study? Without entering into the variety of arguments that oppose nutritionists in setting the minimum level required, it may be noted that various poverty studies have used rather different RDAs. This fact underlines the somewhat arbitrary nature of the resulting poverty estimates since the level of the RDA is a major determinant of the poverty incidence. FAO-recommended levels, it has sometimes been argued, exaggerate average requirements, ignoring intra-individual (over time) and inter-individual differences. Greer and Thorbecke (1986) appear to share this view and use a basic RDA of 2,250 kcals per adult equivalent (defined as any male or female above 15 years of age) in their analysis of Kenyan smallholders. Given the uncertainty, they also carry out a sensitivity test of the results using two other RDA levels, one 15 percent below the basic level and another 15 percent above. In the Ghana study mentioned earlier, Kyereme and Thorbecke (1987, pp. 1190-1191, and Note 5, p. 1198) used the FAO-recommended level of 2,092 kcals per adult equivalent, based on adult weights of 58 kg (male) and 50 kg (female), with sensitivity tests involving figures that are 10 percent below and above the basic level. It appears, however, that in this study an adult equivalent is actually a *male* person of 15 years of age and above since the coefficient applied to a *female* adult is 0.8 (Kyereme and Thorbecke 1986). If this interpretation is correct, the basic RDA for an adult equivalent would be only 1,880 when an adult is equally likely to be male or female. Finally, the WHO source referred to earlier recommends, following another FAO recommendation (FAO 1987), a level of 2,700 for a man and one of 2,200 for a woman in the 18-30 age bracket (WHO 1990, p. 168).

Assuming that the population is divided equally between males and females, the simple average of Houyoux's figures, 2,960 for a male adult and 2,099 for a female one, yields an RDA of 2,530 for an adult. This average may be compared with the basic RDA of 2,250 in the Kenya study (which is 9 percent lower) and the calculated average figure of 1,880 in the Ghana study (26 percent lower).[18] Accordingly, we shall treat the Houyoux RDA as the "high" variant in our analysis.

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[18] The comparisons are approximate because the age ranges are not the same.

Ben-Senia (1991), in his analysis of rural Bandundu, also regards the FAO-norms-based Houyoux estimate of 2,960 for a (male) consumption unit (which he adjusts slightly upward to 3,000 to account for the more strenuous work performed by the rural populations) as too high. His sensitivity tests use several lower figures as well, of which the lowest, 2,550, is his preferred alternative. This is 15 percent lower than the starting figure and is considered more realistic, in part because the measured calorie intakes in his survey were "certainly underestimated" (Ben-Senia 1991, pp. 26-27). Partly to be able to compare urban and rural areas in Bandundu, we also adopt a variant with an RDA that is 15 percent lower than the high case, i.e., 2,516.

As the final variant in our sensitivity tests, we opt for an RDA level that is 30 percent lower than the "high" case. This implies a figure of 2,072 for a (male) consumption unit, which is just below the basic level used in the Ghana study, i.e. 2,092 for a (male) adult equivalent. We consider this level to be much too low to provide realistic estimates of the extent of poverty in our analysis. This level is probably more appropriate for identifying "extreme" poverty, but the justification for its adoption is simply to have a wide enough range for the RDA in tests of sensitivity. Our "high," "medium," and "low" variants for the RDA are, therefore, 2,960, 2,516, and 2,072 calories per day, respectively, for a (male) consumption unit. The middle figure probably comes closest to what an "appropriate" RDA level would have been for our study, had it been known.

HOUSEHOLD DEMOGRAPHIC AND SOCIOECONOMIC CHARACTERISTICS

In a preliminary effort to identify the differences in characteristics between poorer and richer households (i.e., before poverty lines are established in the next section), sample households are grouped by the level of monthly consumption expenditures (MCE) per consumption unit (CU). These comprise expenditures on food, lodging, clothing, and other items that are intended for the actual consumption of household members. They exclude expenditures on items to be given away (gifts, etc.), to be resold, or to be used in household business activities (which collectively constitute nonconsumption expenditures).

Four categories of households are identified in each of the two urban centers (Kinshasa and Bandundu Town) by the level of MCE per CU: the poorest 30 percent of households (LOW30), the next 30 percent with intermediate levels of the variable (MED30), the richer 30 percent (HIGH30), and the richest 10 percent of households (TOP10). This grouping of households is designed to be both simple and able to capture the essential differences that may exist between poorer and richer households.

Demographic Characteristics of Households by Expenditure Category

Table 8 assembles the results relating to some household demographic characteristics by expenditure category. Kinshasa households are fairly large, averaging seven members. The average household in Bandundu Town is somewhat

Table 8 – Kinshasa and Bandundu Town: Demographic Indicators by Monthly Consumption Expenditures Per Consumption Unit Category

Indicator	Kinshasa					Bandundu Town				
	LOW30	MED30	HIGH30	TOP10	Total	LOW30	MED30	HIGH30	TOP10	Total
Households										
Number	324	324	324	108	1,080	195	195	195	65	650
Percent	30	30	30	10	100	30	30	30	10	100
Population										
Number	2,768	2,382	1,948	505	7,603	1,521	1,239	914	271	3,945
Percent	36.4	31.3	25.6	6.6	100.0	38.6	31.4	23.2	6.9	100.0
Household size	8.5	7.4	6.0	4.7	7.0	7.8	6.3	4.7	4.2	6.1
per household	6.4	5.4	4.4	3.3	5.2	5.9	4.8	3.5	3.1	4.6
Age of household head (years)	44.4	41.3	40.9	39.9	42.0	44.5	43.0	36.7	36.0	40.9
Education of household head (years)	6.6	7.9	8.4	9.0	7.8	6.3	6.3	8.3	9.3	7.2
Percent female-headed households	11.4	11.4	10.8	13.0	11.4	10.8	14.9	14.4	13.8	13.4
Marital status of household head										
Single	2.5	4.3	4.9	11.1	4.6	7.2	10.8	20.5	21.5	13.7
Married (monogamous)	79.6	79.3	76.5	67.6	77.4	73.9	69.2	64.6	61.5	68.5
Married (polygamous)	7.1	3.1	6.5	9.3	5.9	7.2	7.2	4.1	4.6	6.0
Divorced	3.7	5.9	3.7	2.8	4.3	2.1	6.7	4.6	7.7	4.8
Widow(er)	6.5	4.9	6.8	6.5	6.1	9.2	5.6	5.1	4.6	6.5
Others	0.6	2.5	1.6	2.8	1.7	0.5	0.5	1.0	0.0	0.6

[a] Number of inactive household members (age groups 0-14 and 65 or more) divided by that of active members (age group 15-64).
[b] Unweighted mean of household-level data.

smaller, 6.1 members per household. The difference is partly due to the considerably higher proportion of single-member households in Bandundu than in Kinshasa. (As a close indicator, households headed by singles represent 13.7 and 4.6 percent of all households, respectively.)

In both cities, household size (whether in terms of the number of members or of consumption units) is negatively associated with the level of expenditure per consumption unit. Since household size is, at the same time, positively associated with total household expenditures, it has sometimes been argued that these opposite results are primarily due to the socio-cultural phenomenon of richer households having to accommodate and provide for members of their extended families. While this is no doubt the case, alternative hypotheses having to do with differences in socioeconomic characteristics may also be advanced (smaller households, for example, tend to have better educated heads).

Richer households have younger and better educated heads. The average age and the number of years of formal education of household heads are similar in Kinshasa and Bandundu Town, 41-42 years of age and 7-8 years of schooling. And in both cities, the average age of the household head drops and his or her level of education rises consistently with expenditure per consumption unit.

The proportion of female-headed households is 11.4 percent in Kinshasa and 13.4 percent in Bandundu Town. The sex of the household head does not seem to be associated in any systematic way with the level of expenditure per consumption unit in either of the two cities. Female-headed households do not appear to be poorer than male-headed ones. Concerning marital status, in Kinshasa 77.4 percent of household heads have one spouse and 4.6 percent are unmarried; those with more than one wife, and those who are divorced or widowed each account for about 4-6 percent of the total. In Bandundu, the sole notable difference (already mentioned earlier) is the much higher proportion of unmarried heads of household (13.7 percent, three times that in Kinshasa) and the correspondingly lower proportion of monogamous households (68.5 percent). Households headed by singles tend to be underrepresented in lower expenditure categories and more than proportionately represented in higher ones. The reverse tends to hold for households with married heads. This is in fact one manifestation of the inverse relationship between household size and expenditure per consumption unit and may well reflect, at least in part, the generally higher educational levels of single heads of households than of married ones (not shown in Table 8).

Socioeconomic Characteristics of Households by Expenditure Category

Starting with the type of neighborhood area, it may be seen from the results in Table 9 that most households in Kinshasa live in various extension areas, which tend to be the least attractive quarters of the city. As testimony to the diversity of such areas, no less than 50 percent of the richest households also live in extension areas. Indeed, this appears to characterize the entire city since households of all expenditure categories may be found in all types of neighborhoods. It is nevertheless possible to regard the "residential areas" as

Table 9 – Kinshasa and Bandundu Town: Distribution of Households by Monthly Consumption Expenditures per Consumption Unit and Strate

	Percent of Households					MCE/CU[a]
Strate	LOW30	MED30	HIGH30	TOP10	Total	Mean[b] (zaires)
Kinshasa						
Quartiers résidentiels	2.5	3.4	4.3	13.9	4.4	9,862
Anciennes cités	3.4	5.9	6.8	6.5	5.5	3,837
Nouvelles cités	14.2	11.7	12.0	9.3	12.3	2,318
Cités planifiées	13.0	9.6	11.4	20.4	12.2	2,592
Quartiers d'extension	67.0	69.4	65.4	50.0	65.6	2,060
Total	100.0	100.0	100.0	100.0	100.0	2,385
Bandundu Town						
Quartiers résidentiels	1.0	2.6	1.5	10.8	2.6	2,006
Nouvelles cités	74.4	72.8	68.7	63.1	71.1	662
Quartiers d'extension	24.6	24.6	29.7	26.2	26.3	715
Total	100.0	100.0	100.0	100.0	100.0	711

[a] Monthly consumption expenditures per consumption unit.
[b] Unweighted.

the most privileged, followed by old neighborhoods and planned developments. New developments come next, followed by the extension areas.

Bandundu Town is much younger than Kinshasa. Some 71 percent of households live in new developments which, however, may not be any more attractive than extension areas where more than a quarter of the town's population lives. Indeed, the mean expenditure per consumption unit is lower in new developments than in extension areas. As with Kinshasa, "residential areas" have a higher concentration of the rich than the town as a whole, although nearly 90 percent of the rich live elsewhere.

As regards the possible association between the expenditure level and the socio-professional category of the household head, it may be observed in Table 10 that the relationship appears to be particularly weak in Kinshasa. In Bandundu it can more readily be seen that the "cadres" are most heavily represented in the highest expenditure group and the working class in the lowest. Interestingly, the inactive (*sans objet*) tend to be rather better off than expected in Bandundu Town but not in Kinshasa.

Finally, Table 11 reports some results regarding the level and the structure of expenditures in the four groups in each city. The average expenditure per consumption unit of the top 10 percent of the sample households is more than 10 times that of the lowest 30 percent in both Kinshasa and Bandundu Town. The structure of expenditures in each city moves in line with expectations, with the share of food declining as the average expenditure rises. The poorer status of Bandundu Town relative to Kinshasa may also be seen in the higher share of food in the average budget. The poorest 30 percent of the Bandundu households spend more than four-fifths of their expenditure on food.

Table 10 – Kinshasa and Bandundu Town: Distribution of Households by Monthly Consumption Expenditures per Consumption Unit and Socio-Professional Category of the Household Head

	Percent of Households					MCE/CU[a]
Socio-Professional Category	LOW30	MED30	HIGH30	TOP10	Total	Mean[b] (zaires)
Kinshasa						
Cadre	5.3	2.2	4.0	3.7	6.5	3,578
Salaried employees	14.2	31.2	34.6	38.9	33.0	2,347
Self-employed and employers					24.5	3,388
Self-employed	21.9	25.0	22.5	23.2	23.2	2,389
Employers						
with <10 workers	1.5	0.3	0.3	0.0	0.6	6,974
with >10 workers	1.2	0.6	0.3	0.9	0.7	31,450
Skilled workers	12.7	14.2	13.6	17.6	13.9	1,997
Semiskilled workers	5.2	8.0	8.6	7.4	7.3	1,895
Unskilled workers	6.8	10.5	10.5	2.8	8.6	1,954
Inactive and other	5.3	8.0	5.6	5.6	6.2	2,896
Total	100.0	100.0	100.0	100.0	100.0	2,385
Bandundu Town						
Cadre	2.1	6.2	3.1	13.9	4.8	1,453
Salaried employees	30.8	31.8	29.2	32.3	30.8	685
Self-employed	36.9	34.9	35.9	29.2	35.2	617
Skilled workers	12.8	13.3	10.8	6.2	11.7	587
Semiskilled workers	4.6	3.1	2.6	0.0	3.1	643
Unskilled workers	6.7	5.1	5.6	1.5	5.4	531
Inactive	6.2	5.6	12.8	16.9	9.1	1,062
Total	100.0	100.0	100.0	100.0	100.0	711

[a] Monthly consumption expenditures per consumption unit.
[b] Unweighted.

Table 11 – Kinshasa and Bandundu Town: Level and Structure of Expenditures by Monthly Consumption Expenditures per Consumption Unit

	Kinshasa					Bandundu Town				
Variable	**LOW30**	**MED30**	**HIGH30**	**TOP10[a]**	**Total[a]**	**LOW30**	**MED30**	**HIGH30**	**TOP10**	**Total**
MCE per CU[b] (zaires)										
Mean[c]	790	1,525	2,913	8,224	2,385	242	440	822	2,605	711
Range	110-1,132	1,132-2,005	2,005-4,550	4,550-55,750	110-55,750	54.0-337.5	337.5-554.4	554.4-1,320	1,320-17,640	54.0-17,640
Expenditure structure (percent)										
Food	72.0	69.4	65.7	55.5	65.1	81.2	78.3	74.9	65.7	74.2
Lodging	12.4	12.8	13.7	24.3	15.8	10.0	10.7	11.0	12.0	11.1
Clothing	5.1	6.8	7.9	7.0	7.0	3.0	4.0	6.3	10.5	6.4
Other	10.5	11.0	12.7	13.2	12.1	5.2	7.0	7.8	11.8	8.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[a] One observation with an unlikely total expenditure figure was dropped.
[b] Monthly consumption expenditures per consumption unit.
[c] Unweighted mean of household-level data.

5. POVERTY PROFILES

This section builds on the preparatory work of the preceding one to construct poverty profiles for Kinshasa and Bandundu Town in the mid-1980s. It begins by describing the determination of poverty lines under different assumptions and then presents estimates of poverty incidence for various groups of households in each town. Next, poverty profiles are generated for Kinshasa and Bandundu Town by decomposing total poverty according to household characteristics that were earlier found to be associated with poverty. The main results of a multivariate analysis are discussed, and some statistics of inequality are presented at the end.

DETERMINATION OF POVERTY LINES

The cost-of-calorie function is the basic relationship required to derive the poverty lines. Alternative functional forms will have different properties from a theoretical point of view and may differ in the goodness-of-fit to the data. Several specifications with reasonable properties were tried, and Table 12 presents the results of two that are statistically the most significant. The semilog specification, used in both the Kenya and Ghana studies mentioned earlier, assumes that cost per calorie rises with increased consumption of calories, and at an ever-increasing rate.[19] This is a reasonable expectation under many circumstances but the scattergram of our data indicated that this specification was not the most appropriate in this instance. The log-log specification, which assumes a constant elasticity of calorie consumption with respect to food expenditures, proved to be somewhat better for both cities, as evidenced by the higher values of the coefficient of determination. This result suggests that the differences in food composition between the richer and poorer households are not dramatic, at least insofar as cost per calorie is the criterion for the differentiation of food items. For the base run of the results the selected regression has been used to derive the level of food expenditure per consumption unit that is necessary to permit meeting the RDA.

In order to estimate the poverty line, food expenditures have to be supplemented with the minimum expenditures necessary to satisfy essential nonfood needs. The procedures commonly used to arrive at the latter are usually simple

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[19] This assumption is not necessarily at odds with our earlier use of average prices for individual food items in the derivation of calorie consumption. Since food composition differs across households, with richer ones consuming more expensive foods than poorer ones, cost per calorie would be higher for the former when all foods are lumped together although it would be the same for all types of households as far as each particular food item is concerned.

Table 12 – Kinshasa and Bandundu Town: Alternative Specifications of Calorie Cost Function (dependent variable: LFEXUC)

	Intercept	CALUC	LCALUC	$\bar{R}^2$	F	N
Kinshasa						
Semi-log	8.17452 (324.68)	0.0002825 (45.71)	–	0.73	2,089	790
Log-log	1.07083 (7.09)	–	1.00307 (54.17)	0.79	2,935	790
Bandundu Town						
Semi-log	5.19008 (155.79)	0.0003254 (26.28)	–	0.56	690	539
Log-log	-0.28121 (-1.21)	–	0.81548 (27.00)	0.58	729	539

Notes:

LFEXCU = Log of food expenditures per consumption unit (for the year of survey in Kinshasa and for the month of survey in Bandundu);
CALUC = Calories per consumption unit per day;
LCALUC = Log of CALUC.

Figures in parentheses are t-statistics.

and ad hoc, relying essentially on some estimate of the share of nonfood expenditures in total expenditures. Alternative approaches differ in their exact choice of this share. The choice may be based on the entire sample of households or on a truncated sample that includes only households around the poverty line. In our case, this share is derived from the restricted sample used to estimate the cost-of-calorie function.[20]

POVERTY INCIDENCE

Table 13 presents the estimated poverty lines and incidences for Kinshasa and Bandundu Town. The three poverty lines in each town correspond to the three RDA levels selected in the previous section: 2,960 calories per consumption unit per day (the high case), 2,516 (the medium case), and 2,072 (the low case). The higher monetary values of the poverty lines in Kinshasa reflect essentially the higher prices of the capital city relative to Bandundu Town, a far smaller town with certain rural characteristics.

The incidence of poverty in Kinshasa is estimated at 45.4 percent of the (restricted) sample population for the "high" poverty line, 32.1 percent for the "medium" case, and 20.4 percent for the "low" case. In Bandundu Town the corresponding figures are 80.5, 75.6, and 64.4 percent, respectively.[21] The ranges may appear large, particularly in Kinshasa, but this feature was built into the estimates deliberately for the sake of sensitivity tests; the medium estimates are likely to be the most appropriate measures of the extent of poverty. Regardless of the precise figures involved, however, poverty appears to be far more extensive in Bandundu Town than in Kinshasa. To take the medium estimates, while in Kinshasa nearly every third household lives below the poverty line, in Bandundu two out of every three households are poor. Note also that incidence figures referring to the population are always higher than the corresponding incidence for households. This arises from the fact that poorer households are, on average, larger than richer ones.

The incidence results above call for several observations to clarify the limits of their reliability. First, the Kinshasa poverty incidences are rather sensitive to the choice of the range for the calorie variable, with a higher upper limit resulting in a reduction in poverty. The changes, within reason, to the lower limit are far less consequential. This is because of the asymmetry in the frequency distribution of this variable in the Kinshasa sample (see Figure 2). The same effect is not present in the case of Bandundu Town. Second, the economies of scale at the household level reduce poverty for a given level of the RDA (the corresponding poverty line changes only slightly). The detailed

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[20] In an effort to avoid having to account for nonfood expenditures separately calorie consumption was also directly related to total expenditure. The results were poor, however.

[21] The specification of the decimal point is not intended to imply precision of the estimates, but to facilitate locating the specific figure in the table.

Table 13 – Kinshasa and Bandundu Town: Poverty Lines and Incidence

	Kinshasa				Bandundu Town			
		Poverty Line				Poverty Line		
	Sample Size	High	Medium	Low	Sample Size	High	Medium	Low
Poverty lines (zaires per consumption unit per month)	790	1,143	971	799	539	697	611	521
Food	–	738	627	516	–	511	448	382
Nonfood	–	405	344	283	–	186	163	139
Poverty incidence								
Percent of population	6,022	45.4	32.1	20.4	3,240	80.5	75.6	64.4
Percent of households	790	40.6	28.0	17.5	539	73.3	67.7	56.4
By gender of household head								
Male	721	41.1	27.9	17.1	467	73.9	68.5	57.6
Female	69	36.2	29.0	21.7	72	69.4	62.5	48.6
By education of household head								
None	68	44.1	27.9	16.2	65	84.6	76.9	66.2
Primary	272	51.1	36.4	24.6	184	83.2	78.3	67.9
Secondary	383	36.3	25.6	15.1	253	67.2	61.7	49.0
Higher	67	19.4	7.5	3.0	37	45.9	40.5	32.4
By socio-professional category of household head								
Inactive and other	44	34.1	25.0	15.9	49	67.3	57.1	49.0
Cadres	48	22.9	14.6	6.3	25	44.0	36.0	32.0
Employees	259	39.8	31.7	20.1	168	74.4	66.7	51.8
Self-employed	186	37.1	25.8	14.5	186	76.3	72.6	60.8
Skilled workers	109	46.8	25.7	16.5	65	72.3	72.3	64.6
Semiskilled workers	63	57.1	36.5	23.8	16	81.3	68.8	56.3
Unskilled workers	81	44.4	27.2	19.8	30	80.0	76.7	70.0
By household size								
1-3 members	58	13.8	8.6	5.2	126	47.6	42.1	31.0
4-5	147	24.4	10.9	6.1	113	73.5	62.8	48.7
6-7	203	39.4	27.1	15.8	147	81.0	76.9	66.0
8-9	189	48.7	35.4	22.8	86	84.9	81.4	72.1
10 or more	193	54.4	40.4	26.4	67	89.6	86.6	76.1

empirical results are not presented here but the effect has in general been to reduce the household-level incidence by 5-10 percentage points depending on the underlying assumptions.[22] Finally, it should be recalled that these estimates refer to 1985/86; the situation has almost certainly deteriorated since then.

In the context of the present discussion mention may be made of the results obtained by Ben-Senia (1991) for rural Bandundu. The survey was carried out in the latter part of 1990 and the methodology used in the analysis is similar to the one applied here. The range of RDA in his study is 2,550-3,000 for a consumption unit and the incidence of poverty is 43-53 percent for households and 50-61 percent for the population, the exact figure depending mainly on the level of the RDA. Differences in the reference periods, the survey methods, etc., must not be ignored; but poverty incidence in Bandundu Town turns out to be *higher* than in rural Bandundu. It is difficult to be too categorical about the reliability of this conclusion, but it is perhaps not that surprising after all. Bandundu Town is small and characterized by many features usually found in rural settings. In many ways it may be thought of as a village, albeit a very large one. For example, some 37 percent of the work force in Bandundu's two largest cities, Kikwit and Bandundu Town, is employed in agriculture[23] (Shapiro 1992, p. 7). In urban Bandundu, no fewer than three out of every four independent workers work in the agricultural sector (Shapiro 1992, p. 8) and as much as 88 percent of households in Bandundu Town derive at least some income (in kind) by producing agricultural output or livestock for their own consumption (Shapiro 1992, p. 18).

The rest of Table 13 presents estimates of poverty incidence by certain characteristics of the household head and household size. In regard to the gender difference, female-headed households, perhaps somewhat surprisingly, do not appear to be consistently worse off than male-headed ones. In Bandundu, in fact, relatively fewer households with female heads live in poverty, regardless of the choice of the poverty line. In Kinshasa, the situation is rather more nuanced. With a high poverty line, female-headed households have a slightly lower incidence of poverty than their male-headed counterparts, but as the poverty line is lowered, the tables turn and households with female heads do increasingly worse than those with male heads. This fact, in conjunction with the additional evidence that female-headed households have an average expenditure that is as high as that of male-headed ones, suggests that while the gender difference may not matter as far as sample averages are concerned, there is more inequality among female-headed households than among male-headed households.

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[22] The approach involved the estimation of household size in terms of *adjusted* consumption units. The scale factors for households of various sizes (in consumption units) were borrowed, as by Collier et al. (1986), from Deaton (1981).

[23] The percentage is probably significantly higher in Bandundu Town, which is much smaller than Kikwit, Bandundu's largest town.

The level of education and the socio-professional category of the household head have a significant bearing on poverty status. As far as education is concerned, the association with poverty is clearly negative, although this is not so clear cut when it comes to distinguishing between those with no education and those with only a primary education. As regards socio-professional status, by far the lowest poverty levels are found among households headed by cadres, regardless of the poverty line. Households with inactive heads (*sans objet*) do relatively well too. The two largest groups are salaried employees and the self-employed. The first is somewhat worse off in Kinshasa than the second, but the situation is reversed in Bandundu. Among wage workers, skill differentiation seems to lead to rather mixed results, depending on the poverty line and the town in question. The effects of skill and the level of education will be analyzed in more detail below. Finally, the positive association of poverty with household size comes out unambiguously from the results at the bottom of the table, a conclusion that was already reached above from the fact that incidence of poverty in the population was higher than among the households. In Kinshasa households with 10 or more members have an incidence of poverty which is four to five times higher than that for households with up to three members. In Bandundu Town the disparity is less, about twice as high.

POVERTY PROFILES

Tables 14 and 15 report the decomposition of poverty by several characteristics of the household or of its head. The index P_2 represents, in both Foster et al. (FGT) and Ray forms, the severity of poverty and can only be interpreted relative to its average value or to the values referring to other groups. Its absolute value has no significance as such. According to the FGT index, poverty in Kinshasa is more severe for male-headed households than for female-headed ones even though the incidence of poverty is slightly higher among the latter. As a result, the contribution of the former to total poverty, 92.1 percent, is somewhat larger than its share of households in the sample, 91.3 percent. This contrast points to the value of a more complete index of poverty than the simple headcount ratio. The Ray index conveys the same story.

When Kinshasa households are grouped according to the level of education of the household head, all three indices — the poverty incidence and the FGT and Ray indices — point in the same direction: poverty is highest and most severe among those with a primary education and lowest and least severe among those with more education. More than half of total poverty is attributable to those households whose heads have a primary education although they constitute only just over a third of the sample. Similarly, semiskilled workers are the most affected group among the various socio-professional groupings and cadres are the least affected. As far as household size is concerned, all three indicators rise uniformly, with the level and severity of poverty increasing as household size grows. Furthermore, it should be noted that all these results are based on the sample of households, not individuals. If individuals were to be the unit of analysis, both the levels and the severity of poverty would be still more to the

Table 14 – Kinshasa: Decompositions of Poverty (Medium Poverty Line)

Household Group	Percent of Households (790)	Poverty Incidence (Percent)	FGT Index (P_2)	Ray Index (P_2)	Contribution to Total Poverty (Percent)
All	100.0	28.0	0.0317	0.1139	100.0
By gender of household head					
Male	91.3	27.9	0.0320	0.1150	92.1
Female	8.7	29.0	0.0285	0.1027	7.9
By education of household head					
None	8.6	27.9	0.0293	0.1104	8.0
Primary	34.4	36.4	0.0468	0.1570	50.9
Secondary	48.5	25.6	0.0263	0.0992	40.3
Higher	8.5	7.5	0.0031	0.0180	0.8
By socio-professional category of household head					
Inactive and other	5.6	25.0	0.0222	0.0877	3.9
Cadres	6.1	14.6	0.0100	0.0489	1.9
Salaried employees	32.8	31.7	0.0383	0.1328	39.7
Self-employed	23.5	25.8	0.0290	0.1084	21.6
Skilled workers	13.8	25.7	0.0241	0.0896	10.5
Semiskilled workers	8.0	36.5	0.0478	0.1655	12.0
Unskilled workers	10.3	27.2	0.0321	0.1079	10.4
By household size					
1-3 members	7.3	8.6	0.0049	0.0234	1.1
4-5	18.6	10.9	0.0120	0.0443	7.1
6-7	25.7	27.1	0.0330	0.1144	26.8
8-9	23.9	35.4	0.0398	0.1447	30.1
10 or more	24.4	40.4	0.0453	0.1625	34.9

Table 15 – Bandundu Town: Decompositions of Poverty (Medium Poverty Line)

Household Group	Percent of Households (790)	Poverty Incidence (Percent)	FGT Index (P_2)	Ray Index (P_2)	Contribution to Total Poverty (Percent)
All	100.0	67.7	0.1109	0.3106	100.0
By gender of household head					
Male	86.6	68.5	0.1146	0.3162	89.5
Female	13.4	62.5	0.0871	0.2725	10.5
By education of household head					
None	12.1	76.9	0.1194	0.3329	13.0
Primary	34.1	78.3	0.1384	0.3688	42.6
Secondary	46.9	61.7	0.0975	0.2834	41.3
Higher	6.9	40.5	0.0509	0.1631	3.1
By socio-professional category of household head					
Inactive and other	9.1	57.1	0.0743	0.2347	6.1
Cadres	4.6	36.0	0.0765	0.1866	3.2
Salaried employees	31.2	66.7	0.0913	0.2850	25.7
Self-employed	34.5	72.6	0.1180	0.3309	36.7
Skilled workers	12.1	72.3	0.1381	0.3458	15.0
Semiskilled workers	3.0	68.8	0.1552	0.3705	4.2
Unskilled workers	5.6	76.7	0.1824	0.4049	9.1
By household size					
1-3 members	23.4	42.1	0.0521	0.1770	11.0
4-5	21.0	62.8	0.0718	0.2446	13.6
6-7	27.3	76.9	0.1251	0.3468	30.8
8-9	16.0	81.4	0.1598	0.3982	23.0
10 or more	12.4	86.6	0.1934	0.4487	21.7

disadvantage of the larger households since, as we saw in Table 13, poverty incidence is higher among individuals than among households.

The situation in Bandundu Town may be similarly analyzed. Briefly, male-headed households come out worse off than female-headed ones regardless of the indicator; the contrast noted in the case of Kinshasa between the incidence and severity of poverty is not present here. Another noteworthy difference compared to Kinshasa is that among socio-professional groups in Bandundu Town, the unskilled workers are worse off than the semiskilled ones, but cadres do best here as well. The effect of household size is the same as in Kinshasa.

Finally, the rankings of groups obtained from the FGT and Ray indices are usually the same, but not always; differences may be seen, for instance, in a comparison of the self-employed and the unskilled workers in Kinshasa.

MULTIVARIATE ANALYSIS

The analysis so far has been concerned with the association of poverty with a number of characteristics of the household or of its head one at a time. We will now consider the possible joint effects of these characteristics. With a multivariate analysis we can begin to discern the individual effect of each in the presence of others, a situation resembling the real world.

The basic issue is the identification of factors that independently affect household income or expenditure. For this purpose a number of regression equations were estimated with the logarithm of total household expenditures per consumption unit as the dependent variable and the following as independent variables: household size (in both consumption units and number of members), educational attainment of the household head (represented as a continuous variable with the number of years of schooling), the sex of the household head (as a dummy variable), and the socio-professional category of the household head (dummy variables distinguishing among wage-earning workers, independent workers, and the rest). Some specifications also included interaction terms among pairs of the following three variables: education, sex, and socio-professional category of the household head. In each of the two cities under consideration, the regressions were run on both the full samples of households and the restricted samples used to derive the poverty profiles.

Table 16 presents some typical results, using the simplest specifications. The most important point to emphasize is that the size of the household and the educational level and sex of its head are statistically highly significant (at 1 percent level) in both Kinshasa and Bandundu Town. This suggests that each of these three variables has an effect that is independent of the other two. Household size is negatively associated with total expenditures per consumption unit, but is positively associated with the level of education of the household head. The positive sign of the sex dummy indicates that, when the effects of other included variables are accounted for, female-headed households have a higher expenditure level than male-headed ones, an interesting result. The dummy variables relating to the socio-professional category of the household head are,

Table 16 – Kinshasa and Bandundu Town: Typical Results of Multivariate Analysis (Dependent variable: LTOTUC)

	Kinshasa		Bandundu Town	
Variable	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
Intercept	10.239	128.57	6.562	69.66
HHSIZE	-0.089	-13.65	-0.108	-12.94
EDUC	0.039	7.32	0.040	5.80
DSEX	0.273	3.71	0.218	2.77
DWORKER	-0.078	-1.44	0.036	0.482
DINDEP	0.035	0.64	-0.033	-0.498
$\bar{R}^2$	0.21	–	0.26	–
F	57.8	–	46.4	–
N	1,080	–	650	–

Notes:

LTOTCU = Log of total expenditures per consumption unit (for the year of survey in Kinshasa and for the month of survey in Bandundu);
HHSIZE = Household size (number of members);
EDUC = Level of education of the household head (years of schooling);
DSEX = 1 if household head is female, 0 if male;
DWORKER = 1 if household head is a wage-earning worker, 0 otherwise;
DINDEP = 1 if household head is self-employed, 0 otherwise.

however, not significant. The three significant variables combined explain only about a fifth or a quarter of the variation in the dependent variable. The adjusted R^2 is in fact further reduced if the sample is restricted by the imposition of limits on the acceptable values of the calorie purchase per consumption unit, as was done in the poverty analysis above, although other results continue to obtain. However, numerous other factors also determine the total expenditures per consumption unit. The interaction terms in various specifications were generally insignificant.

We saw above that, given other conditions, female-headed households may in fact have a higher expenditure level than their male-headed counterparts. Although this result is not unique in the empirical literature, it is widely argued that households with female heads earn less than those with male heads but spend it "better," more on food and other essentials than on, say, beer or cigarettes. Our earlier results did not seem to suggest that the first part of the proposition was true of the two samples under study. But what about the second part of it? Do female-headed households purchase more calories than male-headed ones after other factors, notably the level of expenditures per consumption unit, are controlled for? As may be seen in Table 17, our results fail to substantiate the point: once total expenditures are taken into account, the sex of the household head does not emerge as a statistically significant factor in household access to calories.

EXTENT OF INEQUALITY

We saw in Section 2 that the World Bank *Report* on poverty used the expenditure distribution data of Houyoux (1973 and 1987) for Kinshasa to arrive at the Gini coefficients of 0.482 and 0.490 for 1969 and 1986, respectively (World Bank 1989b, Annex I, p. 3). These estimates appear to be erroneous. This subsection uses the same Houyoux data to estimate several Gini coefficients for those years and compares the results with estimates based on the INS survey data.

The Houyoux data for 1969 and 1986, which are available as grouped data, are presented in Table 18 along with various estimates of the Gini coefficient. With the household as the unit of analysis, total household expenditures had a Gini coefficient of 0.37 in 1969 and 0.34 in 1986. These estimates indicate a moderate amount of inequality in the distribution of household expenditures and a slight equalizing trend between the two periods. They are not, however, the most appropriate estimates as they disregard differences in household size and composition. Household size can be accommodated by expressing total household expenditures in per capita terms (or per consumption unit). In this case the estimates are substantially reduced to 0.26 and 0.20, respectively. They suggest that expenditures per capita are rather equally distributed among Kinshasa households and confirm the reduction in the extent of inequality between 1969 and 1986. The results are no different if household-level observations are weighted by household size to arrive at the Gini coefficients of the per capita expenditures of *individuals*.

Table 17 – Kinshasa and Bandundu Town: Do Female-Headed Households Spend Money "Better?" (Dependent Variable: CALUC)

	Kinshasa		Bandundu Town	
Variable	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
Intercept	-16440.0	-23.71	-4792.7	-9.74
LTOTUC	2112.84	30.141	1205.45	16.21
HHSIZE	-0.694	-0.059	-60.686	-4.32
EDUC	-21.457	-2.418	5.610	0.59
DSEX	-2.722	-0.021	45.49	0.38
$\bar{R}^2$	0.56	–	0.45	–
F	250.7	–	109.28	–
N	790	–	539	–

Notes:

CALUC = Calorie purchase per consumption unit;
LTOTCU = Log of total expenditures per consumption unit (for the year of survey in Kinshasa and for the month of survey in Bandundu);
HHSIZE = Household size (number of members);
EDUC = Level of education of the household head (years of schooling);
DSEX = 1 if household head is female, 0 if male.

Table 18 – Kinshasa: Distribution of Expenditures Among Expenditure Groups, 1969 and 1986

Average Household Expenditures (zaires per month)	No. of Households (1)	No. of Members (2)	Household Size (Members) (3)	Expenditure per Household (zaires per month) (4)	Expenditure per Capita (zaires per month) (5)	Household Size (consumption units) (6)	Expenditure per Consumption Unit (zaires per month) (7)
1969							
1. Less than 15	298	1,331	4.47	10.96	2.45	3.16	3.47
2. 15 - < 20	259	1,340	5.17	17.63	3.41	3.71	4.75
3. 20 - < 25	261	1,515	5.80	22.49	3.87	4.16	5.41
4. 25 - < 35	273	1,626	5.96	29.25	4.91	4.23	6.91
5. 35 - < 60	240	1,648	6.87	44.51	6.48	4.93	9.03
6. 60 and more	140	1,171	8.36	99.04	11.84	5.97	16.59
Total	1,471	8,631	5.87	31.43	5.36	4.19	7.50
1986							
1. Less than 4,000	34	143	4.2	3,105	739		
2. 4,000 - < 5,250	34	228	6.7	4,649	694		
3. 5,250 - < 6,500	35	235	6.7	5,850	873		
4. 6,500 - < 8,000	33	241	7.3	7,131	977		
5. 8,000 - < 13,000	35	298	8.5	10,046	1,182		
6. 13,000 and more	34	357	10.5	20,912	1,992		
Total	205	1,502	7.3	8,563	1,173		

Gini Coefficients, Grouped Data	1969	1986
Total expenditure per household (household sample)	0.37	0.34
Total expenditure per capita (household sample)	0.26	0.20
Total expenditure per consumption unit (household sample)	0.26	–
Total expenditure per capita (weighted by household size)	0.27	0.21
Total expenditure per consumption unit (weighted by household size)	0.27	–

Source: For 1969, Houyoux (1973), p. 107 for items 1 and 4, p. 51 for item 2 and p. 108 for item 6; for 1986, Houyoux (1987), p. A51 for items 1, 3 and 4. Other columns can be easily derived.

The reduction in expenditure inequality is generally attributed to the phenomenon of *dualisme culturel* (see Section 2) whereby better-off families open their homes to the less fortunate members of the extended family in times of economic distress. Notwithstanding its estimates of the Gini coefficient and the accompanying Lorenz curves, which indicated a deterioration in the expenditure distribution, the World Bank *Report* also examined the expenditure differentials among income groups. The *Report* concludes that incomes tended to level off between 1969 and 1986. This evidence "seems to confirm the hypothesis that one of the by-products of the deteriorating economic environment has been the higher levels of *migration within Kinshasa to wealthier households (or from rural areas to visit relatives in Kinshasa)*, rather than a dramatic increase in overall poverty levels in the capital" (World Bank 1989b, Annex I, p. 6, emphasis in the original).

We saw that expenditures per capita appear to be rather equally distributed in Kinshasa. But the relevant Gini coefficients are subject to a downward bias whose extent is not readily determined. The first source of bias is the underreporting of expenditures, which tends to be considerably greater among the richer households than among the poorer ones. This is a perennial problem in household surveys and leads to an underestimation of the extent of inequality. A second source of downward bias is the use of grouped data, which removes within-group variations in the averaging process.[24] The latter does not arise from the expenditure data from the INS surveys, which are available for individual households. The estimated Gini coefficients of expenditure distribution for 1985/86 based on the INS data are presented in Table 19 for Kinshasa and Bandundu Town.

The results in Table 19, and their comparison with those in Table 18, permit several observations. First, the Gini coefficient of the distribution of household expenditures in Kinshasa is 0.40. This estimate, which refers to 1985/86, is somewhat larger than the downward-biased estimate for 1986 based on Houyoux's grouped data (0.34). If the samples were comparable, the difference could be essentially attributed to the effect of grouping. Secondly, household expenditures per capita or per consumption unit are distributed slightly more unequally than household expenditures, despite the positive association between expenditures and household size. This finding stands in contrast with the earlier result based on the Houyoux data for 1986 where the Gini coefficient dropped sharply from 0.34 to 0.20 as a result of the conversion of expenditures into per capita terms. This contrast points to the pitfalls of using grouped data to estimate inequality indices. Thirdly, food expenditures are, as might be expected, more equally distributed than total expenditures for corresponding definitions of the expenditure variable. Finally, the extent of inequality in Bandundu Town is much the same as in Kinshasa for all variables. The greater poverty in the former town is therefore entirely due to its lower level of average income and expenditure relative to Kinshasa.

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[24] The use of expenditure data also tends to understate income inequality, which is normally greater than expenditure inequality.

Table 19 – Kinshasa and Bandundu Town: Gini Coefficients of Expenditure Distribution

	Kinshasa (N = 1,079)	Bandundu Town (N = 650)
Total expenditure per household (household sample)	0.40	0.40
Total expenditure per capita (household sample)	0.44	–
Total expenditure per consumption unit (household sample)	0.44	0.45
Total expenditure per consumption unit (weighted by household size)	0.41	0.42
Food expenditure per household (household sample)	0.37	0.37
Food expenditure per capita (household sample)	0.41	–
Food expenditure per consumption unit (household sample)	0.41	0.41
Food expenditure per consumption unit (weighted by household size)	0.39	0.39

6. CONCLUSIONS

The economy of Zaire has been going through a deepening crisis for at least a decade. Various attempts at stabilization and structural adjustment, which were never seriously pursued, have failed to stop the rapid deterioration, and the problem is now compounded by the paralysis of the political process. The international financial agencies have virtually abandoned the country to its fate, pending the outcome of the political crisis. And, obviously, no serious initiatives may be expected from either of the two parallel governments that currently "run" the country to put the economic house in order. Under these circumstances, the poverty-stricken people in Zaire are likely to face even harder days ahead in their struggle to survive.

This study focused on determining the poverty profiles of Kinshasa, the capital city, and Bandundu Town, a town with a population of about 60,000 in the neighboring Bandundu region. The main data came from two household surveys carried out by the INS in 1985/86. Although the samples were reasonably large for the purpose, the analysis was hampered occasionally by the poor quality of the data, and the results must accordingly be treated with caution.

The main findings may be summarized as follows. The incidence of poverty in Kinshasa is estimated at about a third of the population as of the mid-1980s. This level, which is based on a "medium" poverty line, is likely to have increased substantially since then as a result of the deteriorating economic situation. Poverty in Bandundu Town is estimated to have been much higher, affecting as much as three-quarters of the population.

Several household characteristics are found to be significantly associated with poverty in both cities. Households with younger and better educated heads tend to be less poor than those headed by older people with less education. The socio-professional status of the household head is also associated with poverty, with the lowest poverty being found among households headed by cadres and the highest poverty among manual and semiskilled workers. Household size is the variable that is most significantly (and positively) related to poverty: Kinshasa households with 10 or more members have an incidence of poverty four to five times higher than that for households with up to 3 members. The corresponding disparity in Bandundu Town is less marked, about twice as high. Households with different income levels inhabit all types of neighborhoods in both cities but, on the whole, "residential areas" tend to be populated by the richer households and extension areas by the poorer ones.

The gender of the household head is also found to be associated with poverty in both cities but in a rather surprising direction: female-headed households have on average higher incomes and lower poverty incidence than male-headed households. This is true at all levels of the poverty line in Bandundu Town but

becomes less pronounced and is eventually reversed in Kinshasa with the lowering of the poverty threshold. Even then, however, the severity of poverty, as measured by the FGT and Ray indices, remains higher for male-headed than for female-headed households. The argument that, for a given level of resources, female-headed households tend to spend relatively more on essentials, such as food, than male-headed households is not supported by our empirical results.

Finally, based on grouped data from other surveys, estimates of the Gini coefficient of expenditure distribution reveal a certain reduction in the extent of inequality in Kinshasa between 1969 and 1986, an improvement that is attributed to the opening up of the richer households to the poorer members of their extended families as economic conditions deteriorated. On the basis of ungrouped data from the INS surveys, however, the extent of inequality is found to be rather significant, with Gini coefficients of approximately 0.40 in both Kinshasa and Bandundu Town.

APPENDIX
AXIOMATIC APPROACH TO THE CONSTRUCTION OF POVERTY INDICES: A REVIEW

The *headcount ratio* is the simplest aggregate measure of the extent of poverty in a population of individuals or households. It is also the least informative for it captures no more than the proportion of the poor in the population. It may be expressed as:

$$H = q/n, \tag{6}$$

where q is the number of the poor and n is the total population.

Among the shortcomings of the headcount index (and there are several) is its insensitivity to *how poor* the poor are, i.e., the extent to which their incomes (or expenditures) fall short of the poverty line. There is a measure that captures this dimension of poverty. It relies on the notion of the *poverty gap* of a poor individual, which is defined as:

$$g_i = z - y_i \geq 0, \tag{7}$$

where z is the poverty line and y_i is the income of individual i. These gaps may be expressed as proportions of the poverty line (common to all individuals) and averaged over all poor individuals to arrive at the so-called *poverty gap ratio*:

$$I = (1/q) \sum_{i=1}^{q} g_i/z = \bar{g}/z, \tag{8}$$

where $\bar{g}$ is the "mean poverty gap."

As a stand-alone poverty index, the poverty gap ratio suffers itself from the serious shortcoming of being insensitive to the proportion of the poor in the population. It is therefore more appropriately viewed as a complement to the headcount ratio than as a substitute for it. Some empirical studies, therefore, report both H and I side by side (see, for example, Chan 1990). This has the inconvenience of making intergroup and intertemporal comparisons difficult. A single index is generally preferable, and a substantial and growing literature is devoted to the construction of different indices that combine various properties commonly viewed as being desirable. These properties are normally formulated as axioms.

The axiomatic approach to the construction of poverty indices was pioneered by Sen (1976, 1979). He formulated two appealing axioms:

(1) **Monotonicity Axiom:** Given other things, a reduction in the income of a poor individual must increase the poverty measure.

(2) **Transfer Axiom:** Given other things, a pure transfer of income from a poor individual below the poverty line to any other person who is richer, but may still be poor, must increase the poverty measure.

It may easily be seen that H violates both of these axioms, and I violates the second of them in the case of transfers involving poor persons without making either cross the poverty line, i.e., it violates a weaker (more restricted) version of the transfer axiom. Noting these shortcomings of H and I, Sen then set about to derive, using an ordinal approach to the comparison of the welfare states of the poor, a new index of poverty that satisfied these axioms.

Sen's transfer axiom implies that larger poverty gaps should be assigned larger weights than smaller ones. Thus, if poverty gaps are ordered such that $g_1 \leq \ldots \leq g_j \leq \ldots \leq g_k \leq \ldots \leq g_q$, then $\phi_1 \leq \ldots \leq \phi_j \leq \ldots \leq \phi_k \leq \ldots \leq \phi_q$, where ϕ is the corresponding weight. On the basis of three axioms as a point of departure, Sen derives a weighting system in which the weight ϕ_i attached to poverty gap g_i corresponds to the rank order of g_i in an ordered ranking of poverty gaps, i.e., $\phi_i=i$ ($\phi_1=1$, $\phi_2=2$, etc.). A further axiom is then introduced:

(3) **Normalization Axiom:** When all the poor have identical incomes, the poverty index should equal the product of H and I, i.e., $P = HI$.

This axiom, when combined with the weighting system above, defines a unique poverty index known as the *Sen index* which is given by:

$$S = H(1-(1-I)\{1-G[q/(1+q)]\}) = H[I+(1-I)G] \qquad as\ q \dashrightarrow \infty, \qquad (9)$$

where G is the Gini coefficient of the distribution of income among the poor. S satisfies the monotonicity and transfer axioms, is increasing in H, I, and G, and lies in the closed interval (0,1), the limits being defined when there are no poor ($H = 0$) and when all individuals have zero incomes ($H = I = 1$).

The Sen index reflects simultaneously the proportion of the population that is poor (H), the average deprivation (I) and what Sen refers to as relative deprivation. The latter notion is captured by the inclusion of a measure of inequality among the poor (G) and arises from comparisons of welfare states before and after a transfer of income between two poor individuals without making either cross the poverty line. Such a transfer raises the poverty gap of a poor individual by exactly the same amount as it reduces that of the other. While the average gap (deprivation) would remain the same following this transfer, the inequality in the gaps would either decrease (the two gaps move closer together) or increase (they move further apart). Relative deprivation may be considered to have been reduced in the first case and increased in the second. The inclusion of G in the index (arising from the particular weighting scheme derived) introduces this notion of relative deprivation into the index. (Indeed, any scheme attaching larger weights to larger gaps may be interpreted as doing the same.)

Clark et al. (1981) have shown that the Sen index may be alternatively written as:

$$S = HI(1+G^*), \tag{10}$$

where G^* is the Gini index of the distribution of poverty gaps. G^* may be expressed as (see Sen 1973):

$$G^* = 1 + (1/q) - (2g/q^2)\ [qg_1 + (q-1)g_2 + \ldots + 2g_{q-1} + g_q]. \tag{11}$$

This expression demonstrates that the impact of a given income transfer between two individuals on G^*, and hence on S, depends only upon the difference in their rankings, i.e., on the coefficients in the expression in brackets, not on where in the distribution this transfer takes place. Thus, the Sen index does not satisfy a further axiom suggested by Kakwani (1980):

(4) **Relative Transfer Sensitivity Axiom:** If a transfer $t > 0$ of income takes place from a poor person with income y_i (poverty gap g_i) to another poor person with income $y_i + d$ (poverty gap $g_i - d$), then for a given d $(d > 0)$, the magnitude of the increase in the poverty measure must increase as y_i decreases (g_i increases).

Kakwani suggests that if the weights ϕ_i are raised to a power $k > 1$ the Sen index would become more sensitive to transfers among those with larger poverty gaps. However, as Clark et al. point out, Kakwani's axiom would not be satisfied unless k is sufficiently above 1. This is because fixed equidistant transfers have a much larger impact around the mode of the distribution where observations are more densely concentrated and transfer sensitivity is at its greatest. A sufficiently high k, however, can guarantee that this sensitivity would be greater at the bottom than at the top of the distribution.

Clark et al. (1981) then go on to derive a class of poverty indices, P_α, that relate to one another via a single parameter, α, which is interpreted as a measure of aversion to poverty. This is given by:

$$P_\alpha = HI\,(g*/\bar{g}), \tag{12}$$

where g^* is the "equally distributed equivalent poverty gap" defined as:

$$g* = \left[[1/q] \sum_{i=1}^{q} g_i^\alpha\right]^{1/\alpha} \qquad i = 1, \ldots, q. \tag{13}$$

The following two axioms ensure that P_α can indeed be interpreted as claimed:

(5) **Aversion Normalization Axiom:** An evaluator *not* "averse" to poverty, i.e., with $\alpha = 1$, perceives the same magnitude of poverty as when all

poverty gaps are equal, i.e., P_1 (with all g_i's equal) = HI, where it is assumed that (3) holds.

(6) **Aversion Normalization Axiom**: P_α increases monotonically with α, i.e., the more "averse" one is to poverty, the greater does he perceive the level of poverty to be, all other things being constant.

The above poverty indices lack an essential property in the generation of poverty profiles, namely, decomposability. A poverty index is said to be "additively decomposable" if:

$$P = \sum_{j=1}^{m} w_j P_j, \tag{14}$$

where $w_j > 0$ is the weight attached to the poverty of subgroup j and m is the number of subgroups. A new class of poverty indices that does have this property is that introduced by Foster, Greer, and Thorbecke (1984), which is written as follows:

$$P_\alpha = (1/n) \sum_{i=1}^{q} \left([z - y_i]/z\right)^\alpha; \tag{15}$$

or,

$$P_\alpha = (1/n) \sum_{i=1}^{q} (g_i/z)^\alpha \qquad \alpha \geq 0. \tag{16}$$

Two further axioms relate to this class of poverty indices:

(7) **Weak Additive Decomposability Axiom**: The weights, w_j, vary directly with the subgroup's population share, n_j/n, where n_j is the number of individuals in the subgroup and $n = \Sigma\, n_j$ is the total population; in other words, the larger the population share, the greater the impact of a rise in subgroup poverty.

(8) **Strong Additive Decomposability Axiom**: The weights, w_j, vary directly with the subgroup's "mean poverty gap" *relative* to that for the whole population; in other words, ceteris paribus, the poorer a subgroup's poor are *on average*, the greater the impact of a rise in that subgroup's poverty on aggregate poverty.

A final axiom, introduced by Ray (1989), seeks to combine the "poverty aversion" notion in the Clark et al. approach with the "additive decomposability" of the Foster, Greer, and Thorbecke poverty measure:

(9) **Additive Decomposability and Aversion Monotonicity Axiom:** P_α will satisfy this axiom if it can be written as:

$$P_\alpha = \sum_{j=1}^{m} w_{j,\alpha} P_{j,\alpha}, \tag{17}$$

where the subgroup poverty indices, $P_{j,\alpha}$, increase with α, while the corresponding weights, $w_{j,\alpha}$, *increase* with α for subgroups with "above average" poverty, and *decrease* for those with "below average" poverty; moreover, in keeping with the spirit of "poverty aversion" and axiom (6) above, P_α itself must increase with α.

Ray (1989) notes that of those poverty indices mentioned above, none satisfies *all* of the nine axioms: the Sen index violates (4), among others; that by Clark et al. violates (7) to (9); and the Foster, Greer, and Thorbecke index violates (5), (6), and (9). Ray proposes an alternative measure given by:

$$P_\alpha = (\bar{g}/nz) \sum_{i=1}^{q} (g_i/\bar{g})^\alpha, \tag{18}$$

where $\bar{g}$ is the "mean poverty gap." This measure satisfies *all* of the nine axioms (for proof, see Ray 1989). It may easily be shown that for $\alpha = 2$ the contribution of each subgroup to total poverty is the same in the Ray index as in the Foster et al. (1984) index.

This study uses the headcount ratio, the Foster et al. index, and the Ray index. For a discussion of the relationships among these three indices, see Section 3.

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