Supplementary online appendix to "Inequality, poverty and the intra-household allocation of consumption in Senegal" by Philippe De Vreyer and Sylvie Lambert

Appendix S1: ESPS/PSF comparison

1. Questionnaire design

The PSF and ESPS surveys differ in their way of measuring consumption by several aspects. PSF innovates in the fact that the consumption questionnaire is addressed to all household members that potentially have a say about resources allocation (the so-called "cell heads"), as opposed to the usual practice in which only one member (commonly the household head) is sought to answer that part of the questionnaire. In doing so, and since the head may not be informed of the consumption of all members, the PSF survey should capture more consumption than regular surveys, particularly in large extended households where several adults may have their own income sources. However, there are other variations in the questionnaires that may explain eventual discrepancies in the level of consumption captured by the two surveys: the degree of commodity detail and the length of the reference period are two obvious differences that have been investigated in the literature (see Beegle *et al*. 2012 for a survey). It seems common sense to assume that the higher the number of items over which consumption is collected, the larger should be the total level of consumption in the household. However the gain in coverage warranted by a longer list of items may come at the cost of a loss in reporting precision, due to household or surveyor fatigue resulting from an exceedingly long questionnaire. Nevertheless, there is a large consensus in the literature on the fact that a short list of commodity items results in a less precise and lower aggregate consumption level. Conclusions concerning the recall period are less clear cut. On the one hand long recall periods may be better able to capture the consumption of commodities that

are not frequently bought over the year and limit the risk of "telescoping" errors, in which respondent include consumptions just outside the reference period. On the other hand, the longer the recall period, the more are respondent likely to under-report consumption due to recollection difficulties. Evidence concerning the impact of the reference period length is mixed, with some papers invoking a too short report period to explain a level of consumption lower than expected (Lanjouw 2005 for food consumption in Brazil) and other showing that the level of daily consumption expenditure decreases with the number of days of recall (Scott and Amenuvegbe 1990 for Ghana), while Deaton and Grosh (2000) using data from LSMS surveys conducted in Côte d'Ivoire, Vietnam and Pakistan conclude that measured consumption does not depend much on the recall period length. Based on experimental data from Tanzania, Beegle *et al*. (2012) compare eight different questionnaire designs. They find that the "usual" consumption approach in which the household is asked to report the level of consumption over a regular month and the number of months of consumption, yields rather unprecise results when compared to a 7 days record period: food consumption is underestimated and non-food consumption overestimated. They attribute these discrepancies to the high cognitive demand of the usual food questions which require the respondent to make an estimation of their consumption rather than just to recall and count what has been consumed over a given period. They advocate that the 7 days recall period may get closer to the true consumption level, though it may perform poorly in households with a large number of adults.

Table S1.1 : Comparison of « Enquête de Suivi de la Pauvreté au Sénégal » (ESPS) and « Pauvreté et Structure Familiale » (PSF) surveys designs

	ESPS			PSF		
	Respondent	**Number and list of items**	**Recall period**	**Respondent**	**Number and list of items**	**Recall period**
Purchased food (every day spending)	Every day spending is not separately covered.			Household members in charge of preparing meals	Respondent is asked about the amount of every day spending ("dépense quotidienne", DQ), she/he receives from contributors.	Respondent is asked about the length of the period covered by the DQ (from one day to three months).
Food contributions received in kind	Contributions received in kind are not covered.			Household head	Respondent is asked about the amount of the contributions received by the household on a regular basis.	Frequency is reported by the respondent who can choose among twelve modalities from every day to every year. Respondent is asked about the usual contributions.
Other purchased food	Household head	Respondent is asked about expenditure on 27 items: Millet, maize, sorghum and fonio; Sub-products from millet, maize and sorghum; Rice; Peanuts and their	Over the 30 last days. The respondent is then asked about the number of times it spent the same	Household head	The head of household is asked about items that he/she is in charge of buying him/herself (this does not necessarily means that he/she pays for it and	Frequency is reported by the respondent who can choose among twelve modalities from every day to

	ESPS			PSF		
	Respondent	**Number and list of items**	**Recall period**	**Respondent**	**Number and list of items**	**Recall period**
		subproducts; Vegetable (olive, cotton, sesame) and peanut oil; Other oils (palm,…); Tomato concentrate; Fresh tomatoes; Vegetables and tubers; Condiments and seasonings; Fresh fish; Smoked and dried fish; Red meat; Poultry; Sugar; Coffee; Tea; Cola; Non-alcoholic beverages (water, coke, sprite…); Local fruit juices; Alcoholic beverages; Bread (wheat, millet); Cakes and cookies; Milk (fresh and concentrate); Other dairy products; Fruits; Meals and other foods consumed outside.	amount over the 12 last months.		the act of purchasing may be delegated). A total of 25 food items are distinguished: Breads; Rice; Millet and sorghum; Other cereals; Oils; Fish; Meat; Vegetables; Fruits; Sugar; Potatoes; Cassava; Other tubers; Milk; Butter; Eggs; Salt; Coffee; Tea; Drinks; Other food products; Prepared meals; Food consumed outside; Beverages consumed outside; Meals taken outside;	every year. Respondent is asked about the usual expenditure.

	ESPS			PSF		
	Respondent	**Number and list of items**	**Recall period**	**Respondent**	**Number and list of items**	**Recall period**
Home produced food	Household head	3 categories: Agricultural products; Livestock products; Fishing products.	Over the 12 last months.	Household head	3 categories: Agricultural products; Livestock products; Fishing products.	Over the last 12 months. For each item they produce, hunt, fish or gather: Respondent asked how many months in the year it is consumed and the monthly market value
Utilities	Household head	3 items: Water; Electricity; Telephone (fixed and mobile).	Over the two last months.	Household and cell heads	4 items: Water; Electricity; Fixed telephone; Mobile phone.	Frequency is reported by the respondent who can choose among twelve modalities from every day to every year. Respondent is asked about both usual expenditure and last expenditure.
Housing fuels and combustible materials	Household head	4 items: Gas; Charcoal; Wood; Combustible materials (candles and petroleum).	Over the last 30 days (and if not purchased, amount usually spent over a month).	Household and cell heads	1 item: Fuels and combustible materials (wood, charcoal, gas, candles and petroleum);	
Durable goods	Household head	3 items: Furniture and electrical appliances; Transport means (car,	Over the last 12 months	Household and cell heads	2 items: Furniture and electrical appliances; Transport means (car,	

	ESPS			PSF		
	Respondent	**Number and list of items**	**Recall period**	**Respondent**	**Number and list of items**	**Recall period**
		motorcycle, bicycle…); Jewelries.[1]			motorcycle, bicycle…)	
Other non-personal items	Household head	6 items: Soap and housing cleaning products; Maid; Housing maintenance and repair; Small appliances and cutlery; Motor fuels, repair of transport means; Other expenses.	Over the last 30 days (and if not purchased, amount usually spent over a month).	Household and cell heads	7 items: Maid; Housing maintenance and repair; Furniture and electrical appliances repair; Small appliances and cutlery; Motor fuels, repair of transport means; Recreational devices and accessories; Other goods and services.	
Education	Household head	5 items: School fees; Books and school supplies; School transportation; School uniform; Other expenses.	Over the last school year	Cell heads	5 items: School fees; Books and school supplies; School transportation; Private lessons; Vocational training.	Frequency is reported by the respondent who can choose among twelve modalities from every day to every year. Respondent is asked about both usual expenditure and last expenditure.
Personal items	Household head	8 items: Soaps; Perfumes and cosmetics; Tobacco and cigarettes; Recreational services, books and newspapers; Clothing; Shoes; Cloth; Tailoring.	Over the last 30 days (and if not purchased, amount usually spent over a month).	Cell heads	6 items: Transport; Clothing and shoes; Personal care (soaps, perfumes and cosmetics, tobacco and cigarettes etc.); Personal belongings (jewelries etc.); Recreational services; Books and newspapers.	

[1] In the PSF survey, jewelry expenditures are covered in the personal item section of the questionnaire.

In table S1.1 we report the main features of the ESPS and PSF consumption questionnaires. In both surveys the list of commodities is restricted to what has been included in the consumption aggregates computed for this paper. The PSF survey sample is small compared to that of the ESPS (1762 households versus 13559). For this reason, and since in Senegal the large majority of households are owners of their housing (more than 80% at the time of the survey, and more than 97% in rural areas), the PSF survey does not allow to compute imputed rents for owners in rural areas. Therefore, we decided not to include housing rents in our expenditure aggregates. Also excluded are income and direct taxes, together with gifts, construction, celebration that are not completely covered in PSF. We also exclude health expenditures, since we wish to exclude them from the analysis as interpersonal differences are likely to largely correspond to difference in needs. The PSF and ESPS surveys do not differ much in the level of disaggregation of the commodities included by the consumption questionnaire: 30 food and 29 non-food items are covered by ESPS, versus 28 food and 25 non-food in PSF. There are two major differences in the way food expenses are collected. First, while in ESPS the design of the food consumption questionnaire does not differ from that of non-food, in PSF the food section is first addressed to household members in charge of preparing meals. The respondents are asked about the amount of the daily expenditure ("dépense quotidienne", DQ) that is spent for these meals. Field interviews that have been conducted before the survey showed that the DQ mainly covers expenses for fresh food, such as vegetables, fruits, fish and meat. Other food commodities, such as rice or oil for instance, are often bought directly by the head of the household, generally in bulks. The second part of the questionnaire covers these expenses. Later, cell heads are also asked to report any expenditure related to food and meals consumed outside the household by members of their cell. In ESPS, this question is

addressed only to the household head. The second important difference lies in the fact that the PSF questionnaire records the amount of contributions in kind received by the head of the household. This is an important feature since about 20% of the households declare they receive such contributions.

The second important difference between ESPS and PSF designs is that while ESPS varies the length of recall with the type of commodities, PSF gives the respondent the choice of the reference period.

Finally, it should also be mentioned that, aside the consumption survey, the PSF questionnaire is much longer than that of ESPS. Since consumption is covered after the individual surveys, the quality of the consumption data in PSF may be negatively impacted in large households due to respondent and surveyor fatigue. Note, nonetheless, that the extra length of the questionnaire is somewhat compensated in terms of fatigue in PSF by the fact that the burden of the survey is shared among all cell heads.

2. Implications for consumption measurement

Overall, it is difficult to assess how these differences between designs may impact the measurement of consumption. As mentioned, interviewing several adult members of the household is likely to allow PSF to reduce mismeasurement due to asymmetric information within the household. Food consumption may also be better captured in PSF, since respondent in charge of preparing meals and of buying food on markets generally know precisely how much they spend every day, or every week, and this amount is unlikely to change much on a short period of time. On the contrary, household and surveyor fatigue, being potentially more likely to happen in PSF may impact negatively the measurement of consumption. As for variations in the length of the reference period it is difficult to

anticipate how they correlate with any discrepancy between ESPS and PSF total household consumption aggregates.

Nevertheless, two conjectures can be made. First, if the PSF design is better able to apprehend food consumption than that of ESPS and if household or surveyor fatigue does not impact too much the ability to capture consumption of food commodities, then one can expect to find a higher level of food consumption in the PSF survey. Moreover, since in more than 80% of households all members take their meals together, the gap between surveys should not depend on the household structure. Second, for total household consumption, one cannot conjecture whether any difference should be observed on average between surveys, but we may expect the ratio of PSF to ESPS household consumption for a given household type to increase with the complexity of the household structure.

Testing these conjectures is not straightforward. Contrary to PSF, the ESPS survey has not been designed to capture the entire complexity of Senegalese households. One can only rely on the usual "relationship to head" question to recover, in as much as possible, the household structure and identify the number of budget decision units. The basic strategy is to count the number of household members of the different types, as defined by their relationship to the head: spouse, child, grand-child, parent, grand-parent, brother/sister, nephew/niece, other parent, unrelated etc. and then to compare that number to the household size. For instance, a simple two cell household can be constituted of a male head, his (unique) spouse and his children. The children can be those of the spouse, in which case they belong to her cell, or they can be born from another marriage, in which case they belong to the head's cell. In any case, households with the head, one spouse and children and with no other members are two cell households. The difficulty is that these nuclear families are not the only kind of two cell households, but they are the only ones that ESPS can identify for sure. For instance, consider a household in which on top of the

household head, his spouse and their children, one also finds the head's sister and his niece. This could be a two cells or a three cells household, depending on the relationship between these two extra members. If the niece of the household head is also the daughter of his sister, then the two constitute a third cell, while if they are not related, both will be in the head's cell. To sum up, we are able to identify four kinds of households in the ESPS sample (and of course also in the PSF): (1) single person households, (2) one cell households, (3) more than one cell households with only "nuclear" family members and their offspring (head, spouse(s), children, grand-children), (4) other households. For reasons just explained, some truly one cell households may be misclassified as "other" households, but the opposite cannot happen.

We apply this classification rule to both the PSF and ESPS samples and compare the estimated average household per capita food and total consumption for each category of households and for the entire samples. In order to make meaningful comparisons, we need to account for any sampling frame variation and for the fact that about one year separates the ESPS and PSF surveys. Simple unweighted comparison of surveyed household locations shows that PSF oversampled the Dakar region compared to ESPS (37.5% in PSF versus 11.8% in ESPS). Since households in Dakar are on average wealthier than those in other regions of the country, a simple comparison of average consumption levels is unlikely to reflect solely differences in survey design. Using the survey weights helps to correct imbalances but not completely. The weighted proportion of households in Dakar is still 3% higher in PSF than in ESPS (29.5% for PSF versus 26.6% for ESPS) and very large imbalances appear between the Matam (PSF: 12.8%; ESPS: 3.4%) and Thies (PSF: 6.4%; ESPS: 14.2%) regions. In the face of this, we decided to follow a strategy initiated

by DiNardo, Fortin and Lemieux (1996)[2]. Pooling together the PSF and ESPS data, we estimated a logit model on the probability of being in the PSF sample, using region and urbanization dummies as explanatory variables, since these variables have been used to stratify the sampling frame. Estimation results are then used to compute the predicted probability of belonging to the PSF sample, *ps*. Then ESPS observations are reweighted using *ps/(1-ps)* as weights. This strategy gives much better results in that all strong imbalances between samples are corrected, with the maximum difference between the two surveys in the proportion of households living in a given region being lower than 0.5%. We also hold account of the general progression of prices between the two surveys, using figures provided by the Senegalese statistical agency (ANSD). PSF has been conducted between November 2006 and April 2007, almost exactly a year after ESPS. In order to estimate the average change of the price index between these two periods, we computed the mean of the annual inflation rates calculated over the 6 twelve-month periods going from November 2005 to November 2006, December 2005 to December 2006, January 2006 to January 2007, February 2006 to February 2007, March 2006 to March 2007, and April 2006 to April 2007. For total consumption, this leads to an average one year inflation rate of 4.7%. ESPS figures have been adjusted accordingly.[3,4]

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[2] See Nichols (2008).

[3] A total of 1781 households are included in the original PSF sample. Three households have been dropped due to completely incoherent expenditure records. Three others have been excluded due to their head sharing his time between several households, which raised doubt on the correct allocation of his declared expenditure. One household was dropped due to incoherent recording of members' relationship with the head and another five households, because though they include two cells, the surveyor recorded all expenditure in the head's cell. Finally, seven households could not be included due to missing information on some key variable. We end up with a total sample size of 1762 households kept in the analysis.

[4] PSF Households with exceedingly high levels of expenditures have been screened and, when possible, their records corrected case-by-case based on information provided by other variables in the survey. No such work could be done on the ESPS data since the available information is more limited. The maximum level of annual expenditure per capita in PSF is found around 5,810,000 CFA (that is about $11,500 in 2006-2007). In ESPS the

Tables S1.2 and S1.3 show the estimated levels of average aggregate food and total household consumption per capita for all four categories of households and for the entire sample. The pattern is clear and consistent with our intuitions. In table S1.2, the results show no apparent relationship between household complexity and the difference between the two surveys estimates. However, as we conjectured, the amount of measured food consumption is always found higher in PSF, though the difference is not always significant. Table S1.3 shows the same exercise, but this time for total consumption. For single person households we find a higher level of annual expenditure in favour of PSF, but the difference is not significant. For other kinds of households, as expected we see a clear increase in the difference between estimated average aggregate levels of consumption per capita when moving from one cell households (with a negative nonsignificant difference) to "other" complex households, for which PSF expenditure per capita are significantly higher than ESPS. The last line of the table shows the values of expenditure per capita when we hold account of household size, or in other words when the unit of observation is the individual and not the household. On average, the level of expenditure per capita is found higher in PSF than in ESPS by about 15%.[5]

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maximum amount is around 13,780,000 CFA ($27,300), but only eight households out of 13559 have values higher than the PSF maximum. We kept these observations in the sample as very wealthy households are more likely to be included in ESPS than PSF, due to the much larger sample size.

[5] The average household size is found lower in PSF than in ESPS: 7.96 members versus 9.11. This results from a higher proportion of one cell households in PSF (13.9% versus 10.6% in ESPS) and could impact the comparison if larger households have on average a lower level of consumption per capita. In order to control for this possible source of bias, we run the same comparisons using household structure and household size as extra covariates in the logit regression used to build propensity score weights. Doing this, we can compare expenditure levels between households which on average share the same location, structure and size. This does not have a large impact on the estimates.

Table S1.2: average value of household food consumption per capita by household structure - all food commodities

Household type	PSF survey Mean (N)	ESPS survey Mean (N)	Difference PSF-ESPS (Std. err.)
Single person households	570,530	502,432	68,098
	(98)	(540)	(38,759)
Other one cell households	289,300	262,873	26,427
	(147)	(901)	(16,621)
More than one cell 'nuclear' hh.	217,181	193,024	24,156
	(549)	(3,971)	(17,379)
Other households	181,343	150,434	30,909
	(968)	(8,147)	(5,321)
All households	223,162	181,548	41,614
	(1,762)	(13,559)	(6,746)

Source: « Pauvreté et Structure Familiale » (PSF) and « Enquête de Suivi de la Pauvreté au Sénégal » (ESPS) surveys, authors' calculations.
Note: Summary statistics of food consumption per capita, by household types. In the first two columns, the sample size is reported between parentheses. In the third column, the standard error of the difference is reported.

Table S1.3: average value of household total consumption per capita by household structure - all commodities

Household type	PSF survey Mean (N)	ESPS survey Mean (N)	Difference PSF-ESPS (Std. err.)
Single person households	1,086,946	1,000,344	86,602
	(98)	(540)	(84,672)
Other one cell households	531,182	535,947	-4,764
	(147)	(901)	(52,169)
More than one cell 'nuclear' hh.	392,651	351,172	41,479
	(549)	(3,971)	(22,022)
Other households	367,697	301,915	65,783
	(968)	(8,147)	(14,561)
All households	429,115	371,231	57,884
	(1,762)	(13,559)	(12,859)
All individuals	328,135	284,917	43,218
	(13,988)	(123,486)	(3,519)

Source: « Pauvreté et Structure Familiale » (PSF) and « Enquête de Suivi de la Pauvreté au Sénégal » (ESPS) surveys, authors' calculations.
Note: Summary statistics of total consumption per capita, by household types. In the first two columns, the sample size is reported between parentheses. In the third column, the standard error of the difference is reported.

3. Poverty and inequality

We now compare the values of poverty and inequality indices obtained with the two surveys. Two poverty lines are considered. The lowest, « nutrition », line corresponds to the level of expenditure necessary to purchase enough food to attain a minimum caloric intake of 2400 kcal per adult equivalent and per day. Since in PSF we do not have a

reliable set of price data, we use the poverty lines computed by Ndoye et al. (2009), that we update using the average inflation rate between the ESPS and PSF surveys. The second line corresponds to the satisfaction of individual basic needs. It is computed using the average non-food per adult equivalent expenditure of households for which food consumption per adult equivalent is between 0.95 and 1.05 the nutrition poverty line. This average is added to the nutrition threshold to obtain the basic needs line. Table S1.4 reports the values of the poverty thresholds for Dakar, other towns and rural areas.[6]

Table S1.4: Nutrition and basic needs poverty lines

	Nutrition poverty line	Basic needs poverty line
Dakar	396	835
Other towns	369	647
Rural areas	356	558

Source: « Pauvreté et Structure Familiale » (PSF) survey, authors' calculations.
Note: Poverty lines per urbanization strata in Senegal.Values are given in CFA francs.

Using these thresholds, we can compute FGT indexes for both the PSF and ESPS surveys. The results are reported in table S1.5. Not much difference is found between the values of the FGT indexes. PSF finds more people under the nutrition threshold (16.7% versus 12.5%), but less under the basic needs one (42.8% versus 45%).

Table S1.5: FGT indexes for PSF and ESPS surveys

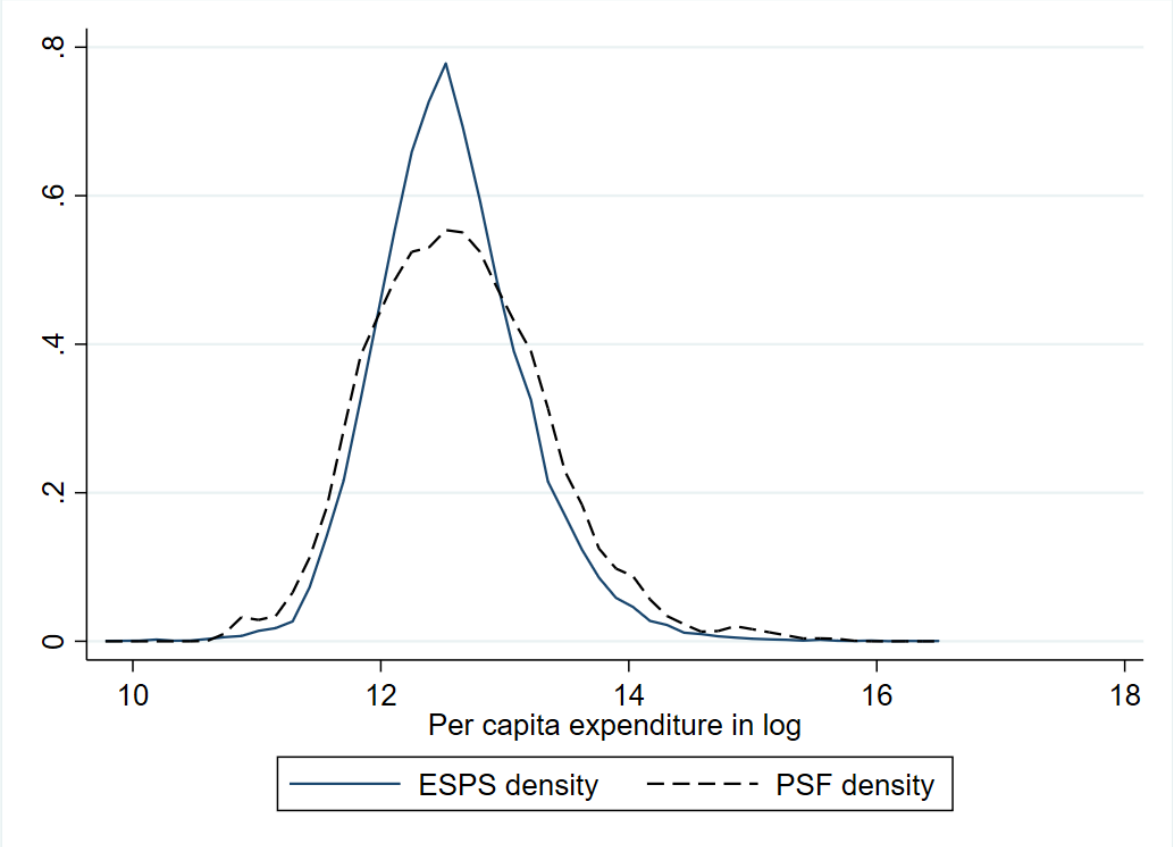
	Nutrition poverty line		Basic needs poverty line	
Index	PSF	ESPS	PSF	ESPS
Poverty headcount	0.167	0.125	0.428	0.450
Mean poverty gap	0.042	0.027	0.143	0.130
Mean squared poverty gap	0.016	0.009	0.064	0.052

Source: « Pauvreté et Structure Familiale » (PSF) and « Enquête de Suivi de la Pauvreté au Sénégal » (ESPS) surveys, authors' calculations based on 13988 and 123486 individual observations for PSF and ESPS surveys respectively
Note : Poverty measures obtained with the two surveys.

[6] We repeated the same exercise on the ESPS sample. The resulting basic needs thresholds are at bit lower than those of PSF (507, 592 and 780 CFA per adult equivalent and per day for rural areas, other towns and Dakar respectively).

Looking now at inequality, we computed the Gini index for both surveys. Here the two surveys lead to widely different measures of the extent of inequalities between individual levels of consumption per capita in Senegal: while, according to ESPS, inequality appears relatively low, with a Gini equal to 38.9, PSF finds it at a much higher level (Gini=47.1). These results are confirmed by figure S1.6 in the online appendix in which we plot kernel density estimates of PSF and ESPS distributions of log-consumption per capita. The graph shows that compared to ESPS, distribution in PSF is skewed towards the right and high values of consumption per capita. This is not surprising given that addressing the consumption questionnaire to more than one adult in the household is more likely to lead to higher values of consumption in relatively wealthy households.

Figure S1.6: ESPS and PSF densities for household per capita expenditure



Source: « Pauvreté et Structure Familiale » (PSF) and « Enquête de Suivi de la Pauvreté au Sénégal » (ESPS) surveys, , authors calculations.

Note: Gaussian kernel density estimates, with 50 estimation points. PSF sample has 13988 observations and ESPS 123486

Appendix S2: Differences between poverty and inequality measures

The rationale for using bootstrap to evaluate the significance of differences between poverty and inequality indices is provided by Biewen (2002). Asymptotic normality of the interdecile, interquartile, mean logarithmic deviation, and Theil indices can be established using the delta-method (Green, 2000). Kakwani (1993) provides the same results for the headcount poverty and the poverty gap indices. For the Gini index, see Xu (2007). In this Appendix, we reproduce in Tables S2.1 and S2.2 the estimated differences between inequality indices, based on per capita consumption, and between poverty indices, based on per adult equivalent consumption. Similar results for inequality indices based on per adult equivalent consumption are available upon request but not shown.

Table S2.1: Differences between inequality indices from Table 3

	Gini	90/10	75/25	Mean log dev	Theil-T
All consumption	2.56***	1.02***	0.10	0.05***	0.07***
	(0.21)	(0.23)	(0.07)	(0.00)	(0.01)
Non-food consumption	4.44***	6.91***	0.68***	0.15***	0.18***
	(0.33)	(1.00)	(0.21)	(0.01)	(0.02)
Food consumption	1.22***	0.55***	0.10**	0.02***	0.02***
	(0.13)	(0.13)	(0.04)	(0.00)	(0.00)

Sources: « Pauvreté et Structure Familiale » (PSF), authors' calculations.
Note : Test of differences between inequality indices computed using per capital household consumption and per capita cell consumption, presented in Table 3. N=1762, Bootstrap standard errors (250 replications). *,**,***: significant at the 10%, %, 1% level.

Table S2.2: Differences between poverty indices from table 6

	Nutrition poverty line		Basic needs poverty line	
	Headcount index	Poverty gap index	Headcount index	Poverty gap index
National	1.56***	0.88***	3.51***	1.78***
	(0.45)	(0.12)	(0.64)	(0.15)
Dakar	0.29	0.16***	3.56***	1.63***
	(0.39)	(0.06)	(1.14)	(0.22)
Other urban areas	2.07**	0.95***	3.43***	1.62***
	(1.01)	(0.31)	(1.26)	(0.30)
Rural areas	2.19***	1.34***	3.51***	1.95***
	(0.81)	(0.20)	(0.99)	(0.24)

Source: « Pauvreté et Structure Familiale » (PSF) survey, authors' calculations. N=1762 households and 4293 cells. Note : Test of differences between poverty indices computed using per capital household consumption and per capita cell consumption, presented in Table 6. Bootstrap standard errors (250 replications) between parentheses. *,**,***: significant at the 10%, 5%, 1% level.

Appendix S3: inequality measures, using per adult equivalent consumption.

Table S3.1: Inequality measures, on per adult equivalent consumption.

	Gini	90/10	75/25	Mean log dev	Theil-T
Per adult equivalent household consumption					
Total consumption	45.28	7.14	2.84	0.35	0.40
	(1.10)	(0.35)	(0.09)	(0.02)	(0.03)
Non-food consumption	61.55	17.91	4.99	0.73	0.79
	(1.29)	(0.90)	(0.24)	(0.03)	(0.05)
Food consumption	37.36	5.52	2.31	0.23	0.24
	(0.70)	(0.25)	(0.06)	(0.01)	(0.01)
Per adult equivalent cell consumption					
Total consumption	47.25***	7.90***	2.86	0.38***	0.45***
	(1.05)	(0.39)	(0.08)	(0.02)	(0.03)
Non-food consumption	65.32***	22.97***	5.47**	0.85***	0.94***
	(1.15)	(1.59)	(0.24)	(0.03)	(0.05)
Food consumption	38.41***	5.88***	2.39**	0.25***	0.26***
	(0.68)	(0.26)	(0.07)	(0.01)	(0.01)

Source: « Pauvreté et Structure Familiale » (PSF) survey, authors' calculations.
Note: The first panel presents inequality measures computed using per adult equivalent household consumption as a measure of individual consumption. The second panel presents inequality measures computed using per adult equivalent cell consumption. *Equivalence scale used:* adult: 1; child 0 to 14: 0.5; N=1762, Bootstrap standard errors (250 replications) between parentheses. *,**,***: difference with per adult eq. household consumption inequality measure is significant at the 10%, 5% or 1% level (see Note 9 and Appendix S2 for details).

Table S3.2: Inequality decomposition, per adult equivalent consumption

	Theil within	Theil between	Share within
Scale A			
Total consumption	0.06	0.39	12.30
	(0.01)	(0.03)	(1.36)
Non-food consumption	0.15	0.79	15.89
	(0.01)	(0.05)	(1.69)
Food consumption	0.01	0.24	5.66
	(0.00)	(0.01)	(0.67)
Scale B			
Total consumption	0.05	0.38	11.99
	(0.01)	(0.03)	(1.34)
Non-food consumption	0.14	0.77	15.67
	(0.01)	(0.05)	(1.67)
Food consumption	0.01	0.24	5.39
	(0.00)	(0.01)	(0.63)
Scale C			
Total consumption	0.06	0.40	12.14
	(0.01)	(0.03)	(1.32)
Non-food consumption	0.15	0.79	15.89
	(0.01)	(0.05)	(1.69)
Food consumption	0.01	0.26	5.50
	(0.00)	(0.01)	(0.65)
Scale A – without education expenditure			
Total consumption	0.06	0.39	12.97
	(0.01)	(0.03)	(1.37)
Non-food consumption	0.16	0.80	16.97
	(0.02)	(0.05)	(1.64)

Source: « Pauvreté et Structure Familiale » (PSF) survey, authors' calculations.

Note: Sensitivity of the inequality decomposition to the choice of equivalence scale. Each panel presents a decomposition using individual consumption measured by the per adult equivalent cell consumption, with the specified equivalence scale. N=1763 households and 4293 cells. Bootstrap standard errors (250 replications) between parentheses. *Scale A:* adult: 1; child 0 to 14: 0.5; *Scale B:* adult: 1: child 5 to 14: 0.5; child 0 to 4: 0.2; *Scale C*: male adult: 1; female adult: 0.83; boy 5 to 14: 0.77; girl 5 to 14: 0.71; child 0 to 4: 0.52 for food consumption; scale A weights for non-food consumption.

Table S3.3: Sensitivity of FGT indices to equivalence scales

	Nutrition poverty line			*Basic needs poverty line*		
Scale	Headcount	Poverty gap	Squared poverty gap	Headcount	Poverty gap	Squared poverty gap
Household per adult equivalent consumption						
Scale A	0.167	0.042	0.016	0.428	0.143	0.064
Scale B	0.145	0.035	0.012	0.390	0.125	0.054
Scale C	0.183	0.046	0.017	0.435	0.148	0.068
Cell per adult equivalent consumption						
Scale A	0.182	0.051	0.020	0.463	0.160	0.075
Scale B	0.159	0.043	0.016	0.430	0.140	0.063
Scale C	0.196	0.055	0.022	0.469	0.167	0.079

Source: « Pauvreté et Structure Familiale » (PSF) survey, authors' calculations.

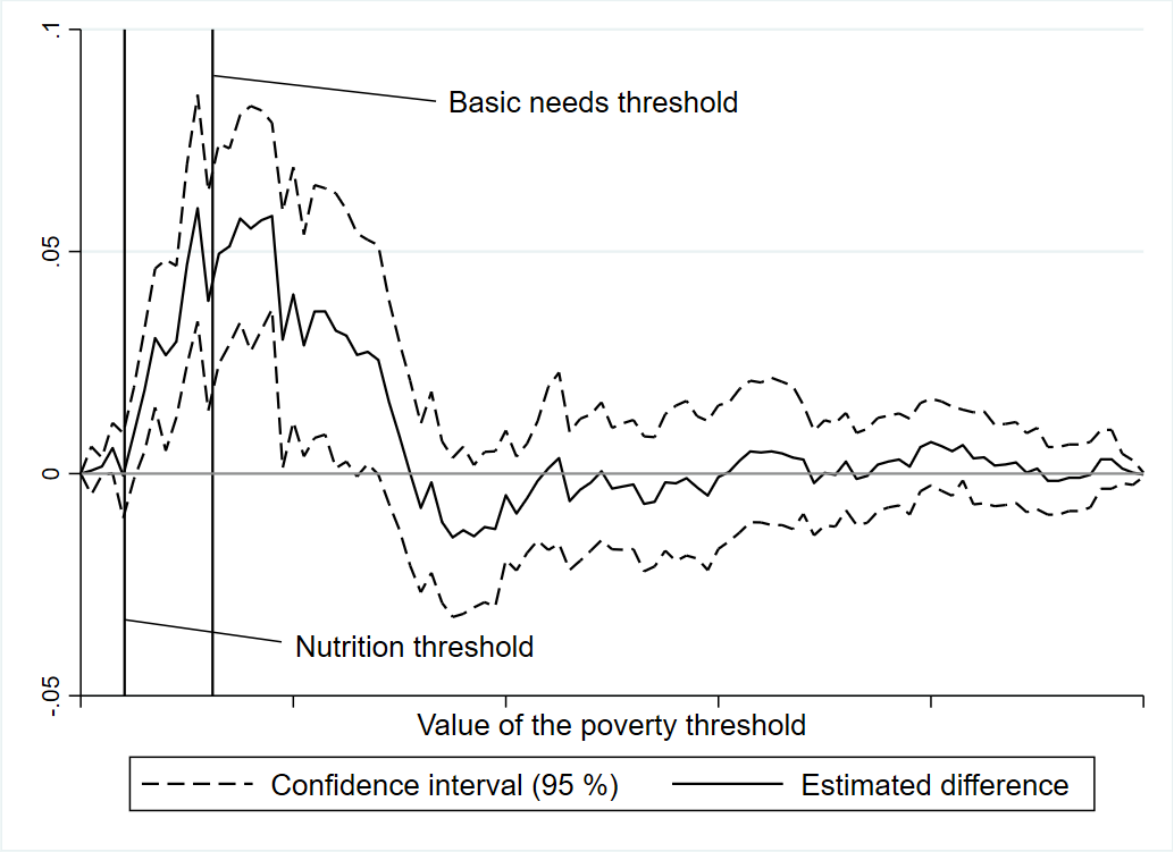
Note: Sensitivity of the poverty indices to the choice of equivalence scale. First panel presents poverty measures using per adult equivalent household consumption, with 3 different equivalence scales. Second panel does the same with per adult equivalent cell consumption. N=1763 households and 4293 cells. Bootstrap standard errors (250 replications) between parentheses. *Scale A:* adult: 1; child 0 to 14: 0.5; *Scale B:* adult: 1: child 5 to 14: 0.5; child 0 to 4: 0.2; *Scale C*: male adult: 1; female adult: 0.83; boy 5 to 14: 0.77; girl 5 to 14: 0.71; child 0 to 4: 0.52 for food consumption; scale A weights for non-food consumption.

Appendix S4: Sensitivity of poverty comparison estimates to the choice of poverty line

Figures S4.1 to S4.3 below show the estimated difference between the poverty rates obtained with the cell and household consumption per adult equivalent depending on the position of the poverty line.[7] As we can see, the difference between poverty rates is significant for a large range of poverty lines.

Figure S4.1 : Difference between poverty rates as a function of the poverty threshold

Dakar



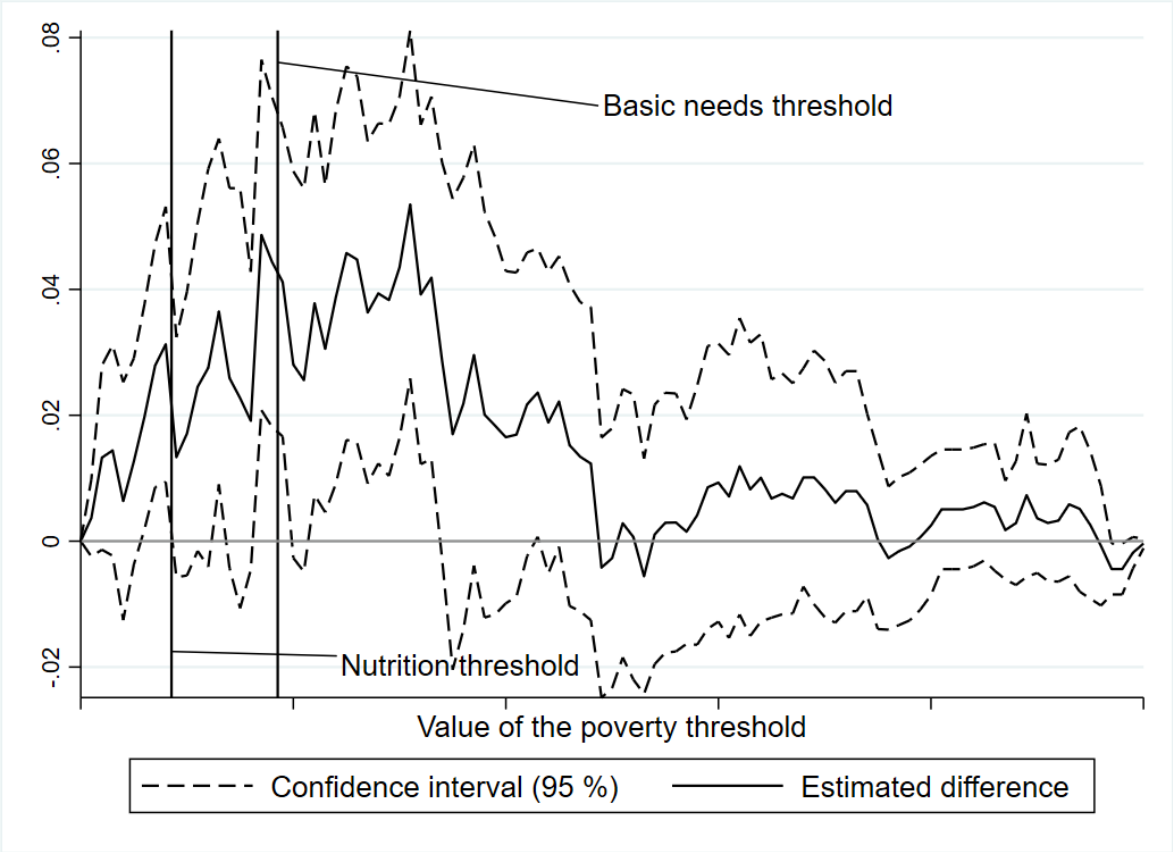
Source: « Pauvreté et Structure Familiale » (PSF) survey, authors' calculations.

Note: The graph shows the estimated difference between poverty rates based on cell versus household consumption per adult equivalent in Dakar. N=4340 individuals.Equivalence scale: 0.5: children 0 to 14 years old; 1: adults.

[7] Graphs have been drawn using Stata command cfgts2d from the DASP Package and available on line at http://dasp.ecn.ulaval.ca/ (Araar and Duclos, 2007).

Figure S4.2 : Difference between poverty rates as a function of the poverty threshold

Other urban areas

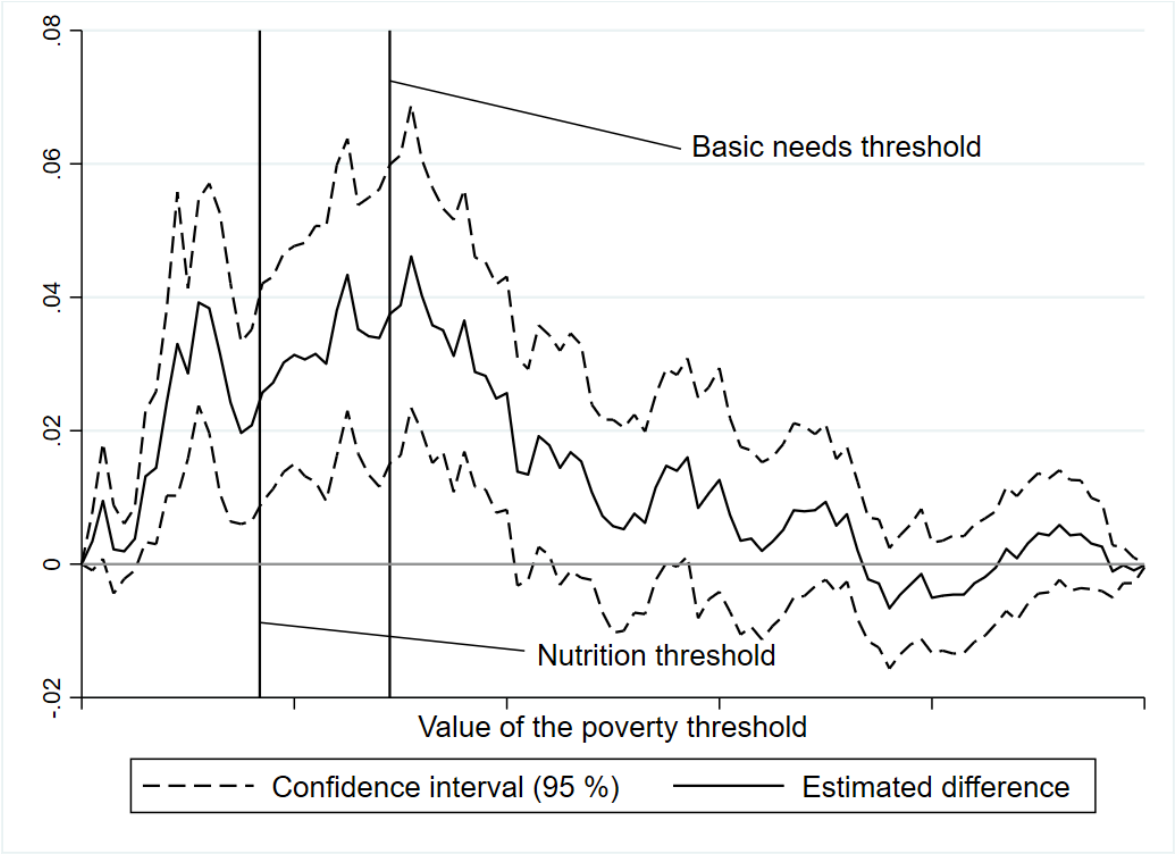


Source: « Pauvreté et Structure Familiale » (PSF) survey, authors' calculations.

Note: The graph shows the estimated difference between poverty rates based on cell versus household consumption per adult equivalent in other urban areas. N=2716 individuals. Equivalence scale: 0.5: children 0 to 14 years old; 1: adults.

Figure S4.3 : Difference between poverty rates as a function of the poverty threshold

Rural areas



Source: « Pauvreté et Structure Familiale » (PSF) survey, authors' calculations.

Note: The graph shows the estimated difference between poverty rates based on cell versus household consumption per adult equivalent in rural areas. N=6440 individuals. Equivalence scale: 0.5: children 0 to 14 years old; 1: adults.

Appendix S5: Additional results.

Appendix S5.1: Correlates of within household inequality, consumption deciles.

VARIABLES	(1) Theil within	(2) Theil within -food	(3) Theil within –nonfood
Dakar	-0.0163	0.00299	-0.105***
	(0.0120)	(0.00749)	(0.0215)
Other urban areas	-0.00801	0.00341	-0.0680***
	(0.0102)	(0.00536)	(0.0199)
o.decile_cons 1	-	-	-
decile_cons 2	0.0331***	0.0150	0.0582**
	(0.00996)	(0.00971)	(0.0273)
decile_cons 3	0.0117	-0.00884	0.0797***
	(0.00814)	(0.00552)	(0.0263)
decile_cons 4	0.0160**	-0.00184	0.0513**
	(0.00730)	(0.00607)	(0.0254)
decile_cons 5	0.0312***	0.00501	0.0964***
	(0.00918)	(0.00880)	(0.0282)
decile_cons 6	0.0378***	0.00435	0.0855***
	(0.00998)	(0.00666)	(0.0276)
decile_cons 7	0.0444***	-0.00148	0.110***
	(0.00972)	(0.00772)	(0.0261)
decile_cons 8	0.0565***	0.000743	0.115***
	(0.0124)	(0.00909)	(0.0257)
decile_cons 9	0.0837***	-0.00596	0.180***
	(0.0163)	(0.00641)	(0.0302)
decile_cons 10	0.0888***	-0.0116	0.148***
	(0.0226)	(0.00774)	(0.0362)
Household size	-0.000567	0.00124	-0.00320
	(0.00171)	(0.00143)	(0.00317)
Nb of cells in the hh	0.000173	0.00389	0.000964
	(0.00550)	(0.00243)	(0.0125)
Nb of children 0-4 y.o	0.00438	-0.00117	0.0144**
	(0.00324)	(0.00265)	(0.00666)
Nb of children 5-14 y.o	0.00570**	-0.00192	0.0172***
	(0.00269)	(0.00191)	(0.00581)
Nb of women 15-65 y.o.	-0.00326	-0.00466**	-0.00253
	(0.00315)	(0.00192)	(0.00616)
Nb of elderly 66+ y.o	0.00400	-0.00124	0.00140
	(0.00628)	(0.00332)	(0.0115)
2-cell hh, head + other	-0.0239***	-0.000737	-0.0791***
	(0.00777)	(0.00573)	(0.0159)
3+-cell hh: head and wives.	0.0211*	0.00360	0.0616**
	(0.0107)	(0.00817)	(0.0279)
3+-cell hh: head, wife(wives), + other	0.0209*	-0.00306	0.0349
	(0.0110)	(0.00417)	(0.0220)
3+-cell hh: head + others (no spouse)	-0.0240**	-0.0198***	-0.0448**
	(0.00972)	(0.00586)	(0.0207)
All meals taken together	-0.0537***	-0.0783***	-0.0371*
	(0.0130)	(0.0145)	(0.0201)
Constant	0.0528***	0.0722***	0.123***
	(0.0188)	(0.0165)	(0.0463)
Observations	1,426	1,426	1,426
R-squared	0.105	0.162	0.111

Source: « Pauvreté et Structure Familiale » (PSF) survey, authors' calculations.

Note : Correlates of intra-household inequality. Sample of households with at least two cells, N=1426. OLS regressions. Additional controls: religion and ethnicity of the household head. Reference category for household structure is a household with two cells: head and spouse. 2-cell hh: head + other refers to households composed of 2 cells, where the second cell is not that of the head's spouse. 3+-cell hh: head and wives refers to polygamous households, where all the cells are headed by member of the conjugal unit. 3+-cell hh: head, wife(wives) + other refers to households with at least 3 cells and where at least one of the cells is not headed by a spouse of the head. 3+-cell hh: head+others (no wife) refers to households with more than 3 cells and where none of them is headed by a spouse of the household head. Robust standard errors in parentheses, clustered at the PSU level, *** p<0.01, ** p<0.05, * p<0.1.

Table S5.2: Probability of being a non-poor household with poor members

VARIABLES	(1) All	(2) 80% richest hh – non-poor	(3) 20% poorest hh – non-poor
Dakar	11.71***	2.221***	
	(4.371)	(0.675)	
Other urban area	2.496***	1.620	7.814
	(0.799)	(0.546)	(11.29)
nb of children 0 - 4 y.o.	0.873	0.903	0.767
	(0.0950)	(0.0932)	(0.303)
nb of children 5 - 14 y.o.	1.003	1.147	0.479**
	(0.0880)	(0.0995)	(0.155)
nb of elderly over 66 y.o.	0.807	0.713	1.521
	(0.167)	(0.154)	(1.011)
hh head is polygamous	1.056	1.151	0.408
	(0.278)	(0.308)	(0.325)
Hh size	1.001	1.020	1.440
	(0.0534)	(0.0501)	(0.337)
hh head has no formal schooling	1.253	2.218***	1.022
	(0.319)	(0.560)	(0.797)
Nb of cells	1.283	1.093	2.079
	(0.231)	(0.198)	(1.680)
2-cell hh, head + other	0.807	0.759	2.256
	(0.329)	(0.338)	(2.563)
3+-cell hh: head and wives.	1.700	1.133	0.749
	(0.792)	(0.555)	(0.948)
3+-cell hh: head, wife(wives), + other	2.906***	3.008***	1.193
	(1.004)	(1.028)	(1.297)
3+-cell hh: head + others (no wife)	1.020	0.793	0.106
	(0.521)	(0.403)	(0.204)
All meals taken together	0.288***	0.389***	0.381
	(0.0829)	(0.101)	(0.384)
Log hh per adult eq consumption	0.00551***		
	(0.00283)		
Dakar = o,			-
Constant	7.12e+27***	0.0538***	0.204
	(4.595e+28)	(0.0255)	(0.337)
Observations	876	793	83

Source « Pauvreté et Structure Familiale » (PSF) survey, author's calculations.
Note: Sample of Non-poor households. Dependent variable: dummy equals 1 if the household contains at least one poor cell. Logit estimates, odd ratios reported; coefficient standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table S5.3 Probability that all meals are taken jointly in the household

VARIABLES	All meals shared
decile_cons1	1.925*
	(0.753)
decile_cons2	1.083
	(0.356)
decile_cons3	0.868
	(0.262)
decile_cons4	1.322
	(0.422)
decile_cons5	0.845
	(0.235)
decile_cons6	1.012
	(0.282)
decile_cons7	0.902
	(0.235)
decile_cons8	0.793
	(0.197)
decile_cons9	0.855
	(0.204)
Dakar	0.670**
	(0.122)
Other urban area	0.783
	(0.148)
Nb of cells	1.312**
	(0.144)
Nb of couples in the household	0.662***
	(0.0940)
2-cell hh: head+wife.	1.708***
	(0.285)
2-cell hh : head + other	1.510*
	(0.367)
3+-cell hh : head, wife(wives) + other	1.549*
	(0.352)
Hh head is polygamous	1.074
	(0.172)
Nb of children 0 – 4 y.o.	0.870**
	(0.0556)
Nb of children 5 - 14 y.o.	0.969
	(0.0415)
Nb of women 15 - 65	0.893**
	(0.0452)
Nb of elderly over 66 y.o.	0.867
	(0.111)
Constant	4.407***
	(1.136)
Observations	1,762

Source : « Pauvreté et Structure Familiale » (PSF) survey, authors' calculations.
Note : Dependent variable: dummy equals 1 if all meals are taken jointly by all household's members. Logit estimates. Odd ratios reported. Coeff. standard errors in parentheses. Top consumption decile as a reference category. *** p<0.01, ** p<0.05, * p<0.

Appendix S6: Simulating the impact of measurement error on intra-household inequality.

The exercise is the following. Assume that the true distribution of consumption is such that there is no intra-household inequality. Nevertheless, because of (classical) measurement errors at the cell level, the observed per capita cell consumption differs from the per capita household consumption. We simulate the observed distribution of per capita cell consumption varying the magnitude of the error term, by drawing it from a normal distribution with a variance chosen as a percentage of the variance of the original distribution of log-consumption. This percentage varies from 10 to 80%. From this simulated cell consumption data, we compute again both the per capita household consumption and the per capita cell consumption. We then calculate the Gini and Theil indices of the 2 distributions and assess the variance of the white noise that would be enough to explain a level of intra-household inequality equal to 14.6% of total inequality. We replicate the simulation 100 times to compute the standard errors of the indices. We will not focus on the total level of inequality, as the addition of such white noise will mechanically increase it.

Table S6.1. below gives the result of these simulations. It appears that it requires an error term with a variance fixed at 70% of the variance of the original distribution of log-consumption for the decomposition of the Theil index to indicate a within-household share of total inequality of 14%. At 40%, the Gini index for the distribution of per capita cell consumption is 2.75% higher than the one for the per capita household consumption, as we actually observe in our data (2.56%). In both cases, such levels of measurement error are unrealistically large compared to the 20% benchmark mentioned above, so that we are confident measurement error is not the only force driving our results.

Table S6.1.: Simulated inequality measures in the presence of measurement error

$\sigma^2(u_c)/\sigma^2(\ln Y_h)$	Per capita household consumption	Per capita cell consumption			
	Gini	Gini	Theil	Theil within	Share of within inequality
10%	48.83 (0.39)	49.61 (0.39)	0.50 (0.01)	0.01 (0.00)	0.03
20%	49.65 (0.52)	51.16 (0.50)	0.53 (0.02)	0.03 (0.00)	0.06
30%	50.60 (0.66)	52.78 (0.63)	0.57 (0.03)	0.04 (0.00)	0.08
40%	51.37 (0.82)	54.12 (0.75)	0.60 (0.03)	0.06 (0.00)	0.10
50%	52.10 (0.79)	55.41 (0.73)	0.63 (0.03)	0.07 (0.00)	0.11
60%	52.79 (0.82)	56.57 (0.77)	0.65 (0.03)	0.08 (0.00)	0.13
70%	53.61 (0.90)	57.86 (0.82)	0.69 (0.04)	0.10 (0.01)	0.14
80%	54.40 (1.13)	59.04 (1.01)	0.72 (0.06)	0.11 (0.01)	0.15

Source: « Pauvreté et Structure Familiale » (PSF) survey, authors' simulated distributions, 100 replications, standard errors between parentheses.

Note: Decomposition of inequality for simulated distributions of individual consumption, with varying cell level measurement errors added to an original distribution with no intra-household inequality.