Estimation of Monetary Indicators of Poverty for Local Communities in Senegal*

Momar Balle Sylla**

Abstract

The question of poverty is always central to any discussion on development. Therefore, it is important to recognize the different manifestations of poverty in a given country in order to ensure that poverty alleviation policies and programs effectively target the social segments that need it most.

Senegal's experience with poverty is a case in point. Given its complex nature, the national government sought a partnership with the World Bank in crafting a Poverty Reduction Strategy Paper (PRSP) that employs participative and decentralized strategies. To these ends, a survey was designed by the MIMAP project in Senegal to determine poverty indicators that can readily be observed and monitored by local communities. Consumption expenses from the Household Consumption Budget Survey (ESAM) were the main data sets for the survey, and these were inputted using estimated coefficients (by the MCG method). These two approaches were combined to determine which households are poor. Moreover, the poor households, according to each of the two approaches, present different characteristics.

* For more of the technical details, see the unedited paper of the author at the CBMS section of the PEP website (www.pep-net.org).

** CBMS-Senegal Project Leader.

A hierarchical ascendancy classification done on the relative variables in the appliances and housing permitted to obtain stratification in three classes of households.

The study on the determinants of poverty also highlighted the importance of education, employment, and securing a good quality of life. Thus, poverty reduction strategies must also consider these as success indicators.

Introduction

Poverty remains one of the more crucial problems confronted by developing countries such as those in Sub-Saharan Africa. Though it has seen heightened development assistance from the international donor community in the last two decades, statistics have shown that such efforts seemed to have barely made a difference in the continent's poverty situation. In fact, according to the World Bank's report on development (2000-2001), the number of poor people has even increased in numerous places in Sub-Saharan Africa. For example, the proportion of population living in extreme poverty rose in the region (47.7% to 49.7% from 1990 to 1993). Moreover, the majority of the countries in this region are considered by the World Bank and the International Monetary Fund as being totally in debt. This debt status, coupled with high rates of population, creates a volatile situation in the region.

Multilateral aid agencies crafted structural adjustment programs (PAS) in order to boost economic growth and address poverty issues in the region essentially through reduced production subsidies but these failed to accomplish either goal. Subsequently, revised programs focused on redistribution and debt reduction were included, and these were contained in the PRSP for Senegal. The PRSP had three principal objectives:

- To double the revenue from now until 2015, in the context of strong, fair and equitable growth;
- To set up the infrastructure for improved access to essential social services before 2010; and

- To eradicate all forms of exclusion within the nation and establish gender equality in the primary and secondary levels of teaching from now until 2015.

Given that Senegal has a decentralization policy in place, it was acknowledged that such a policy should facilitate the implementation of the PRSP. However, it remained unclear whether local governments were equipped with the proper skills and knowledge to put the plan into operation. It was precisely this reason that the study was undertaken, to ensure that the poor in Senegal are properly identified in order for local governments to develop effective strategies and rationalize poverty intervention efforts.

This study hopes to address the technical component of the implementation effort. With funding assistance from the Micro Impacts of Macroeconomic Adjustment Policies (MIMAP) project for Senegal, the study was an attempt to profile the incidence and identify the determinants of poverty in the three local communities of Wakhinane, Tivaouane and Ndangalma near the capital city of Dakar. These three were considered as among the poorest communities in various national level studies on poverty. Indicators describing the socioeconomic situation in each community were identified and poor households were evaluated and classified according to the monetary approach used in the study.

Framework of the study

The study area: Senegal and the relevant communities

Poverty in Senegal was profiled using national level data from the ESAM I (1994-1995) and ESAM II (2001-2002) surveys. Given the country's average GDP growth of 5 percent registered during the period between the surveys, it can be imputed that poverty declined by 12.9 percentage points. This reduction, long to be in uniform, has profited a lot from urban households in general and those of Dakar in particular. Although, the average growth of the activities of the secondary or tertiary sections (4.7%) in the city is sensibly equal to

that of the primary sector, which is predominant in the rural areas. In fact, the preliminary report entitled "Poverty in Senegal: Devaluation of 1994 to 2001-2002"[1] noted that based on estimates of poverty thresholds, Dakar experienced a reduction in poverty incidence of 33.3 percent, relative to other areas such as urban agricultural areas (from 49.7% on 1994-1995 to 33.3% on 2001-2002), urban areas (62.6% in 1994-1995 and 43.3% in 2001-2002) and rural areas (65.9% on 1994-1995 to 57.5% on 2001-2002).

The decentralization law of 1996 divided Senegal into four administrative levels referred to as regions, communes, commune districts, and rural communities. This study focused on the three local communes of Wakhinane, Tivaouane and Ndangalma. All these communes exhibit both urban and rural characteristics.

Wakhinane is officially composed of 56 districts (there is a discrepancy though: the Local Development Plan declares that the commune is made up of 78 districts) occupying a land area of 1,353 hectares. The commune is within the periphery of Dakar and considered a blighted area marked by old shantytowns.

On the other hand, Tivaouane is located some 90 kms north of Dakar and is largely an agricultural area; its built-up area covers 294.3 has. It has 25 districts that host a population of 42,000 people. The commune currently benefits from development assistance provided by non-government organizations (NGOs) such as Radi and World Vision, as well as the Support Project to Decentralization and the Local Development (PADEL) funded by the French government.

Finally, Ndangalma is approximately 110 kms from the capital, with an estimated population of 19,551 inhabiting 41 villages and covering a land area of 83 sqms. Eighty percent of its population depend on agriculture for their subsistence needs and development assistance is currently being provided to the commune by organizations such as United Nations Development Programme (UNDP), NGO, World Vision, the World Bank, and the Belgian government.

[1] Document produced by the Department of Forecast and Statistics, Senegal.

Study methodology

The principal data source used in this study came from poverty research carried out in these communities as part of MIMAP, a project financed by the International Development Research Center (IDRC). The project gathered poverty-related information such as household structure, education, health, employment, migration, and housing. A complementary source of data was the ESAM II, a national census organized by the Department of Forecast and Statistics (DPS). ESAM II surveyed 6,624 households regarding their income and expenditure patterns. To briefly illustrate this procedure, incomes were estimated using the households' total expenditure on goods and services as a starting point. The aggregate of consumption (or total expenditure) were observed on two occasions and covered the annual expenditure of households. The figures were arrived at by adding expenditures in the first four months preceding the first occasion (May 2001) and the eight months preceding the second occasion (February 2002).

The survey respondents were determined using a three-step plan. The first step involved the identification of 264 households for each commune. The researchers then chose 22 districts/villages based on the number of households. Finally, 12 households were identified in each village according to the number of household members. In order to extrapolate the results of these samples, a weight (the opposite of the probability of inclusion[2] of each household) was calculated for the households belonging to each district retained in each local community.

Reviewing the literature on poverty

Given the complexity of poverty, two of its dimensions (qualitative and quantitative) need to be defined and clarified in an effort to explain how poverty is treated in this study.

---

[2] Probability that a household of the district belongs to the sample corresponding to the product of the probabilities of belonging to pullings of first and second degrees.

Quantitative poverty

The monetary approach is the oldest yet most recognized poverty appraisal method popularized by Booth and Rowntree towards the end of the 19th century. It is also considered the most intuitive method; the approach states that a person is poor if he does not have sufficient income to satisfy a certain level of well-being. In other words, a person is considered poor if his level of income or consumption is lower than a predetermined threshold. This level of income or consumption– which was previously limited to physiological states– currently incorporates all dimensions (e.g., decent housing, welfare, and education) which can, in turn, have monetary values. Thus, while allowing the aggregation of the various components of well-being, the quantitative approach still makes it possible to define statistical indicators and tests (of intensity, severity, and predominance, among others) for the separate dimensions.

However, this approach has its limits. It does not make it possible to affect the price of public goods, the intensity of the social relation or the quality of life.

In addition, the approach assumes that more consumption is needed to increase the level of well-being, which is not always justified. Thus, it classifies poor and non-poor households similarly, the difference being the amount of consumption of non-essential goods.

This insufficiency of the quantitative approach opens up the discussion on poverty measures to accommodate non-monetary or qualitative approaches such as the minimum basic needs approach endorsed by the UNDP.

Qualitative poverty

Advocates of this school of thought consider as poor "any person not being able to meet essential needs common to all human beings, the satisfaction of which is necessary to maintain a certain quality of life".

According to this approach, the basic needs (e.g., food, drinking water, housing, health services, education, and transport) have to be satisfied to be considered not poor. This poverty measure, endorsed by

the UNDP and referred to as the minimum basic needs (MBN) approach, goes well beyond an insufficiency of income and also takes into account the need for delivering basic needs in order to avert poverty.

Poverty as a question of participation

This definition of poverty builds on the former approaches (monetary, basic needs), encompassing much broader concerns while integrating and reconciling fundamental concepts (such as capacities and of deprivations). It states that "poverty appears in various forms: absence of income and sufficient productive resources to ensure a viable means of existence; hunger and malnutrition; absence or insufficiency of residences; unhealthy environment; social discrimination and exclusion"[3]. A key characteristic of this definition is that the poor do not take part in decisionmaking in the civil, social and cultural life. This definition of lying within the general scope of human development, insists on three major concerns of human poverty: (1) monetary poverty and economic growth; (2) satisfaction of the essential needs; and (3) participation in decisionmaking.

This study considers all three approaches in its identification of the determinants of poverty in Senegal.

Methodology

Quantitative measure

The indicators are calculated based on the indicators selected to define poverty and proceeds with setting a poverty line. Although majority of studies undertaken until now, agree in recognizing the lack or insufficiency of income and the non-fulfillment of a number of essential needs as the fundamental reasons of poverty, this approach is clearly normative and entails a more or less big arbitrary part. In fact, it is the analyst who considers the fields (essential needs) and

[3] «Elimination of poverty» , in" «World Summit for the social development»", 1995.

establishes the level where one breaks away from poverty, independently of the satisfaction expressed by the agents themselves.

In the analysis, the indices of Foster-Greer-Thoorbecke (FGT) will be referred to.

Measure of monetary poverty: three FGT indices to better determine the phenomenon

The FGT indices ($P_{á}$) turns up with $P_\alpha = \frac{1}{N}\sum_{i=1}^{n}(z-y_i)^\alpha$:

α >= 0

z = poverty line

Y_i = Income of household i

N = total number of households

n= size of the poor households (having an income lower than the z threshold).

The first three values allow to determine three measurements which describe the importance of poverty.

P_0 representing the percentage of people living below poverty line is called incidence of poverty or rate of poverty.

Generally called acuteness or depth of poverty, P_1[4] has the advantage of giving not only information on the impact of poverty (P_0) but also the quality of life of persons who are already poor ( ). Indeed, it quantifies the degree of poverty at or near the threshold.

P_2 evaluates the seriousness or severity of poverty. It is sensitive to inequalities among the poor and takes note of the gap separating the latter from the poverty line.

In addition, FGT ratings have the advantage of being disintegratable through population subgroups. On top of its neutrality vis-à-vis inter-group inequalities over the level of poverty, this disintegration allows for the measuring of the impact, on the whole, of an improvement in a subgroup's situation while that of other

[4] P1 = $\frac{1}{N}\sum_{i=1}^{n}(z-y_i) = \frac{n}{N}*\left[\frac{1}{n}\sum_{i=1}^{n}(z-y_i)\right] = P_0 * I$

subgroups remains unchanged. However, the implementation of this method requires knowledge of income of each household and establishment of a poverty line.

Imputation procedure

This section recounts the technique of allocating expenditures for each main source of household data based on a previously completed regression of data from ESAM II.

Selecting variables

Having the logarithm of consumer expenditures per adult equivalent[5] of each household i ($\ln(y_i)$) as dependent variable, this regression takes into account some variables that are common to both surveys while answering four main specifications stated below:

- Identically written questions in the two surveys;
- Modalities of equivalent answers in the two surveys; in cases where modalities of one variable are more detailed in either of the surveys, a regrouping will be carried out on the latter in an effort to coordinate the information supplied by the two data sources;
- Same target referred to by the questions (e.g., questions asked to individuals over 15 years old) in the two surveys; and
- Identical allocation of different variables.

The retained variables for this regression are again set as follows:

- demographic variables (characteristics of household head[6] and household composition);
- variables relative to living environment; and

[5] The consumer expenditures of a household are brought back to the size of this household; each member has its share (1 for adults and 0.5 for children under 15 yrs old).

[6] These characteristics have been considered, while those of the main contributor to the household income were not available in ESAM II

- variables measuring the access to basic services.

Table 1 gives the details of the obtained variables after verification with the specifications enumerated above.

Model specification and validation

The resulting model from this regression, as estimated by a generalized and less straightforward method, is thus written as:

$ln(y_i) = X_i \beta + \varepsilon_i$ where

X_i is a vector representing independent variables chosen for the regression at the level of household i;

ε_i is a random vector supposed to follow the normal law at the level of household i;

Below, the model corresponding to each region j will be written in the following form: $ln(y_{ij}) = X_{ij} \beta + \varepsilon_{ij}$

with $ln(y_{ij})$ = logarithm of consumer expenditures equivalent to adult of household i of the stratum j.

X_{ij} : vector representing independent variables chosen for the regression at the level of household i of the stratum j;

ε_{ij} : random vector supposed to follow the normal law;

$(\varepsilon_{ij} \sim N[0, \sigma^2 \exp(\gamma X_j^v)]$, X_j^v being the average of values of explicative variables in the stratum j.

To validate the model, it is important to test the hypothesis of normality on the set of random variable in the specification of the model. Once the homoscedasticity is established, the regression of the model allows for determining the estimators b and s of β and σ.

Imputation method

The estimated parameters in the previous regression are applied to equivalent characteristics in the surveyed households (main source) to obtain the attributed value of logarithm of consumer expenditures by adult equivalent. To estimate consumer expenditures, the exponential function to the obtained results from the regression will be applied.

Table 1. Retained variables for expenditures estimation

Concepts	Variables	Modalities
Demographic	Number of children (less than 15 yrs old) Number of adult males Number of adult females	Enrollment of children Enrollment of adult males Enrollment of adult females
Characteristics of household head	Gender Age group 1 Age group 2 Age group 3	1= masculine 0 = feminine 1 = less than 35 yrs old 0 = not to say 1 = 35 - 54 yrs old 0 = not to say 1 = 55 yrs old & above 0 = not to say
Characteristics of the Household	% of members having primary level % of members having secondary level % of members having tertiary level % of members having other level % of occupied active members Dependency rate	Numeric values of corresponding ration to each literacy rate of household members Numeric values Numeric values
Habitat	Occupation status Number of persons per bedroom WC with connection WC with latrines/pits No toilet Type of kitchen fuel	1 = tenant 0 = not tenant Numeric value 1 = with connection 0 = not to say 1 = with latrines/pits 0 = not to say 1 = no toilet 0 = not to say 1 = modern 0 = traditional**
Equipments	Television Refrigerator/freezer	1 = owns at least 1 0 = not to say 1 = owns at least 1 0 = not to say
Basic Service	Water Electricity	1 = potable water* 0 = not to say 1 = disposable 0 = not to say

WC connected with flush, WC connected without flush ·· édicule public/ in the environment * Electricity / Gas **other type of fuel *potable water = tap water (interior or exterior) and water distributed by tank trucks

Once the level of expenditures of each household is established, applying the formula of previously specified FGT indexes requires the knowledge of a poverty line.

Absolute threshold based on basic and specific needs of each stratum

The key question in this method is, which poverty threshold value has to be retained?

In general, the absolute poverty line is defined as a function of a certain amount of the side where the population will be considered as poor. The commonly used measure in international plans is the one recommended by World Bank which establishes the extreme poverty line at 1 dollar per head and per day, in parity of buying power in 1985.

The considered thresholds in this study are those calculated in Senegal by DPS based on the data of ESAM II.

The calculation, made after the basic needs cost approach on the collected data from each of the two aforementioned surveys, estimated the amount reaching to half of the population[7] to be endowed with one basket of 26 good foods reflecting the habitual consumption of the country, where non-food expenditures are higher. The total threshold was obtained by making the balanced average of intermediate thresholds, this being one and two thirds for the threshold of the first and second surveys. Respectively, the equivalent thresholds per day and per adult were 879.0, 712.8 and 497.9 FCFA for Dakar and other towns in the country. These values will be applied to Wakhinane, Tivaouane and Ndangalma, respectively, which are outcomes of these strata. It is true that the choice of these thresholds includes many insufficiencies. Indeed, allocating for example, the threshold of capital of Wakhinane (in the periphery of Dakar) returns to assimilating its average expenditures to the average of the capital. However, since there is no specific poverty line for these localities,

[7] Population situated in the 2nd, 3rd, 4th, 5th and 6th consumption deciles by adult equivalent.

these thresholds will have to be adopted.

On the other hand, the qualitative approach tackles the poverty phenomenon using lifestyle conditions.

Qualitative measure through the scores method

The scores method will be done through two important dimensions of households' quality of life: the relative housing elements and those related at the convenience of the household. This method was patterned after Lollivier S. and de Verger D[8], where each household is assigned an index representing the amount of material and social deprivations (which is measured by scores) that the household suffers from and perceives as unfavorable. This non-monetary objective indicator tackles poverty from the perspective of effects rather than the causes, even though, for example, ownership of a comfortable house can also contribute to the improvement of work productivity and consequently, growth in income.

Practically, a household endowed with certain kinds of possessions has a score of 0 while those which do not have any will have a higher score. In other words, if a household x owns a kind of possession, which is retained during the scores drafting, those which do not have any possessions will be assigned the value x as a relative score. With regard to variables divided into three modalities, y is the ratio of households owning a property with the highest quality and z is the ratio for those who have middle quality property then:

- households with the high quality property will be assigned the score 0;
- those with middle quality will be assigned the score y; and
- those with the worst option will have (y + z) as score.

The synthetic index of scores for each household is then calculated, with the obtained scores by this household added to the set

[8] Lollivier S. and de Verger D., (1997), « Pauvreté d'existence, monétaire et subjective sont distinctes », Economie et Statistique, n 308-309-310, INSEE.

of the retained 12 variables to gauge their degree of deprivation. The higher the index is, the more the household suffers the notable deprivations, and is therefore considered as poor. Zero value in this index means that the household is endowed with all the considered properties and is therefore considered well-off. Table 2 summarizes the different scores that a household in the three localities will be assigned.

Determining the qualitative poverty line

The poverty line is calculated by considering a ratio of the poor approximately equal to the obtained ratio (in each locality) using the monetary approach. Thus, the threshold will correspond to the abscissa in the accumulated monotonic distribution of the scores following the population. The households with a high cumulative score or equal to the value of this threshold will therefore be considered as poor in terms of quality of life.

Contrary to the monetary approach, the "lifestyle conditions" depicted in the qualitative approach have the advantage of limiting the uncertainties related to measuring errors. However, such an approach is not free from criticism, notably with regard to the determination of the threshold which is as follows:

- the households which have higher quality will be allotted the score of 0;
- those having intermediate quality will have as a score y; and
- those having the worst option will have (y + Z) as a score.

Thereafter, the aggregate index of scores is calculated for each household, by adding the scores obtained by this household on all 12 variables selected to comprehend their degree of deprivation. The higher the index is, the more deprived the household is and is thus regarded as poor. The zero value of this index means that the household possesses all goods considered and consequently regarded as non-poor.

Table 2. Scores of deprivation alloted to households according to localities

Variables	Mode	Corresponding Scores		
		Wakhinane	Tivaouane	Ndangalma
Variables of appreciation of housing conditions				
Mode of principal lighting	Electricity No electricity	0.000 0.900	0.000 85.977	0.000 0.118
Nature of floor	tiles Cement Sand /clay and others	0.000 0.247 0.804	0.000 0.148 0.817	0.000 NA 0.386
Number of people per section	Few people Normally with people A lot of people	0.000 0.280 0.585	0.000 0.111 0.447	0.000 0.456 0.715
Type of ease	CR attached Latrines/cesspool Without toilets	0.000 0.150 0.971	0.000 0.110 0.919	0.000 0.681 0.349
Means of removal of dirt	Modern Antiquated Savage	0.000 Néant 0.970	0.000 0.493 0.987	0.000 0.578 0.827
Access to potable water	Tap Well /forage/tanker Salesman of water/ current water	0.000 0.982 100.0	0.000 0.963 Néant	0.000 0.704 0.996
Means of drainage	river System sewerage closed/open Channel;Grid stops in the house; in the sea river Different nature in the street	0.000 0.620 0.106	0.000 0.000 0.520	0.000 0.352 0.267
variables linked to the appliances of housekeepers				
Radio/radio cassette	Possesses Does not posess	0.000 0.892	0.000 0.821	0.000 0.703
Television	Possesses Does not posess	0.000 0.982	0.000 0.658	0.000 0.146
Electric fan/aircon	Possesses Does not posess	0.000 0.988	0.000 0.723	0.000 0.153
Gas range/cooker	Possesses Does not posess	0.000 0.993	0.000 0.630	0.000 0.331
Telephone	Possesses Does not posess	0.000 0.996	0.000 Néant	0.000 1.000

How to determine the qualitative poverty line

Given that one of the objectives of this study is the comparison of the approaches of monetary and qualitative poverty, a poverty line is calculated so as to consider a proportion of the poor roughly equal to that obtained (in each locality) starting from the monetary approach carried out beforehand. In other words, the threshold will correspond to the X-coordinate, in the increasing distribution of accumulated scores according to the population or the incidence of poverty according to the quantitative method. Households having a cumulative score equal to or higher than the value of this threshold will then be regarded as poor in terms of living conditions.

Calculating the scores of deprivation per locality

The variables used in the aggregate indexes of deprivations and the scores which these indexes are associated can be seen also in Table 2.

This method makes it possible to calculate the existing poverty lines which are 0.71 in Wakhinane, 1.98 in Tivaouane and 1.17 in Ndangalma. The threshold of Wakhinane represents less than half of the poverty lines of the other two communes, which translates to a high level of ownership of goods and services in this locality.

Once the thresholds (quantitative and qualitative) are determined, the poor will be identified and their profile will be drawn up by analyzing their characteristics.

Poverty profile

Based on the definition and measurement of poverty previously indicated, the poverty profile is an analytical procedure which summarizes information on the sources of income, the modes of consumption, the economic activities, and the living conditions of the poor in a locality. This profile compares data across the various socio-economic groups, with the results being used as input for government leaders in crafting policies in favor of the most economically marginalized sectors.

The analysis of poverty in the communes of Senegal revolves around the responses to the following questions:

- How many people are poor? Are they extremely poor?
- What is the extent of and the variation of poverty?
- What is the standard of living among the poor?
- Are the poor mainly located in the rural or urban zones?
- Is poverty correlated with gender?
- What are the principal income sources of the poor?
- What is the importance of unemployment and under employment among the poor?
- Which public services do poor people have access to?

Model of poverty determinants

This section intends to clarify the relations which prevail between the standard of living (very poor, fairly poor, and not poor) and the variables likely to explain it (education, health, demography, and gender, among others). The study hopes to evaluate the probability for a household to be poor according to certain variables.

In this regard, the modeling of the determinants of poverty according to the qualitative approach will use the model probit, simple for the method of the scores and ordered for classification (Box 1), and will assess the marginal effects of the various socio-economic factors on households and their standard of living.

Analysis of results

The next section is an interpretation of the results obtained from the poverty profiling exercise.

Socioeconomic and demographic indicators for three communes

Characteristics of household heads

Age, gender and marital status

Data show that the household heads (CMs) are advanced in age and that majority of them are monogamists.

Box 1. Specification probit model (simple and order)

The specification :

☞ if there are two classes of poverty: $Z_i = 0$ si $Z_i^* \leq 0$

$Z_i = 1$ si $0 < Z_i^*$

☞ if there is more than two classes: $Z_i = 0$ si $Z_i^* \leq 0$

$Z_i = 1$ si $0 \prec Z_i^* \leq \mu_1$

$Z_i = j$ si $\mu_{j-1} \prec Z_i^* \leq \mu_j$, j = 2,...,5

where Z_i^* is a latent variable definite as follows:

$$Z_i^* = \beta' X_i + \varepsilon_i \text{ , with}$$

X_i: characteristics of the household excluded characteristics of the habitat and the equipment of the household; and ε_i: error term.

The households are managed by people whose average age exceeds 50[9] years: about nine out of ten CMs are more than 35 years of age (93.7% in Wakhinane, 95.3% in Tivaouane and 93.0% in Ndangalma).

Their distribution by gender is uneven, particularly in Ndangalma, where only 6.7 percent of CMs are women. This inequality persists but to a lesser extent in Wakhinane and Tivaouane, where the women represent approximately a quarter of the heads of households (25.4% and 24.7%, respectively), as gleaned in Table 3.

A majority of CMs are married but the practice of polygamy is particularly high in Ndangalma (43.5%), where their numbers almost equal that of the monogamists who constitute about half (48.5%) of the population of CMs.

Widowers constitute a rather significant part of CMs in Wakhinane (13.1%) and Tivaouane (10.2%) whereas they make up only 5.7

[9] With a variable standard deviation between 13.1 and 14.6.

Table 3. Characteristics of households heads (CM) according to age, sex and marital status

Characteristics of CM	Wakhinane	Tivaouane	Ndangalma
Distribution of CM by sex (% of women)	25.4	24.7	6.7
Age of the CM (%)			
less than 35 years old	6.3	4.7	7.0
35 – 55 years old	53.7	49.5	50.8
55 years old or above	39.2	44.4	42.2
ND	0.8	1.4	0.0
Total	100.0	100.0	100.0
Average age of CM (years)	51.7	54.0	53. 3
Marital status of CM (%)			
Monogamy	57.4	47.5	48.5
Polygamy	25.2	36.3	43.5
Single	2.0	2.1	1.1
Divorce/Separated	2.3	3.9	1.2
Widow/widower	13.1	10.2	5.7
Total	100.0	100.0	100.0

Source: statistics of the authors from CREA, MIMAP 2003

percent of CMs in Ndangalma. The number of divorced CMs is very low in all three communes, an indication that household heads value marriage for the sake of maintaining family interests.

Education and employment

Table 4 shows that 12.1 percent of CMs in Ndangalma are educated. In Wakhinane, the proportion is 29.9 percent while in Tivaouane, it is 41.1 percent. To add, three quarters (71.07%) of the uneducated in Ndangalma did not complete primary school. The figures were more satisfactory in Tivaouane, where 14.25 percent of educated CMs reached higher schooling levels.

Meanwhile, even though the majority of CM is in activity in the three communities, one counts a significant part of inactive (for example, 36.3% in Tivaouane). A majority of CMs work for their own sake.

Table 4. Distribution of CMs according to the educational level and activity status

Characteristics of CM	Wakhinane	Tivaouane	Ndangalma
Proportion of educated people (%)	29.9	41.1	12.1
Level of education of the CM (%)			
Any level	69.3	59.3	87.9
Preparatory	0.5	0.0	0.0
Primary	6.0	16.6	8.6
Secondary	15.9	14.2	1.9
Technical	1.7	1.0	0
Vocational	3.0	1.6	0.8
Superieur	2.6	5.8	0.4
Others	0.0	1.1	0.4
ND	0.8	0.4	0.0
Total	100.0	100.0	100.0
Status in the activities of the CM (%)			
Active	63.3	57.2	65.7
Unemployed	4.0	6.5	4.7
Inactive	32.7	36.3	29.6
Total	100.0	100.0	100.0
Employment status of CM that they hold			
Employed	31.6	18.8	19.4
Employer/Independent	40.8	44.4	59.8
Others	24.0	35.2	20.0
N.D.	3.6	1.6	0.8
Total	100.0	100.0	100.0

Source: statistics based on the data base of CREA. MIMAP 2003

Demographic characteristics of the households

The households are characterized by large members and a strong proportion of young people.

The population of Wakhinane is primarily young, with an average age of 22.0[10] years old, with individuals of less than 15 years

[10] With a standard deviation of 15.9 years and a mean of 20 years.

old representing a significant portion[11] of the youth (35.6%). Half of the population in this commune are women (51.1%), much like in Tivaouane (54.7%) and Ndangalma (56.2%). The predominance of the youth is also a characteristic of the latter communes, with their average age being 20[12] years old in Tivaouane and 18.7[13] years old in Ndangalma.

A comparative analysis of the age structure of the population shows a higher number of youth in the rural areas of Tivaouane than in Wakhinane. Thus, young people of less than 15 years living in Ndangalma (49.8%) and Tivaouane (43.1%) exceed those in Wakhinane.

Household distribution data according to size reveal an average of 13.2 people per household in Ndangalma while it is 10.8 and 7.9 in Tivaouane and Wakhinane, respectively. However, in spite of these relatively important size of the households, the index of settlement[14] of these local communities is rather reasonable, with a maximum value of 2.37 in Ndangalma, this index is worth 2.3 in Tivaouane and only 1.8 in Wakhinane

In all three localities, the ethnic group with the highest representation is Wolof (and Lébou) which compose 76.2 percent of the Tivaouane population. Apart from Wolof, the two ethnic groups represented in Wakhinane are Pular (22.8%) and Sérère (12.5%); on the other hand, Pular is the second highest ethnic group in Tivouane (13.8%). In Ndangalma, Sérère (35.4%) and Wolof (64.4%) constitute almost all of the local population (99.8%).

[11] 15 years being regarded in the study as the minimal age of entry in activity. The remainder of this population which can be consisted of the people of more than inactive or unemployed.

[12] With a standard deviation of 15.4 years and a mean of 18 years.

[13] With a standard deviation of 15.8 years and a mean of 10 years.

[14] It indicates the average number people by livable part.

Weaker unemployment in Ndangalma than in urban environment where the commercial activities prevail

Approximately, half of the adults of the three localities carry on an economic activity. The unemployed account for 9.6 percent of the working-age population (15 years and above) in Ndangalma (Table 5). In Wakhinane and Tivaouane, however, the situation is worse, with more than a third of the CMs unemployed (40.4% and 35.9%, respectively). In addition, the proportion of inactive CMs is quite significant in all three localities. In Tivaouane it is 41.5 percent inactive against 28.6 percent.

Trade, industry and the public works and engineering (BTP) constitute, in this order, the principal economic activities in the urban localities (Wakhinane and Tivaouane). In Ndangalma, domestic services constitute the dominant activity (32.7%), followed by trade, and transport and communications.

Failure in the examinations is the principal reason for school abandonment

Educated children (with ages ranging from 7 to 14 years old) occupy a considerable proportion of the population: 17.3 percent in Wakhinane, 23.2 percent in Tivaouane and about one quarter of the population in Ndangalma (Table 6). The net rate of schooling[15] is quite high in Wakhinane (63.6%) and Tivaouane (69.9%). On the other hand, the rate is lower in Ndangalma where only 39.0 percent of children aged 7 to 14 years old are provided education. In Wakhinane, there are more educated boys than girls, the difference being almost ten percent (68.5% among boys against 58.6% among girls).

Drop-out rate[16] in primary education is low, with only 2.7 percent of school age children failing to complete their primary education.

[15] Ratio of the children provided education for on the children scolarisables (7 to 14 years old).

[16] Proportion of the people having given up the school at the end of the year preceding the investigation compared to the unit by the registered voters of this same year

Table 5. Indicators on adult activities

Indicators on the Activities and Education of the Adults	Wakhinane	Tivaouane	Ndangalma
15 years old or + (%)	64.6	56.5	50.1
Status in the activities of 15 years old or + (%)			
Active	29.7	28.6	41.8
Unemployed	20.1	16.0	4.4
Inactive	31.7	41.5	27.8
N.D.	18.5	13.8	25.9
Total	100.0	100.0	100.0
Rate of activities of persons 15 years old or more (%)	49.8	44.6	46.3
Unemployment rate (%)	40.4	35.9	9.6
Branch of activity of the principal work (%)			
Private sector	4.6	6.6	4.5
Industry	14.2	23.5	10.2
BTP	12.4	12.1	3.9
Administration	6.1	7.1	2.1
Transport/Communication	6.7	7.8	14.4
Commerce	35.4	31.8	21.4
Domestic services	6.3	4.1	32.7
Other services	7.0	3.9	9.4
ND	7.4	3.1	1.3
Total	100.0	100.0	100.0
Work Status(%)			
Employed	28.2	11.4	19.6
Employer/Independent	35.9	45.2	57.4
Other	30.7	41.9	22.3
N.D.	5.1	1.5	0.6
Total	100.0	100.0	100.0

Source : calcul des auteurs à partir des données du CREA. MIMAP 2003

Table 6. Indicators on education / literacy

Indicators on education / literacy	Wakhinane	Tivaouane	Ndangalma
Number of children – 7-14 years old	3638	7927	6674
(% of the total population)	17.3	23.2	25.1
Educaltional status of children between 7-14 years old(%)			
Not in school	55.2	20.8	53.0
Schooling	18.1	75.0	42.9
Stopped studying	0.7	3.9	4.0
ND	26.0	0.3	0.1
Total	100.0	100.0	100.0
Net rate of schooling of children between 7-14 years old (%)			
Boys	68.5	72.8	41.2
Girls	58.6	66.7	36.7
Both	63.6	69.9	39.0
Abandoning school net rate of children between 7-14 years old (%)			
Boys	0.0	0.4	3.3
Girls	1.7	0.9	2.0
Both	0.8	0.6	2.7
Reasons of abandonning their studies (%)			
Done with school	0.0	22.7	9.1
Far from school	0.0	0.0	0.0
Expensive education	0.0	26.3	11.1
Work (house / employment)	0.0	0.0	50.9
Without interest	0.0	0.0	10.8
Sickness / Obesity	0.0	0.0	0.0
Failing grade in exams	100.0	26.3	9.1
Marriage	0.0	0.0	0.0
Other reason	0.0	24.6	9.1

Source : statistics from the data base of CREA. MIMAP 2003

The main reasons given for dropping in school include failure in examinations, lack of finances, and lack of interest among parents (parents in the rural areas would rather make their children work in order to augment family income).

Health

In rural areas, the proportion of households consulting local health professionals is high (18.8%) as shown in Table 7. Despite this however, self-medication is still the primary recourse. This observation is general in Senegal where professional medical care is considered expensive for the average Senegalese. In Tivouane, for example, 31.7 percent of the populace prefer to treat themselves using traditional methods or would rather buy medicine in the streets.

However, almost all women who gave birth in the year preceding the investigation were able to receive prenatal care, in a vast majority (100% in Wakhinane and more than 90% in the other localities).

Utilities

The proportion of households with electricity in Wakhinane and Tivaouane (90% and 86.0%, respectively) significantly contrast with the small proportion of households (11.8%) in Ndangalma having access to such (Table 8). Meanwhile, 94.8 percent of the population in Ndangalma and almost all of Tivaouane do not have toilet facilities[17]. Although the proportion of households in Wakhinane having toilet facilities is relatively higher (11.0%), their condition is suspect.

Potable water is accessible to all households in Wakhinane but one fourth of these households (23.2%) still need to walk between 1 and 2 kilometers to get to potable water sources. On the other hand, 5.6 percent of households in Ndangalma need to walk more than 2 kms to get water.

[17] Connected to a network of drainage.

Table 7. Indicators on health

Indicators on health	Wakhinane	Tivaouane	Ndangalma
Sick / injured Population in the previous 4 weeks before the survey (%)	18.3	18.2	10.4
Sick people having consultation (%)	80.3	70.3	88.8
Health Department / Personnel consulted by sick people(%)			
Hospital / Clinic / Private	27.9	26.0	40.3
Hospital / Heath Center	64.1	62.3	7.2
Doctor / private dentist	2.0	0.0	0.0
healer / Marabout	2.6	4.4	18.8
Midwife / District nurse	0.0	0.0	16.8
Hospital / Community clinic	0.7	5.5	1.2
Pharmacy / Pharmacist	1.0	0.5	0.0
Health hut	0.0	0.3	10.1
Others	0.0	0.0	5.0
ND	1.7	1.0	0.6
Total	100.0	100.0	100.0
Reason of not consulting (%)			
Not necessary	39.5	6.2	29.5
Self medication	57.2	43.2	53.6
Too expensive	3.3	31.7	4.8
Too far	0.0	3.2	0.0
Other reason	0.0	15.7	12.0
Women between 13-49 having received prebirth care (%)	100.0	97.4	93.6

Source : statistics from the data base of CREA. MIMAP 2003

Quantitative analysis of poverty

The first part of this chapter is devoted to an analysis of the model given the expenditure estimates. The second part assesses the incidence of poverty among the socio-economic groups in each locality. Box 2 shows how the imputation models of each locality were obtained.

The regressions carried out on the ESAM II data in order to reflect expenditure patterns in this MIMAP study, made it possible to

Box 2. Imputation models of each locality

Models retained for Wakhinane

$$LOG(DPEQUIVAD) = 10{,}47589 + 0{,}5139547 * LATFOSS + 0{,}4729835 * TOILRAC + 0{,}29369 * TELE + 0{,}1777668 * FRIGO + 0{,}4630248 * VOITUREC + 0{,}3474542 * ELECTR + 0{,}3339336 * STATOC + 0{,}0223324 * ENFANT - 0{,}032865 * HOMMES - 0{,}1003703 * FEMME + 0{,}7567374 * PROPOCNI + 0{,}7213672 * PROPPRIM + 1{,}46256 * PROPSECO + 0{,}0362371 * TXDPDCE + 2{,}237738 * PROPOQP$$

Models retained for Tivaouane

$$LOG(DPEQUIVAD) = 12{,}05549 + 0{,}3656641 * FRIGO + 0{,}2751605 * VOITUREC + 2372915 * ELECTR + 0{,}2324816 * TYPCOMB + 0{,}142954 * SEX - 0{,}0724346 * HOMME - 0{,}0727551 * FEMME + 0{,}5652222 * PROPSECO + 0{,}0679431 * TXDPDCE + 0{,}8947163 * PROPOQP$$

Models retained for Ndangalma

$$LOG(DPEQUIVAD) = 12{,}15259 + 0{,}2236038 * EAUPOTA + 0{,}3281757 * TOILRAC + 0{,}3606436 * FRIGO + 0{,}2763075 * VOITUREC - 0{,}1165785 * HOMMES - 0{,}072386 * FEMMES$$

LOG(DPEQUIVAD)= logarithm of consumption expenses
LATFOSS : WC Latrines/cesspool
TOILRAC : WC accorded with flush
TELE : possession of tv
FRIGO : possession of refrigerator
VOITUREC : possession of car
ELECTR : access to electricity
STATOC : occupational status of working occupants of the household des actifs occupés du ménage
ENFANT : children i n the household
HOMMES : men in the household
FEMME : women in the household
PROPOCNI : proportion of the household members in any educational level
PROPPRIM : proportion of the household members in primary level
PROPSECO : proportion of the household members in secondary level
TXDPDCE : dependence rate
PROPOQP : proportion of working people in the household
TYPCOMB : type of material use in cooking
SEX : sex of the cm
EAUPOTA :potable water

Table 8. Indicators of lifestyle of household

Indicators of lifestyle of household	Wakhinane	Tivaouane	Ndangalma
Average number of person per room	1.8	2.3	2.7
Population with access to electricity (%)	90.0	86.0	11.8
Population having television (%)	70.1	65.8	14.6
Population living in a household branched in the cleaning up network (%)	11.0	5.2	2.7
Distance in terms of access to water			
Less than 1 Km	76.8	98.6	89.6
1 to2 Km	23.2	1.4	4.8
More than 2 Km	0.0	0.0	5.6
Population having access to potable water (%)	98.2	100.0	99.2

Source : statistics from the data base of CREA. MIMAP 2003

obtain a model for all three communes, thus allowing for a strong forecast rate.

The threshold of 5 percent (based on Cook-Weisberg) used to test data heteroscedascity make it possible to accept the homoscedascity of the terms of error for each model. In the same way, the test of normality based on the joint statistics of skewness of Kurtosis lead us to accept that the latter follow the normal law (centered and reduced) in the models retained for Wakhinane and Ndagalma.

The summary characteristics of the terms of error (Table 9) make it possible to admit the nullity of the average.

Comments on the models obtained

The models of imputation obtained for the urban communities (Wakhinane and Tivaouane) clearly explain the variations of household expenditure per adult equivalent, as their coefficient values attest to (0.71 and to 0.46, respectively). In Ndangalma, where this capacity is relatively weak, the proportion is approximately 32 percent.

Table 9. Some characteristics of the estimation residues of 3 models of imputation*

Statistics \ Models obtained in…	Wakhinane	Tivaouane	Ndangalma
Probability of Cook-Weisberg statistics	0.3596	0.1851	0.4409
Probability of Skewness/Kurtosis	0,.453	0.0000	0.2635
Average	-0.0258451	-2.16e-10	3.52e-10

The results of the test are significant at 5%
Source : Calculation from the data base of CREA, MIMAP 2003
**See Annex 4 and Annex 5 for detailed results*

Apart from the number of adults (men and women) in the household which is negatively correlated with the expenditure by adult equivalent, all other significant variables (on a degree of confidence of 5%) are positively correlated for all three models. In other words, these last variables positively influence the level of household expenditure.

It should be noted that the variables, proportion of the occupied credits of the household and access to electricity, are prevalent in the explanation of the dependent variable in the urban communities. Moreover, the variable sex of CM is significant only in Tivaouane.

Analysis of monetary poverty

The estimated FGT indices confirm that the poverty situation in Tivaouane is definitely better compared to the two other localities. As gleaned in Table 10, not only is the proportion of households living below the poverty line smaller (21.20%) in this community, this figure is lower than Wakhinane (57.27%) and Ndangalma (83.12%). The variation in the average income of the poor (P1=29.69) in Tivaouane compared to their threshold (712.8 Francs) is largely lower than that of the two other localities (175.21 and 133.96 in Wakhinane and Ndangalma, respectively). The indicator of severity of poverty (P2) reinforces the idea that poverty is more prevalent in Wakhinane (72878.21) and Ndangalma (29092.63) than in Tivaouane (6298.74).

Table 10. Mesure of poverty in three localities

FGT INDEX (P_a)	Wakhinane			Tivaouane			Ndangalma		
	P_0(%)	P_1	P_2	P_0 (%)	P_1	P_2	P_0 (%)	P_1	P_2
Estimated value	57.27	175.21	72878.21	21.20	29.69	6298.74	83.12	133.96	29092.63
Difference-type	3.12	12.98	7136.31	2.56	4.54	1197.67	2.5	6.90	2475.38
Week boundary	51.17	149.77	58891.31	16.78	20.79	3951.35	78.23	120.44	24240.99
Strong boundary	63.38	200.65	86865.11	21.73	38.59	8646.14	88.02	147.48	33944.28

Source : calcul des auteurs à partir des données du CREA. MIMAP 2003

On the other hand, although the proportion of poor households is higher in Ndangalma than in Wakhinane, a review of the P1 and P2 indices show that the phenomenon is more intense (and consequently more alarming) in the latter locality. On the other hand, the incidence of poverty in these communes is lower than half of the other cities in Senegal (except for Dakar at 43.3%).

However, this description does not take into account the specificities of the various socio-economic groups that make up to communes, e.g., the size of the household, the characteristics of housing and the educational level of the household's secondary members.

In Wakhinane and Ndangalma, the households headed by the women are poorest

In the case of Wakhinane, Table 11 shows that poverty is more pronounced in households led by women; this is contrary to the situation in the rest of Senegal (total or by area)[18] where patriarchal communities have higher poverty incidence. In Ndangalma, for example, 95.1 percent of its poor households consider the husband as the head of the family.

[18] See the preliminary report of the DPS on poverty in Senegal: Devaluation of 1994 to 2001-2002

Table 11. Age and sex of the heads of poor household according to monetary approach

Characteristics the CM	Wakhinane		Tivaouane		Ndangalma	
	Incidence	Relative Contribution	Incidence	Relative Contribution	Incidence	Relative Contribution
CM WOMEN (%)	62.7	27.8	20.2	23.5	60.6	4.9
CM MEN (%)	55.4	72.2	21.5	76.5	84.7	95.1
Age OF THE CM (%)						
Less than 35 years old	34.7	3.81	16.2	3.48	82.6	6.78
BEtween 35 – 55 years old	57.3	53.75	15.1	34.91	78.4	47.12
55 years old or more	60.9	41.65	29.2	61.61	88.9	46.10
ND	-	0.80	-	0.0	-	0.0
Total	57.27	100.0	21.2	100.0	83.12	100.0

Source : calculation of the authors from the data base of CREA. MIMAP 2003

Also in Wakhinane, poverty increases the older the household head gets while in Tivaouane and Ndangalma the households most affected by poverty have household heads with age of less than 35 years old or more than 55 years old.

Poverty is experienced more by single persons and the polygamous

In the localities of Wakhinane and Ndangalma, more than half of CMs are poor, whatever their marital status. In Ndangalma, where the level of poverty is highest, all the households placed under the supervision of a single person are poor and only 6.1 percent of those directed by polygamous CMs subsist with less than 497.9 francs for their daily expenses (Table 12). In Tivaouane, where the situation is less alarming, approximately one third (32.2 percent) of CMs, who are either polygamous or single, live below the poverty line.

Table 12. Marital status of the household head according to monetary approach

Characteristics of the CM	Wakhinane		Tivaouane		Ndangalma	
Marital status of the CM (%)	**Incidence**	**Relative Contribution***	**Incidence**	**Relative Contribution**	**Incidence**	**Relative Contribution**
Monogamy	50.9	51.0	13.6	30.6	75.2	43.9
Polygamy	67.2	29.5	32.2	55.1	93.9	49.2
Single	66.9	2.3	32.2	3.2	100.0	1.3
Divorced(/Separated	71.1	2.8	9.4	1.7	30.7	0.4
Widow/er	62.4	14.3	19.6	9.4	75.4	5.2
Total	57.27	100.0	21.2	100.0	83.12	100.0

Source : calculation of the authors from the data base of CREA. MIMAP 2003.
Relative Contribution to poverty of the involved class, this expression will henceforth be abbreviated as "Contr.rel."

Unemployed, people not looking for work and likewise educated are principally experiencing poverty

In Ndangalma and Tivaouane, households whose CM are illiterate constitute those who are poor. With regard to level of education of CM, the poorest of them are those who finished secondary school (Table 13).

About the status in the activity, CM occupied credits in general are poor though they contribute more to poverty. In Wakhinane, the poorest members of the community work in the communication or transport sector (60.8%) while in Tivaouane and Ndangalma, they engage in activities related to trade (42.2%) and the BTP (100%).

Bigger household size, housing in huts and sand floor characterize the zones of strong density of poverty

Generally, poverty grows with the size of the household. In Senegal, this is corroborated by an analysis of household profiles according to

Table 13. Education level of household chefs according monetary approach

	Wakhinane		Tivaouane		Ndangalma	
Level of education of CM (%)	**Incidence**	**Relative Contribution**	**Incidence**	**Relative Contribution**	**Incidence**	**Relative Contribution**
No level	-	0.0	27.2	76.1	84.0	88.8
Primary	13.7	6.9	4.6	16.1	0.0	9.0
Secondary	36.9	11.4	12.7	3.3	58.9	1.4
Tertiary	23.2	2.3	0.0	4.4	30.7	0.4
OThers	-	0.0	27.2	0.0	100.0	0.4
N.D.	-	79.5	-	0.0	84.0	0.0
Total	57.27	100.0	21.2	100.0	83.12	100.0

Source : calculation of the authors from the data base of CREA. MIMAP 2003

their average size. In Ndangalma, for example, the average size of poor households (14.3) almost doubled that of non-poor households (8.0) as shown in Table 14.

In Wakhinane and Ndangalma, the households most affected by poverty are those living in sheds although they only contribute a little to poverty (Table 15). Meanwhile, the poor in Tivaouane lives in huts and cement houses, which is the type of housing least lived in by the poor in Ndangalma.

In terms of flooring for houses, urban poor households have cement and tile floorings the least while sand and clay are the primary flooring materials used by the poorest households in all localities.

Analysis of qualitative poverty

For this study, determining the poverty threshold is based on the hypothesis that the proportion of poor households (according to the qualitative and quantitative approaches) are approximately equal. After qualitative descriptions of poor households, this chapter now attempts

Table 14. Distribution of poor household according to size

	Wakhinane		Tivaouane		Ndangalma	
Distribution of poor Household according to size	**Incidence**	**Relative Contribution**	**Incidence**	**Relative Contribution**	**Incidence**	**Relative Contribution**
Less than 4 persons	45.5	20.2	0.0	0.0	60.0	1.3
Between 5 - 8 persons	54.8	38.0	10.32	18.0	57.5	16.1
Between 9 -11 persons	57.1	14.6	23.7	17.7	87.6	24.9
More than 12 persons	77.1	27.2	36.5	64.3	93.5	57.7
Total	57.27	100.0	21.2	100.0	83.12	100.0

Source : calculation of authors from the data base of CREA. MIMAP 2003

Table 15. The living environment of poor households according to the monetary approach

Indicators of the living environment	**Wakhinane**		**Tivaouane**		**Ndangalma**	
	Incidence	**Relative Contribution**	**Incidence**	**Relative Contribution**	**Incidence**	**Relative Contribution**
Type of housing						
Hut	64.9	2.5	32.9	17.3	83.2	58.4
Shed	66.8	5.4	0.0	0	95.3	8.3
Cemented house	56.3	81.7	20.9	82.7	79.5	32.6
Storied houses	51.2	7.7	0.0	0.0	-	0.0
Others	100.0	0.8	-	0.0	100.0	0.0
Undeclared	-	2.0	-	0.0	-	0.4
Total	57.27	100.0	21.2	100.0	83.12	100.0
Nature of the Flooring						
Tiles	49.3	21.2	11.1	7.8	-	0.0
Cement	54.9	53.4	16.5	51.9	83.3	38.6
Clay/Bank	-	0.0	33.3	1.6	72.6	6.8
Sand	71.2	21.9	47.4	38.7	84.1	53.9
Others	-	0.0	-	0.0	100.0	0.4
Undeclared	-	3.4	-	0.0	-	0.4
Total	57.27	100.0	21.2	100.0	83.12	100.0

Source : authors' calculations based on data of the CREA, MIMAP 2003

to analyze the link between the two forms of poverty being considered. The poor households will then be simultaneously studied following the two approaches to finally determine the influencing factors of this type of multidimensional poverty.

Households with predominantly female members are the least poor yet the least educated

The proportion of households considered as poor is taken from the determined threshold scores. For these households, it is noted that the males are largely numerous, and are also the most affected by poverty (the difference in Wakhinane is minimal though; 58.1% of male-headed households are poor as against 55.9% of the female-headed households). The qualitatively poor households most often have CMs aged between 35 and 55 years old and who are monogamous. The single and divorced CMs fare the least, especially in Ndangalma where they are all too poor.

The educated females are very weakly represented in this kind of poverty profile since they represent less than a third of the proportion of educated males. In Ndangalma, none of the females have ever been to school, a situation which is quite alarming.

In the three localities, the households of shopkeepers contribute the most to this type of poverty. Furthermore, with the exception of administration workers, of whom 65.1 percent escape qualitative poverty in Wakhinane, all other sectors of economic activity are severely affected by this in both Wakhinane and Ndangalma.

Finally, the average size of qualitatively poor households everywhere is smaller compared to poor households classified as such using the monetary approach.

Joint analysis of the two forms of poverty

It is important to test the correlation between the two forms of poverty and to draw up the profile of the households which suffer from both forms of deprivation.

The two forms of poverty are distinct

The analysis of the models for the three communes confirms that both forms of poverty are positively correlated (at the threshold level of 5%), this despite the weak incidence of poverty in Tivaouane. The positive correlation between the two forms shows that the presence of one noticeably increases the probable presence of the other. The weakness of the coefficients of correlation, however, proves that these two approaches are distinct and that one cannot be deduced from the other. In this context, it appears necessary to study the households concurrently experiencing both dimensions of poverty.

Characteristics of households concurrently experiencing two forms of poverty

The comparison of these two approaches allows the identification of absolute poverty on one hand and poverty in a more general sense on the other. The households concurrently manifesting both forms of poverty are found in Ndangalma and Wakhinane where they represent 66.9 percent 35 percent of the population, respectively (Table 16). On the other hand, only 9.3 percent of Tivaouane's population experience both poverty forms. The rest of the poor households experience one or the other form of poverty (77.3% in Ndangalma and in 57.3% in Wakhinane).

Poverty increases with the age of the CMs and affects more households headed by males

As with monetary poverty, households headed by females contribute the least to the poverty situation in their localities despite their poor literacy. Moreover, households with CMs younger than 35 years old contribute the least to poverty. In Wakhinane and Ndangalma, the incidence of poverty decreases relative to the age of the CMs while in Tivaouane, households most affected by poverty are those whose heads are younger than 35 years or more than 55 years of age. This explains why there were certain households whose homes have been built but remain unfurnished.

Table 16. Incidences of poverty according to the monetary and qualitative approaches

Quantitative Poverty	Qualitative Poverty		
	Wakhinane	Non-poor (%)	Poor (%)
	Poor (%)	22.3%	**35.0%**
	Non-poor (%)	23.5%	19.2%
	Tivaouane	Non-poor (%)	Poor (%)
	Poor (%)	11.9%	**9.3%**
	Non-poor (%)	67.1%	11.7%
	Ndangalma	Non-poor (%)	Poor (%)
	Poor (%)	10.4	**66.9**
	Non-poor (%)	6.5	16.2

Source : authors' calculations based on data of the CREA, MIMAP 2003

With regard to marital status, the majority of poor households in Tivaouane and Ndangalma were managed by CMs who contribute 53.4 percent and 53.0 percent to accumulated poverty, respectively (Table 17). Moreover, single CMs who contribute the least to poverty are the ones most affected by it, given the fact that half of them are poor. In Wakhinane, the poorest households are led by divorced CMs, seven in ten people of which are poor (71.1%).

Households managed by the unemployed live in very difficult conditions

When it comes to economic activity, the unemployed CMs of households contribute the least to poverty even though they are actually the poorest.

Among the employed, in addition to the households of traders who are among the poorest everywhere, the CMs of households in the rural areas and working in the BTP and in the primary and industrial sectors are the poorest. In Wakhinane, the absolute poor can be found

Table 17. Demographic characteristics of poor households with absolute poverty

Characteristics of the CMs	Wakhinane		Tivaouane		Ndangalma	
	Incidence	Relative Contribution	Incidence	Relative Contribution	Incidence	Relative Contribution
Female CMs (%)	39.2	26.5	5.5	14.7	38.2	3.6
Male CMs (%)	37.1	73.5	10.5	85.3	74.0	96.4
Ages of the CMs (%)						
Less than 35 years old	10.4	1.7	7.2	3.6	62.4	6.1
Between 35-55 years old	39.2	56.0	6.0	31.8	67.7	48.1
55 years old and above	40.7	42.3	13.6	64.6	77.8	45.9
Total	57.27	100.0	21.2	100.0	83.7	100.0
Marital Situation of the CMs (%)						
Monogamous	30.3	46.3	6.2	34.0	61.3	41.5
Polygamous	50.6	33.8	13.6	53.4	87.2	53.0
Single	16.6	.9	32.2	7.7	100.0	1.5
Divorced / Separated	71.1	14.7	-	0.0	30.7	0.5
Widower / Widow	42.1	4.3	4.5	4.9	43.1	3.4
Total	57.27	100.0	21.2	100.0	83.12	100.0

Source : authors' calculations based on data of the CREA, MIMAP 2003

in the field of transport and other services. This may be due to their low wages which does not allow them to live a comfortable life.

Determinants of qualitative poverty

This study employs four determinants of qualitative poverty–the demography of the household, the level of instruction, the professional status, and the assets of the household.

The households in Wakhinane and Ndangalma whose heads are polygamous are the least poor

Generally, the risk factors of poverty vary from one locality to another. Thus, aside from the size of the households, none of these factors are simultaneously significant in all three localities. Household size has a more important effect in Ndangalma where there is a strong incidence of poverty. In Wakhinane, the effect of household size is reinforced by its number of children, the rate of dependence,[19] and the age of the household members. Poverty in these households may be the result of either their members' negligible participation in economic activity or of the cultural practice of accommodating extended families despite limited means, a trait prevalent among Senegalese. In Tivaouane and Ndangalma, households headed by a single or male CM are likely to become destitute in terms of housing and possessions.

The level of educational attainment influences the quality of the life among the poor

In Wakhinane, where the level of educational attainment is higher, poor households live in relatively more comfortable residences. Obversely, households in the other two communes whose CMs are less educated are more likely to live in precarious conditions.

Households in Wakhinane that are headed by unemployed CMs are deficient in housing and appliances. On the other hand, households in Tivaouane headed by CMs who are employed in transportation, communication, and the trades may have insufficient appliances but this is offset by having well-kept houses.

Farming contributes to the reduction of poverty

Finally, the possession of livestock in Wakhinane and Ndangalma can serve as assets that could alleviate qualitative poverty; those who have lands in Ndangalma are more likely to lose these.

[19] Proportion of the members of the household without income dependent on those who have.

Table 18. Several factors explaining the social situation of the households

Ddeterminants of Qualitative Poverty (Methods of Scores)	Wakhinane		Tivaouane		Ndangalma	
	Coeff.	Eff. marg.	Coeff.	Eff. marg.	Coeff.	Eff. marg.
Demography of the household						
Gender	–	–	–	–	1.26632	0.432462
Single	–	–	1.36059	0.353543	–	–
Polygamous	-0.33616	-0.12085	–	–	-0.61023	-0.14629
Log (age of the HH)	0.648072	0.230877	–	–	–	–
Log (size of the HH)	0.423391	0.150834	0.617278	0.075764	2.301673	0.548446
Log (no. of children)	0.388856	0.138530	–	–	–	–
Rate of dependence	0.052121	0.018568	–	–	–	–
Education						
No level	–	–	–	–	0.789858	0.243054
% of sec. members - no level	–	–	1.102729	0.129653	2.33607	0.556642
% of sec. members - primary level	-1.06490	-0.37937	–	–	2.338747	0.557279
% of sec. members - secondary level	-2.83303	-1.0093	–	–	–	–
Employment						
Employed	–	–	-.630854	-0.07675	–	–
Unemployed	0.995611	0.381364	–	–	–	–
Transport/communication/trade	–	–	0.66431	0.108672	–	–
Patrimony						
Surface area of land owned	–	–	–	–	0.040230	0.009586
Size of small animals	-0.15790	-0.05625	–	–	–	–
Size of big livestock	–	–	–	–	-0.09899	-0.02359
Constant	-3.10595	–	-3.20956	–	-8.00429	–

Source : authors' calculations based on data of the CREA, MIMAP 2003
Cf. Annex 6 and Annex 7 for details on the model

On the whole, very few variables are revealed as determinants in the characterization of existence poverty and in general do not concern but only one or two localities, which does not allow a total comparison of all these determinants. In order to have a more thorough study, the last chapter will attempt to better understand this phenomenon through a more detailed hierarchical classification of these households based on the scores already obtained.

Classification of households according to the conditions of existence

The classical analyses[20] carried out up to this point, even if they allow the determination of poverty and their principal characteristics, do not offer the possibility of establishing a more detailed hierarchy of the households according to their social classes. To have a bigger vision of the living conditions of these households, the Multiple Correspondence Analysis (MCA) of the relative variables of the habitat and equipment of the household has been resorted to.

Multiple Correspondences Analysis

Figures 1, 2 and 3, respectively, give a projection of the three classes of the first factorial maps (for Wakhinane and Ndagalma) and the second factorial map.

Observation of the MCA graphs allows for the better understanding of the details of each class. In Ndangalma, for example, the first factorial axis oppose the households in very good habitat conditions, those with essential equipment (underpopulated, possessing a TV set and toilets), to those living in precarious conditions (possessing neither a TV set nor toilets). The second axis of the same map, for its part, opposes the households with acceptable habitat conditions (possessing a radio set, equipped with a faucet, and having an acceptable number of persons per piece), to those living in precarious conditions (who do not possess a majority of the goods

[20] The consistent classical approaches distinguish the poor and those who are not poor by determination of thresholds.

Figure 1. Projection points of the three classes of the households in Wakhinane on the factorial foreground of the ACM produced on the variables related to habitat and equipment

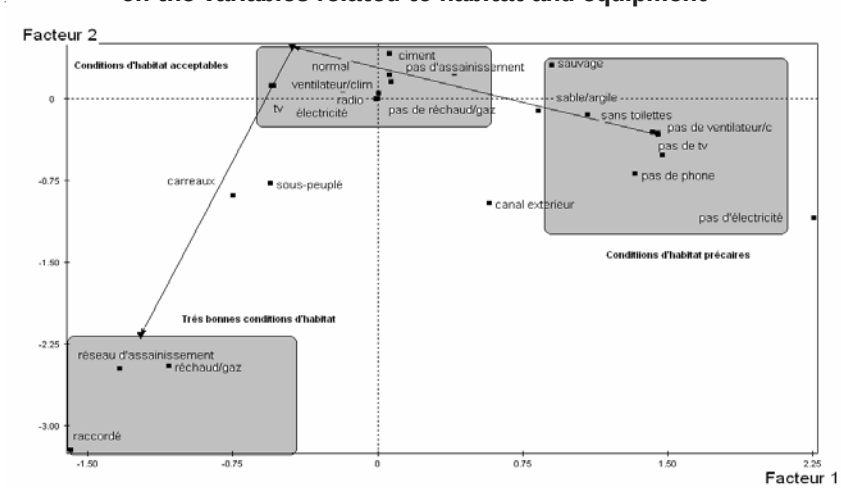


Figure 2. Projection points of the three classes of households in Tivaouane on the factorial plan (1-3) of the ACM produced on the variables related to habitat and equipment

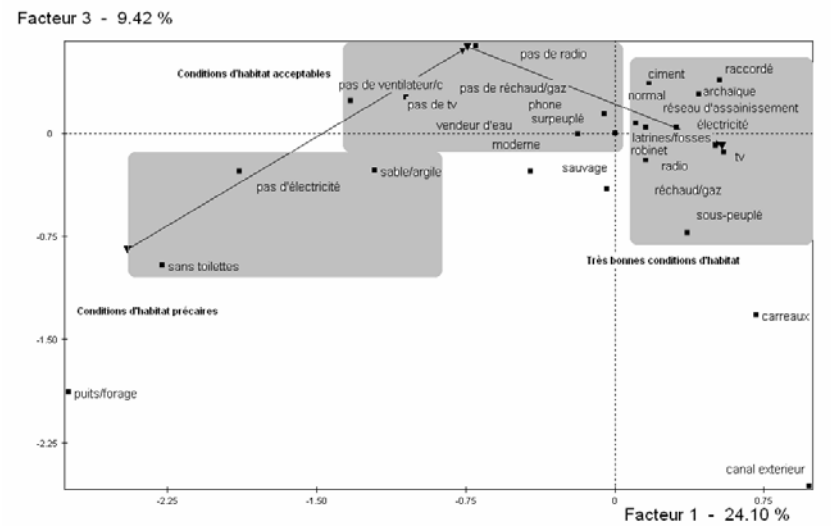
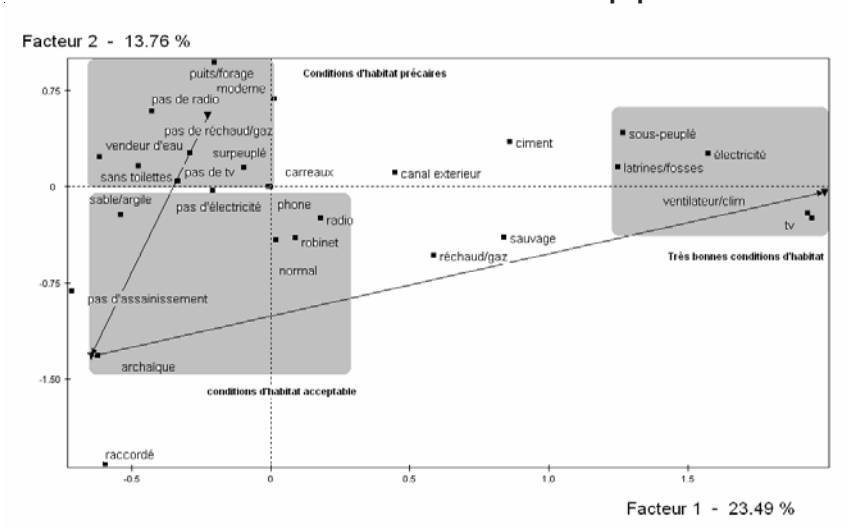


Figure 3. Projection points of the three classes of households in Ndagalma on the factorial foreground of the ACM produced on the variables related to habitat and equipment



during the course of this study). This forms a vulnerable layer. The following paragraph will elaborate a more detailed description of the different classes according to the hierarchy previously stated.

Hierarchization of households

The classification of households into three categories has permitted the distinction of the poorest households, those having average living conditions and those that are most comfortable. These classes present the characteristics described hereunder.

Households living in precarious conditions

This class, which represents 27.3 percent of the population in Wakhinane and 60.3 percent of that in Ndangalma, regroups the majority of households characterized by underequipment and precarious living conditions. In Tivaouane, where this social category is relatively less important, households not possessing certain indispensable social goods such as toilets, potable water, etc., are

found. The heads of these households are all uneducated and majority are males (96.2%). Moreover, in an urban area, none of the households of this class have access to a drainage system while the proportion that has access to this in Ndangalma is only 3.2 percent.

Meanwhile, the households of this class, the majority of which is headed by CMs aged between 36 and 55 years old, are characterized by overpopulation (88.5% in Tivaouane, 70.9% in Ndangalma, and 55.5% in Wakhinane). These numbers could be due to the spirit of solidarity of the Senegalese Society where resources are put together in order to "make the two ends meet" and where the CMs come from the sectors of activity with small remunerations (as with the case in Tivaouane) where they search to be integrated into the professional setting.

Households having acceptable habitat conditions

Constituting 63.1 percent of households, this class is the most important in Wakhinane. Contrary to that of the first class (of Wakhinane), all of these households benefit from the access to electricity, telephone and use of modern means of waste cleaning/ management.

The majority of households were educated and the members of these households call on healers in case of sickness. In Tivaouane and Ndangalma, all households belonging to this class have access to potable water but lacking in equipments of comfort and leisure such as television and fan. In Tivaouane, on the other hand, around one-third of households of this category have access to electricity.

The households best equipped in terms of equipment and housing

The households regrouping together the best living conditions in terms of equipment and habitat are concentrated in this class. It regroups the majority of households having a good number of equipments measured by their possession of gas stoves, television sets, and fans as well as access to electricity. In Wakhinane, this class comprises 9.56 percent. In Tivaouane, the households of this last category all

have access to potable water and the main part of the educated households of the locality can be found in this class that is otherwise the most important (69.55%).

Often, despite having the best living conditions relative to the other classes, the households belonging to this category in Tivaouane and in Ndangalma do not have the best types of toilets (restrooms linked to a drainage system) 84.1 percent and 88.0 percent, respectively, use latrines or pits. Nevertheless, this does not constitute a major handicap with respect to the poor access of these populations to the system of clearing used water.

Having made this classification, it will be interesting to identify the factors that could explain the chances of the households to live in a particular type of housing. This will be the question to be tackled in the next step.

Determinants of qualitative poverty following the stratification approach

The determinants were elaborated by the ordered probit model.

Qualitative poverty increases along with the level of education in the urban setting

There are no determining risk factors of poverty in the three localities at the same time. Numerous studies have shown that education facilitates in professional insertion and improves productivity of work, thereby contributing to weakening the effect of poverty. However, if scholastic indicators considered in the framework of this analysis tend to confirm this assertion in Ndangalma, it is not the case in the urban communities taken into account. In Tivaouane, for example, whatever the level of education of the household heads, their households run the risk of occupying an under-equipped and/or dilapidated habitat. This can be due to the weakness of the employment offers that oftentimes constrains people with high levels of education to be engaged in poorly remunerated activities that often do not correspond to their profile.

The situations of these households in terms of housing will be, without a doubt, due to other factors relative to the households' socio-economic category, to the size or to the assets of the household.

The actively engaged are less at risk to qualitative poverty

Regarding employment, the active in the two urban communities are more inclined to live in decent housings. Often, in Tivaouane, among the actively engaged people, those coming from services cannot attain such types of habitat. Moreover, in Ndangalma, the increase of income obtained by the active allowed them to escape, in 60 percent of the cases, from the worst living conditions.

When it comes to the size of the households, it is a factor contributing to the unfavorable living conditions in Tivaouane while in Ndangalma, the effect is the opposite.

The possession of big livestock reduces the risk of poverty in Wakhinane and Ndangalma

This could be explained by their breeding activity which often obliges them to live by the limits of the communities or by the poor income from the sale of their animals. Whereas, in Wakhinane, landowners have strong chances to have good apartments.

Contrary to urban communities where there is not any significant effect, membership to a household managed by a male or where the head is single are two indices that can increase or decrease, respectively, the risk of living in a precarious habitat.

To sum up, the factors show that the state of activity positively influences the membership of a household to the class of equipment while those relative to the level of education of the household heads have a mixed effect.

Conclusion

The comparison of the monetary and qualitative approaches of poverty was not possible until after the estimation of consumption expenses for each adult equivalent of the households studied. The prediction

models of these expenses have a relatively high explanatory power. From a methodological point of view, the option chosen to determine the poor following the two approaches is the classical one consisting of the determination of a threshold of poverty to distinguish the poor from the non-poor. The estimated expenses have permitted the evaluation of the incidence of poverty that is very high in Ndangalma and Wakhinane.

Monetary poverty principally concerns households with a low proportion of education. They have difficulty accessing well-remunerated employment. Meanwhile, the eldest household heads (55 yrs old and above), which constitute the retired and the inactive, are the most hit by poverty. In Wakhinane, 60.9 percent of the household heads aged 55 years old and above are poor while it is 88.9 percent in Ndangalma. The incidence of poverty in the households with female heads is equally high in these two localities, and to this, it must be added that the poor level of education could be at the base of this situation. Moreover, the poor households according to this approach have large members, 14.82 people in Tivaouane.

The confrontation of this approach with those based on the conditions of existence showed that even if the two approaches partially confirm each other, their trends still remain a little bit different. In effect, even if this poverty is likewise more accentuated in the rural setting, differences exist in the characteristics of the heads of the poor households according to either one of the approaches. Also, households affected by qualitative poverty have, on average, have smaller size and the younger household heads than those of quantitatively poor households.

Moreover, the households concurrently having the two forms of poverty are very few in Tivaouane (9.3%) while this represents 71.6 percent of households in Ndangalma. The poorest households are, like in the monetary approach, those whose heads are aged above 55 years old. Moreover, the size of the households rises in an increasing manner in all three localities.

When it comes to the determinants, the level of education becomes apparent as a factor that reduces poverty in Wakhinane in contrast to the other two localities.

The stratification of the households, taken from the ascending hierarchical classification in three classes, has allowed the confirmation of the prevalence of the level of instruction in the quality of habitat of the urban households. Also, the possession of a big livestock reduces the risks of existence poverty in Wakhinane and Ndangalma.

To end, the results of this study show that the policies against poverty cannot be limited to any unique field of phenomenon. They must act on the job market and not just on the access to education. Moreover, services such as the drainage system, electricity, etc., should be accessible in all localities so that households wishing to have them could procure them. For the inequalities between strata (urban and rural), there is a need to develop lucrative activities that permit rural households to improve their standard of living especially during the dry seasons.

References

Bourbonais R. 2002. *Econométrie*. 4th edition. DUNOD. Paris. p.317.

DPS. 2004. *La pauvreté au Sénégal : de la dévaluation de 1994 à 2001-2002*, *version préliminaire*, Ministry of Economics and Finance, p.30.

Fall S. and Sylla M.B. 2000. *Etude de la pauvreté urbaine au Sénégal 1991-1997.* Dakar. DPS. Ministry of Economics and Finance. Senegal. p.45.

Escofier B. Pages J. *Analyses factorielles simples et multiples.* 3rd edition. DUNOD.

Kakwende M., Greggoire J.L., Legros H., Ouedraogo H. 1999. *La lutte contre la pauvreté en Afrique Subsaharienne.* Economica. Paris. p.473.

Lachaud J.-P. *Les déterminants de l'inégalité du bien-être au Burkina Faso :une décomposition de régression*. Montesquieu-Bordeaux IV. University–France. p.21.

Lachaud J.-P. *Les déterminants de la réduction de l'inégalité et de la pauvreté en Mauritanie : une approche micro-économique.* Montesquieu-Bordeaux IV. University France. p.23.

Lebart L., Morineau A., Piron M. 1997. *Statistique exploratoire multidimensionnelle*. 2nd edition. DUNOD.

Ministry of Finance of Senegal. 2002. *Document Stratégique de Réduction de la Pauvreté,* p.75**.**

Razafindrakoto M., Roubaud F. 2001. *Pauvreté et récession dans les métropoles africaines et malgaches : éléments de diagnostic.* DIAL. Work Document. p.30.

Thomas A. 2000. *Economètrie des variables qualitatives*. DUNOD. Paris. p.179.

Comments

- Research objectives:
  a. The CBMS survey in the three localities of Senegal makes it possible to study the poverty of existence. Research presented here aims to enrich this poverty profile by adding to it monetary poverty which was not measured in the CBMS survey.
  b. Method used: the total expenditure of the household based on a set of non-monetary variables common to both the ESAM-II and CBMS surveys was considered. The function of prediction is a regression estimated based on ESAM-II, done separately in the three strata: Urban Dakar, other cities, and rural environment.

- The principal weakness of the study is the set of 12 variables selected to define the poverty of existence, in Table 2. In it, variables on habitat (house) and the equipment of the household was found. It thus concerns material living conditions, not taking into account human capital. In the CBMS survey, there is information on education, health, employment, which could have been taken into account for a broader notion of poverty.
- The second major weakness is in the produced results. The estimate of the imputation model of per capita expenditure lacks an essential part, that is, the estimated value of the term of error. It should be completed by providing the following:
  - the estimate of the error for log (total expenses/cap);
  - its transformation into term of error for total expenses/cap.; and

- the impact of this error on the error associated with the poverty indices P0 and P1.

- Section I-1 is definitely insufficient with regards to information on the model. A lot of work has been done these last years on the "small area estimate" type of approach and on the level of disintegration that make it possible to obtain reliable estimates of poverty indices. See in particular Peter Lanjouw et al., 2003 or 2004.
- First section, second part, could go in the appendix, giving the distribution of the 19 variables.
- Tthe profiles of the two types of poverty should be described in parallel.
- Third section on ualitative poverty: in order to bring out the differences in the poverty profile, it would be necessary to have, in the same table, the numerical results of the two types of approach with exactly the same descriptive variables (determininants) of poverty.
- In Section four, there is much analysis of the three groups of households determined from the poverty of existence which moves us away from the principal subject: the comparison between the two types of poverty. Suggestion: Carry over the quintiles determined by the per capita expenditure to graphs 6, 7 and 8.