Simple Poverty Scorecard® Poverty-Assessment Tool Cameroon

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Cette grille (et une autre grille mis à jour) en Français est disponble en
SimplePovertyScorecard.com
This scorecard (and a newer one) in English is at SimplePovertyScorecard.com

Abstract

The Simple Poverty Scorecard®-brand poverty-assessment tool uses 10 low-cost indicators from Cameroon's 2007 Household Survey to estimate the likelihood that a household has consumption below a given poverty line. Field workers can collect responses in about ten minutes. The scorecard's accuracy is reported for a range of poverty lines. The scorecard is a practical way for pro-poor programs in Cameroon to measure poverty rates, to track changes in poverty rates over time, and to segment clients for differentiated treatment.

Acknowledgements

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Simple Poverty Scorecard® Poverty-Assessment Tool

Interview ID:		**Name**		**Identifier**
Interview date:	Participant:			
Country:	CMR	Field agent:		
Scorecard:	001	Service point:		
Sampling wgt.:		Number of household members:		

Indicator	Response	Points	Score
1. How many members does the household have?	A. Seven or more	0	
	B. Six	10	
	C. Five	12	
	D. Four	16	
	E. Three	20	
	F. One or two	29	
2. Do all household members ages 6 to 16 currently go to an officially recognized school or educational institution?	A. No	0	
	B. Yes	2	
	C. No members ages 6 to 16	7	
3. In the past four weeks, did any household member work with his/her main occupation in agriculture, animal husbandry, hunting, or fishing for at least one hour, whether self-employed, as a paid or unpaid employee, apprentice, or as an unpaid family worker?	A. Yes	0	
	B. No	2	
4. Can the male head/spouse read and write a simple sentence in French or English?	A. No	0	
	B. Only English	2	
	C. Only French	2	
	D. No male head/spouse	3	
	E. Both French and English	3	
5. Can the (oldest) female head/spouse read and write a simple sentence in French or English?	A. No	0	
	B. No female head/spouse	2	
	C. Only English	4	
	D. Only French	6	
	E. Both French and English	8	
6. What is the main material of the floor of the residence?	A. Dirt, or other	0	
	B. Wood, cement, or tile	6	
7. What is the main type of fuel used for cooking?	A. Collected/gifted firewood, or other	0	
	B. Purchased firewood, kerosene/paraffin/petroleum, charcoal, sawdust/wood chips, electricity, or does not cook	9	
	C. LPG	19	
8. Does the household have an electric iron?	A. No	0	
	B. Yes	6	
9. Does the household have a radio or a television?	A. No	0	
	B. Only radio	7	
	C. Television (regardless of radio)	14	
10. Does your household have a buffet or wardrobe?	A. No	0	
	B. Yes	6	

Score:

Back-page Worksheet:
Household Members, Age, School Attendance, and Work Status with Main Occupation in Agriculture

At the start, read to the respondent: *Please tell me the name (or nickname) and age of each member of your household. A* household *is a socio-economic unit of one or more people—regardless of blood or marital relationship—who have lived (or plan to live) together for at least six months in the same compound, who share resources, who usually eat together, and who recognize the same head. For each household member ages 6 to 16, please tell me whether he/she currently attends an officially recognized school. For each member, please tell me whether, in the past 4 weeks, he/she worked with his/her main occupation in agriculture, animal husbandry, hunting, or fishing for at least one hour, whether self-employed, as a paid or unpaid employee, apprentice, or as an unpaid family worker?*

Write down the name and age of each household member. Then write the number of members in the scorecard header next to "# HH members:" and circle the response to the first indicator. Next, check whether there are any members ages 6 to 16 and whether they all attend school, and mark the second indicator. Finally, check whether any members worked in the past four weeks and whether their main occupation was agriculture etc.. Then mark the third indicator.

Please keep in mind the full definitions of *household member* and *working* found in the "Guidelines for the Interpretation of Scorecard Indicators".

Name (or nickname) of member	Age	If \<name\> is 6- to 16-years-old or older, does he/she go to an officially recognized school or educational institution?	In the past four weeks, did \<name\> work with his/her main occupation in agriculture, animal husbandry, hunting, or fishing for at least one hour, whether self-employed, as a paid or unpaid employee, apprentice, or as an unpaid family worker?	
1.		Not 6 to 16 No Yes	No	Yes
2.		Not 6 to 16 No Yes	No	Yes
3.		Not 6 to 16 No Yes	No	Yes
4.		Not 6 to 16 No Yes	No	Yes
5.		Not 6 to 16 No Yes	No	Yes
6.		Not 6 to 16 No Yes	No	Yes
7.		Not 6 to 16 No Yes	No	Yes
8.		Not 6 to 16 No Yes	No	Yes
9.		Not 6 to 16 No Yes	No	Yes
10.		Not 6 to 16 No Yes	No	Yes
11.		Not 6 to 16 No Yes	No	Yes
12.		Not 6 to 16 No Yes	No	Yes
13.		Not 6 to 16 No Yes	No	Yes
14.		Not 6 to 16 No Yes	No	Yes
15.		Not 6 to 16 No Yes	No	Yes
16.		Not 6 to 16 No Yes	No	Yes
# members:	—	# "No": # "Yes":	Number "Yes":	

Look-up table to convert scores to poverty likelihoods

Score	Poverty likelihood (%)						
	National			USAID	Intl. 2005 PPP		
	100%	150%	200%	'Extreme'	$1.25	$2.00	$2.50
0–4	94.4	100.0	100.0	67.2	83.4	98.3	100.0
5–9	83.3	97.0	99.2	51.2	74.0	94.9	98.6
10–14	81.7	96.8	98.9	48.5	72.4	94.3	98.3
15–19	72.1	95.5	98.1	33.4	50.4	90.5	95.6
20–24	63.0	89.8	97.6	23.7	42.6	84.5	91.9
25–29	47.7	82.8	95.2	21.0	30.7	73.1	87.9
30–34	34.1	74.3	93.7	11.6	18.9	59.5	83.2
35–39	30.0	63.8	84.2	7.9	13.6	47.4	67.6
40–44	18.0	52.5	75.9	4.0	6.2	35.1	57.3
45–49	10.6	42.8	67.5	2.3	3.4	23.0	41.8
50–54	8.3	33.5	56.3	2.3	2.7	18.0	32.9
55–59	4.3	25.7	47.7	0.9	0.9	10.4	23.9
60–64	3.6	17.2	37.2	0.3	0.3	5.4	17.5
65–69	1.7	8.3	25.1	0.3	0.3	4.2	9.0
70–74	0.9	5.7	20.7	0.0	0.0	1.5	5.5
75–79	0.9	3.5	13.3	0.0	0.0	1.3	3.4
80–84	0.5	2.9	9.3	0.0	0.0	0.6	2.3
85–89	0.0	1.2	7.0	0.0	0.0	0.4	0.8
90–94	0.0	1.1	3.3	0.0	0.0	0.4	0.8
95–100	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Simple Poverty Scorecard® Poverty-Assessment Tool Cameroon

1. Introduction

Pro-poor programs in Cameroon can use the Simple Poverty Scorecard poverty-assesment tool to estimate the likelihood that a household has consumption below a given poverty line, to estimate a population's poverty rate at a point in time, to track changes in a population's poverty rate over time, and to segment participants for differentiated treatment.

The direct approach to poverty measurement via consumption surveys is difficult and costly. As a case in point, Cameroon's 2007 *Enquête Camerounaise Auprès des Ménages* (ECAM, Household Survey) runs 30 pages. Enumerators completed interviews at a rate of about 1.5 households per day, visiting urban households six times and rural households twice over the course of two weeks. In addition, respondents kept a diary of all their expenses for 15 days. Enumerators also asked about hundreds of non-consumption items.

In comparison, the indirect approach via the scorecard is simple, quick, and inexpensive. It uses ten verifiable indicators (such as "What is the main material of the floor of the residence?" and "Does your household have a buffet or wardrobe?") to get a score that is highly correlated with poverty status as measured by the exhaustive ECAM survey.

The scorecard differs from "proxy means tests" (Coady, Grosh, and Hoddinott, 2004) in that it is transparent, it is freely available,[1] and it is tailored to the capabilities and purposes not of national governments but rather of local, pro-poor organizations. The feasible poverty-measurement options for local organizations are typically blunt (such as rules based on land-ownership or housing quality) or subjective and relative (such as participatory wealth ranking facilitated by skilled field workers). Estimates from these approaches may be costly, their accuracy is unknown, and they are not comparable across places, organizations, nor time.

The scorecard can be used to measure the share of a program's participants who are below a given poverty line, for example, the Millennium Development Goals' $1.25/day line at 2005 purchase-power parity (PPP). USAID microenterprise partners in Cameroon can use scoring with the $1.25/day line to report how many of their participants are "very poor".[2] Scoring can also be used to measure net movement across a poverty line over time. In all these cases, the scorecard provides a consumption-based, objective tool with known accuracy. While consumption surveys are costly even for governments, some local pro-poor organizations may be able to implement an inexpensive poverty-assessment tool to help with poverty monitoring and (if desired) targeting.

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[1] The Simple Poverty Scorecard poverty-assessment tool is not, however, in the public domain. Copyright is held by Microfinance Risk Management, L.L.C.

[2] USAID defines a household as *very poor* if its daily per-capita consumption is less than the highest of the $1.25/day line (XAF394 in average prices in Yaoundé from September to December 2007, Figure 1) or the USAID "extreme" line that divides people in households below the national line into two equal-size groups (XAF361).

The statistical approach here aims to be understood by non-specialists. After all, if managers are to adopt the scorecard on their own and apply it to inform their decisions, then they first must trust that it works. Transparency and simplicity build trust. Getting "buy-in" matters; proxy means tests and regressions on the "determinants of poverty" have been around for three decades, but they are rarely used to inform decisions by local, pro-poor organizations. This is not because they do not work, but because they are presented (when they are presented at all) as tables of regression coefficients incomprehensible to non-specialists (with cryptic indicator names such as "`LGHHSZ_2`" and with points with negative values and many decimal places). Thanks to the predictive-modeling phenomenon known as the "flat maximum", simple scoring approaches can be about as accurate as complex ones (Schreiner, 2012a; Caire and Schreiner, 2012).

Beyond its simplicity and transparency, the scorecard's technical approach is innovative in how it associates scores with poverty likelihoods, in the extent of its accuracy tests, and in how it derives formulas for standard errors. Although the accuracy tests are simple and commonplace in statistical practice and in the for-profit field of credit-risk scoring, they have rarely been applied to poverty-assessment tools.

The scorecard is based on data from the 2007 ECAM done by Cameroon's

Institut National de la Statistique (INS). Indicators are selected to be:

- Inexpensive to collect, easy to answer quickly, and simple to verify
- Strongly correlated with poverty
- Liable to change over time as poverty status changes
- Applicable in all regions of Cameroon

All points in the scorecard are non-negative integers, and total scores range from 0 (most likely below a poverty line) to 100 (least likely below a poverty line). Non-specialists can collect data and tally scores on paper in the field in about ten minutes.

The scorecard can be used to estimate three basic quantities. First, it can estimate a particular household's *poverty likelihood*, that is, the probability that the household has per-adult-equivalent consumption (or per-capita consumption) below a given poverty line.

Second, the scorecard can estimate the poverty rate of a group of households at a point in time. This estimate is the average poverty likelihood among the households in the group.

Third, the scorecard can estimate changes in the poverty rate for a group of households (or for two independent samples of households, both of which are representative of the same population) between two points in time. This estimate is the baseline/follow-up change in the average poverty likelihood of the group(s).

The scorecard can also be used for targeting. To help managers choose an appropriate targeting cut-off for their purposes, this paper reports several measures of targeting accuracy for a range of possible cut-offs.

The scorecard's indicators and points are derived from household consumption data and Cameroon's national poverty line. Scores from this one scorecard are calibrated to poverty likelihoods for seven poverty lines.

The scorecard is constructed and calibrated using half of the data from the 2007 ECAM. The other half is used to validate the scorecard's accuracy for estimating households' poverty likelihoods, for estimating groups' poverty rates at a point in time, and for targeting.

All three scoring estimators are *unbiased.* That is, they match the true value on average in repeated samples when constructed from (and applied to) a single, unchanging population. Like all predictive models, the scorecard here is constructed from a single sample and so misses the mark to some unknown extent when applied to a different population or when applied after 2007.[3]

Thus, while the indirect scoring approach is less costly than the direct survey approach, it is also biased when applied in practice. (The survey approach is unbiased by definition.) There is bias because the scorecard necessarily assumes that the future relationships between indicators and poverty in all possible groups of households will be the same as in the construction data. Of course, this assumption—inevitable in predictive modeling—holds only partly.

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[3] Important examples include nationally representative samples at a later point in time or sub-groups that are not nationally representative (Tarozzi and Deaton, 2007).

On average when applied to the validation sample with 1,000 bootstraps of $n = 16,384$, the difference between scorecard estimates of groups' poverty rates and the true rates at a point in time for the national poverty line is –2.1 percentage points. The average difference across all seven poverty lines is –1.3 percentage points, and the maximum absolute difference for any poverty line is 2.3 percentage points. These differences are due to sampling variation, not bias; the average difference would be zero if the whole 2007 ECAM were to be repeatedly re-fielded and divided into sub-samples before repeating the entire process of constructing and validating scorecards.

The 90-percent confidence intervals for these estimates are ±0.6 percentage points or less. For $n = 1,024$, the 90-percent intervals are ±2.6 percentage points or less.

Section 2 below documents data and poverty lines. Sections 3 and 4 describe scorecard construction and offer guidelines for use in practice. Sections 5 and 6 tell how to estimate households' poverty likelihoods and groups' poverty rates at a point in time. Section 7 discusses estimating changes in poverty rates over time, and Section 8 covers targeting. Section 9 places the scorecard here in the context of related exercises for Cameroon. The last section is a summary.

2. Data and poverty lines

This section discusses the data used to construct and validate the scorecard. It also documents the poverty lines to which scores are calibrated.

2.1 Data

The scorecard is based on data from the 11,391 households in the 2007 ECAM. This is Cameroon's most recent national consumption survey.

For the purposes of the scorecard, the households in the 2007 ECAM are randomly divided into two sub-samples:

- *Construction and calibration* for selecting indicators and points and for associating scores with poverty likelihoods
- *Validation* for measuring accuracy with data not used in construction or calibration

2.2 Poverty rates

A *poverty rate* is the share of units in households in which total household consumption (divided by the number of adult equivalents or the number of household members) is below a given poverty line. The unit is either the household itself or a person in the household. Each household member is defined to have the same poverty status (or estimated poverty likelihood) as does the household as a whole.

Suppose a program serves two households. The first household is poor (its per-adult-equivalent consumption or its per-capita consumption is less than a given poverty

line), and it has three members, one of whom is a program participant. The second

household is non-poor, and it has four members, two of whom are program participants.

Poverty rates are at the level of either households or people. If the program

defines its *participants* as households, then the household level is relevant. The

estimated household-level poverty rate is the equal-weighted average of poverty statuses

(or estimated poverty likelihoods) across participants' households. In the example here,

this is $\dfrac{1 \cdot 1 + 1 \cdot 0}{1 + 1} = \dfrac{1}{2} = 0.5 = 50$ percent. In the "$1 \cdot 1$" term in the numerator, the first

"1" is the first household's weight, and the second "1" is the first household's poverty

status (poor). In the "$1 \cdot 0$" term in the numerator, the "1" is the second household's

weight, and the "0" is the second household's poverty status (non-poor). The "$1 + 1$" in

the denominator is the sum of the weights of the two households. Each household has a

weight of one (1) because the unit of analysis is the household.

Alternatively, a person-level rate is relevant if a program defines all people in

households that benefit from its services as *participants*. In the example here, the

person-level rate is the household-size-weighted average[4] of poverty statuses for

households with participants, or $\dfrac{3 \cdot 1 + 4 \cdot 0}{3 + 4} = \dfrac{3}{7} = 0.43 = 43$ percent. In the "$3 \cdot 1$" term

in the numerator, the "3" is the first household's weight because it has three members,

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[4] Even if adult equivalents are used to determine whether a household is poor, poverty rates are always weighted by people or households, never by adult equivalents. Adult equivalents are determined by caloric needs based on age and sex, so weighting poverty rates by adult equivalents would treat children as less important than adults—and women as less important than men—simply because they have lower caloric needs.

and the "1" is its poverty status (poor). In the "$4 \cdot 0$" term in the numerator, the "4" is the second household's weight because it has four members, and the zero is its poverty status (non-poor). The "$3 + 4$" in the denominator is the sum of the weights of the two households. A household's weight is its number of members because the unit of analysis is the household member.

As a final example—one that pertains to what is likely the most common situation in practice—a program counts as *participants* only those household members with whom it deals with directly. For the example here, this means that some—but not all—household members are counted. The person-level rate is now the participant-weighted average of the poverty statuses of households with participants, or

$$\frac{1 \cdot 1 + 2 \cdot 0}{1 + 2} = \frac{1}{3} = 0.33 = 33 \text{ percent.}$$ The first "1" in the "$1 \cdot 1$" in the numerator is the first household's weight because it has one participant, and the second "1" is its poverty status (poor). In the "$2 \cdot 0$" term in the numerator, the "2" is the second household's weight because it has two participants, and the zero is its poverty status (non-poor). The "$1 + 2$" in the denominator is the sum of the weights of the two households. Each household's weight is its number of participants because the unit of analysis is the participant.

To sum up, estimated poverty rates are weighted averages of households' poverty statuses (or estimated poverty likelihoods), where the weights are the number of relevant units in the household. When reporting, programs should explain who is counted as a *participant* and why.

Figure 1 reports poverty rates for seven poverty lines at the levels of households and people for Cameroon as a whole in 2007 and for the construction and validation samples. (Figure 2 reports poverty lines and poverty rates by urban/rural in each of the 12 strata used in the 2007 ECAM.) Person-level poverty rates are included in Figures 1 and 2 because these are the rates reported by governments and used in most policy discussions. Household-level poverty rates are also reported because—as shown above—household-level poverty likelihoods can be straightforwardly converted into poverty rates for other units of analysis. This is also why the scorecard is constructed, calibrated, and validated with household weights.

2.3   Poverty lines

According to INS (2008), the derivation of Cameroon's national poverty line (sometimes called here "100% of the national line") follows the "cost-of-basic-needs" method of Ravallion (1998). It begins with a food-poverty line defined as the cost (based on data from the 2001 ECAM) of a food basket with 2,900 Calories, the assumed minimum daily intake for an adult equivalent. The 2001 national poverty line is then derived as this food line, plus the non-food consumption observed for households in the 2001 ECAM whose total consumption was at the food line.

To arrive at a 2007 national (food-plus-non-food) poverty line, the 2001 food line is inflated—separately for each of the 12 strata used in the 2007 ECAM—in step with the increase in the cost of the food basket between the 2001 ECAM and the 2007

ECAM.[5] In the same way, the non-food allowance is inflated to reflect the increase in the prices of non-food items.

For Cameroon overall, the resulting national (food-plus-non-food) poverty line (in average prices in Yaoundé from September to December, 2007) is XAF666 per adult equivalent per day (Figure 1). This implies country-level poverty rates of 29.1 percent (households) and 39.9 percent (people). This person-level rate matches that reported in INS (2008).

The scorecard is constructed using the national poverty line. Because local, pro-poor programs in Cameroon may want to use different or various poverty lines, this paper calibrates scores from its single scorecard to poverty likelihoods for seven poverty lines:

- 100% of national
- 150% of national
- 200% of national
- USAID "extreme"
- $1.25/day 2005 PPP
- $2.00/day 2005 PPP
- $2.50/day 2005 PPP

For each of the 12 strata in the 2007 ECAM, the USAID "extreme" line is defined as the median per-capita consumption (not per-adult-equivalent econsumption) of people (not households) who are below 100% of the national line (United States Congress, 2004).

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[5] There are no price adjustments by urban/rural within a given stratum.

The $1.25/day 2005 PPP poverty line is derived from:

- 2005 PPP exchange rate of XAF294.497 per $1.00 (World Bank, 2008)
- Consumer Price Index for Cameroon:[6]
    — Average in 2005: 109.4734
    — Average from September to December 2007 (during ECAM fieldwork): 117.2908
- Average all-Cameroon national line (Figure 1): XAF666
- The relevant value of the national line in each of the 12 strata (Figure 2)

Using the formula from Sillers (2006), the all-Cameroon $1.25/day 2005 PPP line

is:

$$
\left(2005 \text{ PPP exchange rate}\right) \cdot \$1.25 \cdot \left(\frac{\text{CPI}_{\text{Sep. to Dec. 2007}}}{\text{CPI}_{2005}}\right) =
$$

$$
\left(\frac{\text{XAF294.497}}{\$1.00}\right) \cdot \$1.25 \cdot \left(\frac{117.2908}{109.4734}\right) = \text{XAF394.41}.
$$

This line applies to Cameroon on average. A given stratum's $1.25/day line is

the all-Cameroon $1.25/day line, multiplied by value of the national line in that

particular stratum, and then divided by Cameroon's average national line.[7]

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[6] Price indexes are derived from monthly inflation rates that are interpolated from average annual inflation rates from Table 1.1 of INS (2008).

[7] For the 2007 ECAM, the World Bank's PovCalNet (`iresearch.worldbank.org/PovcalNet/index.htm`, retrieved 25 August 2013) uses the same all-Cameroon $1.25/day line (adjusted to prices in Sept. to Dec. 2007) as here. PovCalNet's person-level poverty rate (9.6 percent), however, seems too low and is not close to the 28.8 percent in Figure 1. PovCalNet seems to have divided consumption by adult equivalents rather than by people and to have misapplied strata price deflators.

For example, the $1.25/day 2005 PPP line for the all-urban stratum of Yaoundé

is the all-Cameroon line of XAF394.41 (Figure 1), multiplied by the value of the

national line for Yaoundé of XAF738, divided by the average all-Cameroon national

line of XAF666 (Figure 1). This gives a $1.25/day line for Yaoundé of XAF437 (Figure

2).

USAID microenterprise partners in Cameroon who use the scorecard to report

poverty rates to USAID should use the $1.25/day 2005 PPP line. This is because

USAID defines "very poor" as those households whose per-capita consumption is below

the highest of two lines:

- $1.25/day 2005 PPP (XAF394, Figure 1)
- USAID "extreme" line (XAF361).

3. Scorecard construction

For Cameroon, about 110 candidate indicators are initially prepared in the areas

of:

- Household composition (such as number of members)
- Education (such as literacy and school attendance)
- Housing (such as the type of floor)
- Ownership of durable assets (such as irons or televisions)
- Employment (such as the number of household members working in agriculture)
- Agriculture (such as ownership of land or livestock)

Figure 3 lists the candidate indicators, ordered by the entropy-based "uncertainty

coefficient" (Goodman and Kruskal, 1979) that measures how well a given indicator

predicts poverty on its own.

The scorecard also aims to measure *changes* in poverty through time. This means

that, when selecting indicators and holding other considerations constant, preference is

given to more sensitive indicators. For example, the ownership of a buffet or wardrobe

is probably more likely to change in response to changes in poverty than is the age of

the male head/spouse.

The scorecard itself is built using the national poverty line and Logit regression

on the construction sub-sample. Indicator selection uses both judgment and statistics.

The first step is to use Logit to build one scorecard for each candidate indicator. Each

scorecard's power to rank households by poverty status is measured as "c" (SAS

Institute Inc., 2004).

One of these one-indicator scorecards is then selected based on several factors (Schreiner *et al.*, 2004; Zeller, 2004). These include improvement in accuracy, likelihood of acceptance by users (determined by simplicity, cost of collection, and "face validity" in terms of experience, theory, and common sense), sensitivity to changes in poverty, variety among indicators, applicability across regions, relevance for distinguishing among households at the poorer end of the distribution of consumption, and verifiability.

A series of two-indicator scorecards are then built, each based on the one-indicator scorecard selected from the first round, with a second candidate indicator added. The best two-indicator scorecard is then selected, again using judgment to balance "c" with the non-statistical criteria. These steps are repeated until the scorecard has 10 indicators that work well together.

The final step is to transform the Logit coefficients into non-negative integers such that total scores range from 0 (most likely below a poverty line) to 100 (least likely below a poverty line).

This algorithm is similar to the common R^2-based stepwise least-squares regression. It differs from naïve stepwise in that the selection of indicators considers both statistical[8] and non-statistical criteria. The non-statistical criteria can improve robustness through time and help ensure that indicators are simple, sensible, and acceptable to users.

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[8] The statistical criterion for selecting an indicator is not the *p* value of its coefficient but rather its contribution to the ranking of households by poverty status.

The single scorecard here applies to all of Cameroon. Tests for Indonesia (World Bank, 2012), Bangladesh (Sharif, 2009), India and Mexico (Schreiner, 2006 and 2005a), Sri Lanka (Narayan and Yoshida, 2005), and Jamaica (Grosh and Baker, 1995) suggest that segmenting scorecards by urban/rural does not improve targeting accuracy much, although segmentation in general may improve the bias and precision of estimates of poverty rates (Tarozzi and Deaton, 2007).

4. Practical guidelines for scorecard use

The main challenge of scorecard design is not to maximize statistical accuracy but rather to improve the chances that the scorecard is actually used (Schreiner, 2005b). When scoring projects fail, the reason is not usually statistical inaccuracy but rather the failure of an organization to decide to do what is needed to integrate scoring in its processes and to train and convince its employees to use the scorecard properly (Schreiner, 2002). After all, most reasonable scorecards have similar targeting accuracy, thanks to the empirical phenomenon known as the "flat maximum" (Caire and Schreiner, 2012; Hand, 2006; Baesens *et al.*, 2003; Lovie and Lovie, 1986; Kolesar and Showers, 1985; Stillwell, Barron, and Edwards, 1983; Dawes, 1979; Wainer, 1976; Myers and Forgy, 1963). The bottleneck is less technical and more human, not statistics but organizational-change management. Accuracy is easier to achieve than adoption.

The scorecard here is designed to encourage understanding and trust so that users will want to adopt it on their own and use it properly. Of course, accuracy matters, but it must be balanced with simplicity, ease-of-use, and "face validity". Programs are more likely to collect data, compute scores, and pay attention to the results if, in their view, scoring does not imply a lot of additional work and if the whole process generally seems to make sense.

To this end, Cameroon's scorecard fits on one page. The construction process, indicators, and points are simple and transparent. Additional work is minimized; non-specialists can compute scores by hand in the field because the scorecard has:

- Only 10 indicators
- Only categorical indicators
- Only simple weights (non-negative integers, and no arithmetic beyond addition)

The scorecard (and its back-page worksheet) is ready to be photocopied. A field worker using Cameroon's paper scorecard would:

- Record the names and identifiers of the participant, of the field worker, and of the relevant organizational service point
- Record the date that the participant first participated with the organization
- Record the date of the scorecard interview
- Complete the back-page worksheet with each household member's name, age, school attendance, and work status with main occupation in agriculture
- Record household size in the scorecard header, and record the responses to the scorecard's first, second, and third indicators based on the back-page worksheet
- Read each of the remaining seven questions one-by-one from the scorecard, drawing a circle around the relevant response options and their points, and writing each point value in the far right-hand column
- Add up the points to get a total score
- Implement targeting policy (if any)
- Deliver the paper scorecard to a central office for data entry and filing

Of course, field workers must be trained. The quality of outputs depends on the quality of inputs. If organizations or field workers gather their own data and believe that they have an incentive to exaggerate poverty rates (for example, if funders reward them for higher poverty rates), then it is wise to do on-going quality control via data review and random audits (Matul and Kline, 2003).[9] IRIS Center (2007a) and Toohig

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[9] If a program does not want field workers to know the points associated with responses, then it can use a version of the scorecard that does not display the points and then

(2008) are useful nuts-and-bolts guides for budgeting, training field workers and supervisors, logistics, sampling, interviewing, piloting, recording data, and controlling quality.

In particular, while collecting scorecard indicators is relatively easier than alternative ways of measuring poverty, it is still absolutely difficult. Training and explicit definitions of terms and concepts in the scorecard are essential, and field workers should scrupulously study and follow the "Guidelines for the Interpretation of Indicators" found at the end of this paper, as they are an integral part of the Simple Poverty Scorecard tool.[10]

For the example of Nigeria, one study (Onwujekwe, Hanson, and Fox-Rushby, 2006) found distressingly low inter-rater and test-retest correlations for indicators as seemingly simple as whether the household owns an automobile. At the same time, Grosh and Baker (1995) suggest that gross underreporting of assets does not affect targeting. For the first stage of targeting in a conditional cash-transfer program in Mexico, Martinelli and Parker (2007, pp. 24–25) find that "underreporting [of asset ownership] is widespread but not overwhelming, except for a few goods . . . [and]

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apply the points and compute scores later at a central office. Schreiner (2012b) argues that hiding points in Colombia (Camacho and Conover, 2011) did little to deter cheating and that, in any case, cheating by the user's central office was more damaging than cheating by field workers and respondents. Even if points are hidden, field workers can use common sense to guess which response options are linked with greater poverty.
[10] The guidelines here are the only ones that organizations should give to field workers. All other issues of interpretation are to be left to the judgment of field workers and respondents, as this seems to be what Cameroon's Institut National de la Statistique did when it fielded the 2007 ECAM.

overreporting is common for a few goods, which implies that self-reporting may lead to the exclusion of deserving households". Still, as is done in Mexico in the second stage of its targeting process, most false self-reports can be corrected (or avoided in the first place) by field workers who make a home visit. This is the recommended procedure for local, pro-poor organizations in Cameroon.

In terms of sampling design, an organization must make choices about:

- Who will do the scoring
- How scores will be recorded
- What participants will be scored
- How many participants will be scored
- How frequently participants will be scored
- Whether scoring will be applied at more than one point in time
- Whether the same participants will be scored at more than one point in time

In general, the sampling design should follow from the organization's goals for the exercise, the questions to be answered, and the budget. The main goal should be to make sure that the sample is representative of a well-defined population and that the scorecard will inform an issue important to the organization.

The non-specialists who apply the scorecard with participants in the field can be:

- Employees of the organization
- Third parties

Responses, scores, and poverty likelihoods can be recorded on:

- Paper in the field, and then filed at a central office
- Paper in the field, and then keyed into a database or spreadsheet at a central office
- Portable electronic devices in the field, and then uploaded to a database

Given a population of participants relevant for a particular business question, the participants to be scored can be:

- All relevant participants (a census)
- A representative sample of relevant participants
- All relevant participants in a representative sample of relevant field offices
- A representative sample of relevant participants in a representative sample of relevant field offices

If not determined by other factors, the number of participants to be scored can be derived from sample-size formulas (presented later) to achieve a desired confidence level and a desired confidence interval. To be clear, however, the focus should not be on having a sample size large enough to achieve some arbitrary level of statistical significance but rather to get a representative sample from a well-defined population so that the analysis of the results can meaningfully inform questions that matter to the organization.

Frequency of application can be:

- As a once-off project (precluding measuring change)
- Every two years (or at any other fixed or variable time interval, allowing measuring change)
- Each time a field worker visits a participant at home (allowing measuring change)

When a scorecard is applied more than once in order to measure change in poverty rates, it can be applied:

- With a different set of participants from the same population
- With the same set of participants

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An example set of choices is illustrated by BRAC and ASA, two microfinance organizations in Bangladesh who each have about 7 million participants and who apply the Simple Poverty Scorecard tool for Bangladesh (Schreiner, 2013a) with a sample of about 25,000. Their design is that all loan officers in a random sample of branches score all participants each time they visit a homestead (about once a year) as part of their standard due diligence prior to loan disbursement. They record responses on paper in the field before sending the forms to a central office to be entered into a database and converted to poverty likelihoods.

5. Estimates of household poverty likelihoods

The sum of scorecard points for a household is called the *score*. For Cameroon, scores range from 0 (most likely below a poverty line) to 100 (least likely below a poverty line). While higher scores indicate less likelihood of being below a line, the scores themselves have only relative units. For example, doubling the score decreases the likelihood of being below a given poverty line, but it does not cut it in half.

To get absolute units, scores must be converted to *poverty likelihoods*, that is, probabilities of being below a poverty line. This is done via simple look-up tables. For the example of the national line, scores of 25–29 have a poverty likelihood of 47.7 percent, and scores of 30–34 have a poverty likelihood of 34.1 percent (Figure 4).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 25–29 are associated with a poverty likelihood of 47.7 percent for the national line but of 30.7 percent for the $1.25/day 2005 PPP line.[11]

5.1   Calibrating scores with poverty likelihoods

A given score is associated ("calibrated") with a poverty likelihood by defining the poverty likelihood as the share of households in the calibration sub-sample who have the score and who have per-adult-equivalent consumption or per-capita consumption below a given poverty line.

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[11] Starting with Figure 4, many figures have seven versions, one for each of the seven poverty lines. To keep them straight, they are grouped by poverty line. Single tables pertaining to all seven lines are placed with the tables for 100% of the national line.

For the example of the national line (Figure 5), there are 8,412 (normalized) households in the calibration sub-sample with a score of 25–29. Of these, 4,016 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 25–29 is then 47.7 percent, because $4,016 \div 8,412 = 47.7$ percent.

To illustrate with the national line and a score of 30–34, there are 6,965 (normalized) households in the calibration sample, of whom 2,373 (normalized) are below the line (Figure 5). The poverty likelihood for this score range is then $2,373 \div 6,965 = 34.1$ percent.

The same method is used to calibrate scores with estimated poverty likelihoods for the other six poverty lines.[12]

The two versions of Figure 6 show, for all scores, the likelihood that a given household's per-adult-equivalent consumption or per-capita consumption falls in a range demarcated by two adjacent per-adult-equivalent or per-capita poverty lines.

For the example of the national line (which is per-adult-equivalent), the probability that a household with a score of 25–29 falls between two adjacent poverty lines is:

- 47.7 percent   below 100% of the national line
- 35.1 percent   between 100% and 150% of the national line
- 12.3 percent   between 150% and 200% of the national line
- 4.8 percent   above 200% of the national line

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[12] To ensure that poverty likelihoods always decrease as scores increase, likelihoods across series of adjacent scores are sometimes iteratively averaged before grouping scores into ranges. This preserves unbiasedness, and it keeps users from balking when sampling variation in score ranges with few households would otherwise lead to higher scores being linked with higher poverty likelihoods.

For the example of the $1.25/day 2005 PPP line (which is per-capita), the probability that a household with a score of 25–29 falls between two adjacent poverty lines is:

- 21.0 percent below the USAID "extreme" line
- 9.8 percent between the USAID "extreme" line and $1.25/day
- 42.4 percent between $1.25/day and $2.00/day
- 14.8 percent between $2.00/day and $2.50/day
- 12.1 percent above $2.50/day

Even though the scorecard is constructed partly based on judgment related to non-statistical criteria, the calibration process produces poverty likelihoods that are objective, that is, derived from quantitative poverty lines and from survey data on consumption. The calibrated poverty likelihoods would be objective even if the process of selecting indicators and points did not use any data at all. In fact, objective scorecards of proven accuracy are often constructed using only expert judgment to select indicators and points (Fuller, 2006; Caire, 2004; Schreiner *et al.*, 2004). Of course, the scorecard here is constructed with both data and judgment. The fact that this paper acknowledges that some choices in scorecard construction—as in any statistical analysis—are informed by judgment in no way impugns the objectivity of the poverty likelihoods, as this depends on using data in score calibration, not on using data (and nothing else) in scorecard construction.

Although the points in the Cameroon scorecard are transformed coefficients from a Logit regression, (untransformed) scores are not converted to poverty likelihoods via the Logit formula of 2.718281828^{score} x $(1 + 2.718281828^{score})^{-1}$. This is because the Logit

formula is esoteric and difficult to compute by hand. Non-specialists find it more

intuitive to define the poverty likelihood as the share of households with a given score

in the calibration sample who are below a poverty line. Going from scores to poverty

likelihoods in this way requires no arithmetic at all, just a look-up table. This approach

to calibration can also improve accuracy, especially with large samples.

5.2   Accuracy of estimates of households' poverty likelihoods

As long as the relationships between indicators and poverty do not change over

time, and as long as the scorecard is applied to households that are representative of

the same population from which the scorecard was originally constructed, then this

calibration process produces unbiased estimates of poverty likelihoods. *Unbiased* means

that in repeated samples from the same population, the average estimate matches the

true value. The scorecard also produces unbiased estimates of poverty rates at a point

in time and unbiased estimates of changes in poverty rates between two points in time.[13]

Of course, the relationships between indicators and poverty do change to some

unknown extent over time and also across sub-groups in Cameroon's population. Thus,

the scorecard will generally be biased when applied after December 2007 (the last

month of fieldwork for the 2007 ECAM) or when applied with sub-groups that are not

nationally representative.

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[13] This follows because these estimates of groups' poverty rates are linear functions of
the unbiased estimates of households' poverty likelihoods.

How accurate are estimates of households' poverty likelihoods, given the assumption of unchanging relationships between indicators and poverty over time and the assumption of a sample that is representative of Cameroon as a whole? To find out, the scorecard is applied to 1,000 bootstrap samples of size $n = 16,384$ from the validation sample. Bootstrapping means to:

- Score each household in the validation sample
- Draw a bootstrap sample *with replacement* from the validation sample
- For each score, compute the true poverty likelihood in the bootstrap sample, that is, the share of households with the score and with consumption below a poverty line
- For each score, record the difference between the estimated poverty likelihood (Figure 4) and the true poverty likelihood in the bootstrap sample
- Repeat the previous three steps 1,000 times
- For each score, report the average difference between estimated and true poverty likelihoods across the 1,000 bootstrap samples
- For each score, report the two-sided intervals containing the central 900, 950, and 990 differences between estimated and true poverty likelihoods

For each score range and for $n = 16,384$, Figure 7 shows the average difference between estimated and true poverty likelihoods as well as confidence intervals for the differences.

For the national line, the average poverty likelihood across bootstrap samples for scores of 25–29 in the validation sample is too high by 1.0 percentage points. For scores of 30–34, the estimate is too low by 6.6 percentage points.[14]

The 90-percent confidence interval for the differences for scores of 25–29 is ± 2.5 percentage points (national line, Figure 7). This means that in 900 of 1,000 bootstraps,

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[14] These differences are not zero, despite the estimator's unbiasedness, because the scorecard comes from a single sample. The average difference by score range would be zero if samples were repeatedly drawn from the population and split into sub-samples before repeating the entire process of scorecard construction/calibration and validation.

the difference between the estimate and the true value is between –1.5 and +3.5

percentage points (because +1.0 – 2.5 = –1.5, and +1.0 + 2.5 = +3.5). In 950 of 1,000

bootstraps (95 percent), the difference is +1.0 ± 3.0 percentage points, and in 990 of

1,000 bootstraps (99 percent), the difference is +1.0 ± 3.9 percentage points.

The differences between estimated poverty likelihoods and true values in Figure 7

are usually small but sometimes large. There are differences is because the validation

sample is a single sample that—thanks to sampling variation—differs in distribution

from the construction/calibration sub-samples and from Cameroon's population. For

targeting, however, what matters is less the difference in all score ranges and more the

difference in score ranges just above and below the targeting cut-off. This mitigates the

effects of bias and sampling variation on targeting (Friedman, 1997). Section 8 below

looks at targeting accuracy in detail.

In addition, if estimates of groups' poverty rates are to be usefully accurate, then

errors for individual households' poverty likelihoods must largely balance out. As

discussed in the next section, this is generally the case.

Another possible source of differences between estimates and true values is

overfitting. The scorecard here is unbiased, but it may still be *overfit* when applied after

the end of the ECAM fieldwork in December 2007. That is, it may fit the data from the

2007 ECAM so closely that it captures not only some real patterns but also some

random patterns that, due to sampling variation, show up only in the 2007 ECAM but

not in the overall population of Cameroon. Or the scorecard may be overfit in the sense

that it is not robust when relationships between indicators and poverty change over time or when the scorecard is applied to non-nationally representative samples.

Overfitting can be mitigated by simplifying the scorecard and by not relying only on data but rather also considering theory, experience, and judgment. Of course, the scorecard here does this. Combining scorecards can also reduce overfitting, at the cost of greater complexity.

Most errors in individual households' likelihoods do balance out in the estimates of groups' poverty rates (see the next section). Furthermore, at least some of the differences will come from non-scorecard sources such as changes in the relationships between indicators and poverty, sampling variation, changes in poverty lines, inconsistencies in data quality across time, and imperfections in cost-of-living adjustments across time and across geographic regions. These factors can be addressed only by improving data quantity and quality (which is beyond the scope of the scorecard) or by reducing overfitting (which likely has limited returns, given the scorecard's parsimony).

6. Estimates of a group's poverty rate at a point in time

A group's estimated poverty rate at a point in time is the average of the estimated poverty likelihoods of the individual households in the group.

To illustrate, suppose an organization samples three households on 1 January 2013 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 63.0, 34.1, and 18.0 percent (national line, Figure 4). The group's estimated poverty rate is the households' average poverty likelihood of $(63.0 + 34.1 + 18.0) \div 3 = 38.4$ percent.

Be careful; the group's poverty rate is *not* the poverty likelihood associated with the average score. Here, the average score is 30, which corresponds to a poverty likelihood of 34.1 percent. This differs from the 38.4 percent found as the average of the three individual poverty likelihoods associated with each of the three scores. Unlike poverty likelihoods, scores are ordinal symbols, like letters in the alphabet or colors in the spectrum. Because scores are not cardinal numbers, they cannot be added up or averaged across households. Only three operations are valid for scores: conversion to poverty likelihoods, analysis of distributions (Schreiner, 2012a), or comparison—if desired—with a cut-off for targeting. The safest rule to follow is: Always use poverty likelihoods, never scores.

6.1 Accuracy of estimated poverty rates at a point in time

For the Cameroon scorecard applied to 1,000 bootstraps of $n = 16{,}384$ from the validation sample, the maximum absolute difference between the estimated poverty rate at a point in time and the true rate is 2.3 percentage points (Figure 9, summarizing Figure 8 across all seven poverty lines). The average difference across poverty lines is –1.3 percentage points. At least part of these differences is due to sampling variation in the division of the 2007 ECAM into two sub-samples.

When estimating poverty rates at a point in time, the bias reported in Figure 9 should be subtracted from the average poverty likelihood to make the estimate unbiased. For the Cameroon scorecard and the national line, bias is –2.1 percentage points, so the unbiased estimate in the three-household example above is 38.4 – (–2.1) = 40.5 percent.

In terms of precision, the 90-percent confidence interval for a group's estimated poverty rate at a point in time with $n = 16{,}384$ is ±0.6 percentage points or less (Figure 9). This means that in 900 of 1,000 bootstraps of this size, the estimate (after subtracting off bias) is within 0.6 percentage points of the true value.

For example, suppose that the average poverty likelihood in a sample of $n = 16{,}384$ with the Cameroon scorecard and the national line is 38.4 percent. Then estimates in 90 percent of such samples would be expected to fall in the range of 38.4 – (–2.1) – 0.6 = 39.9 percent to 38.4 – (–2.1) + 0.6 = 41.1 percent, with the most likely true value being the unbiased estimate in the middle of this range (38.4 – (–2.1) = 40.5

percent). This is because the original (biased) estimate is 38.4 percent, bias is –2.1

percentage points, and the 90-percent confidence interval for the national line and this

sample size is ±0.6 percentage points (Figure 9).

6.2   Formula for standard errors for estimates of poverty rates

How precise are the point-in-time estimates? Because these estimates are averages, they have (in "large" samples) a Normal distribution and can be characterized by their average difference vis-à-vis true values, together with the standard error of the average difference.

To derive a formula for the standard errors of estimated poverty rates at a point in time from indirect measurement via poverty-assessent tools (Schreiner, 2008), first note that the textbook formula (Cochran, 1977) that relates confidence intervals with standard errors in the case of direct measurement of ratios is $\pm c = \pm z \cdot \sigma$, where:

$\pm c$ is a confidence interval as a proportion (*e.g.*, 0.02 for ± 2 percentage points),

z is from the Normal distribution and is $\begin{cases} 1.04 \text{ for confidence levels of 70 percent} \\ 1.28 \text{ for confidence levels of 80 percent} \\ 1.64 \text{ for confidence levels of 90 percent} \end{cases}$,

σ is the standard error of the estimated poverty rate, that is, $\sqrt{\dfrac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \phi$,

$\hat{p}$ is the estimated proportion of households below the poverty line in the sample,

ϕ is the finite population correction factor $\sqrt{\dfrac{N - n}{N - 1}}$,

N is the population size, and

n is the sample size.

For example, Cameroon's 2007 ECAM gives a direct-measurement estimate of the household-level poverty rate for the national line of $\hat{p} = 29.1$ percent (Figure 1). If

this estimate came from a sample of $n = 16{,}384$ households from a population N of 4,069,915 (the number of households in Cameroon in 2007), then the finite population correction ϕ is $\sqrt{\dfrac{4{,}069{,}915 - 16{,}384}{4{,}069{,}915 - 1}} = 0.9980$, which can be taken as $\phi = 1$. If the desired confidence level is 90-percent ($z = 1.64$), then the confidence interval $\pm c$ is

$$\pm z \cdot \sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}} = \pm 1.64 \cdot \sqrt{\frac{0.291 \cdot (1 - 0.291)}{16{,}384}} \cdot 1 = \pm 0.582 \text{ percentage points.}$$

The scorecard, however, does not measure poverty directly, so this formula is not applicable. To derive a formula for the Cameroon scorecard, consider Figure 8, which reports empirical confidence intervals $\pm c$ for the differences for the scorecard applied to 1,000 bootstraps of various sizes from the validation sample. For example, with $n = 16{,}384$ and the national line, the 90-percent confidence interval is ± 0.634 percentage points.[15]

Thus, the 90-percent confidence interval with $n = 16{,}384$ is ± 0.634 percentage points for the Cameroon scorecard and ± 0.582 percentage points for direct measurement. The ratio of the two intervals is $0.634 \div 0.582 = 1.09$.

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[15] Due to rounding, Figure 8 displays 0.6, not 0.634.

Now consider the same exercise, but with $n = 8{,}192$. The confidence interval

under direct measurement and the national line is $\pm 1.64 \cdot \sqrt{\dfrac{0.291 \cdot (1 - 0.291)}{8{,}192}} \cdot 1 =$

± 0.823 percentage points. The empirical confidence interval with the Cameroon

scorecard (Figure 8) is ± 0.857 percentage points. Thus for $n = 8{,}192$, the ratio of the

two intervals is $0.857 \div 0.823 = 1.04$.

This ratio of 1.04 for $n = 8{,}192$ is not far from the ratio of 1.09 for $n = 16{,}384$.

Across all sample sizes of 256 or more in Figure 8, the average ratio turns out to be

1.08, implying that confidence intervals for indirect estimates of poverty rates via the

Cameroon scorecard and the national poverty line are—for a given sample size—about

8-percent wider than confidence intervals for direct estimates via the 2007 ECAM. This

1.08 appears in Figure 9 as the "α factor" because if $\alpha = 1.08$, then the formula for

confidence intervals c for the Cameroon scorecard is $\pm c = \pm z \cdot \alpha \cdot \sigma$. That is, the

formula for the standard error σ for point-in-time estimates of poverty rates via scoring

is $\alpha \cdot \sqrt{\dfrac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\dfrac{N - n}{N - 1}}$.

In general, α can be more or less than 1.00. When α is less than 1.00, it means

that the scorecard is more precise than direct measurement. This occurs for four of the

seven poverty lines in Figure 9.

The formula relating confidence intervals with standard errors for the scorecard

can be rearranged to give a formula for determining sample size before measurement. If

$\tilde{p}$ is the expected poverty rate before measurement, then the formula for sample size n

from a population of size N that is based on the desired confidence level that

corresponds to z and the desired confidence interval $\pm c$ is

$$n = N \cdot \left(\frac{z^2 \cdot \alpha^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p})}{z^2 \cdot \alpha^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p}) + c^2 \cdot (N - 1)} \right)$$. If the population N is "large" relative to the

sample size n, then the finite population correction factor ϕ can be taken as one (1),

and the formula becomes $n = \left(\frac{\alpha \cdot z}{c} \right)^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p})$.

To illustrate how to use this, suppose the population N is 4,069,915 (the number

of households in Cameroon in 2007), suppose $c = 0.05266$, $z = 1.64$ (90-percent

confidence), and the relevant poverty line is the national line so that the most sensible

expected poverty rate $\widetilde{p}$ is Cameroon's overall poverty rate for that line in 2007 (29.1

percent at the household level, Figure 1). The α factor is 1.08 (Figure 9). Then the

sample-size formula gives

$$n = 4{,}069{,}915 \cdot \left(\frac{1.64^2 \cdot 1.08^2 \cdot 0.291 \cdot (1 - 0.291)}{1.64^2 \cdot 1.08^2 \cdot 0.291 \cdot (1 - 0.291) + 0.05266^2 \cdot (4{,}069{,}915 - 1)} \right) = 234, \text{ which}$$

is not too far from the sample size of 256 observed for these parameters in Figure 8 for

the national line. Taking the finite population correction factor ϕ as one (1) gives the

same answer, as $n = \left(\frac{1.08 \cdot 1.64}{0.05266} \right)^2 \cdot 0.291 \cdot (1 - 0.291) = 234.$ [16]

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[16] Although USAID has not specified confidence levels nor intervals, IRIS Center (2007a and 2007b) says that a sample size of $n = 300$ is sufficient for USAID reporting. USAID microenterprise partners in Cameroon should report using the \$1.25/day 2005 PPP line. Given the α factor of 1.15 for this line (Figure 9), an expected before-measurement household-level poverty rate of 19.5 percent (the all-Cameroon rate for 2007, Figure 1),

Of course, the α factors in Figure 9 are specific to Cameroon, its poverty lines, its poverty rates, and this scorecard. The derivation of the formulas for standard errors using the α factors, however, is valid for any poverty-assessment tool following the approach in this paper.

In practice after the end of fieldwork for the ECAM in December 2007, a program would select a poverty line (say, the national line), note its participants' population size (for example, $N = 10{,}000$ participants), select a desired confidence level (say, 90 percent, or $z = 1.64$), select a desired confidence interval (say, ± 2.0 percentage points, or $c = \pm 0.02$), make an assumption about $\widetilde{p}$ (perhaps based on a previous measurement such as the household-level poverty rate for the national line for Cameroon of 29.1 percent in the 2007 ECAM in Figure 1), look up α (here, 1.08 in Figure 9), assume that the scorecard will still work in the future and for non-nationally representative sub-groups,[17] and then compute the required sample size. In this

illustration, $n = 10{,}000 \cdot \left(\dfrac{1.64^2 \cdot 1.08^2 \cdot 0.291 \cdot (1 - 0.291)}{1.64^2 \cdot 1.08^2 \cdot 0.291 \cdot (1 - 0.291) + 0.02^2 \cdot (10{,}000 - 1)} \right) = 1{,}393.$

and a confidence level of 90 percent, then $n = 300$ implies a confidence interval of $\pm\, 1.64 \cdot 1.15 \cdot \sqrt{\dfrac{0.195 \cdot (1 - 0.195)}{300}} = \pm 4.3$ percentage points.

[17] This paper reports accuracy for the scorecard applied to the validation sample, but it cannot test accuracy for later years or for sub-groups. Performance after December 2007 will resemble that in the 2007 ECAM with deterioration over time to the extent that the relationships between indicators and poverty status change.

7. Estimates of changes in poverty rates over time

The change in a group's poverty rate between two points in time is estimated as the change in the average poverty likelihood of the households in the group. With data only from the 2007 ECAM, this paper cannot test estimates of change over time for Cameroon, and it can only suggest approximate formulas for standard errors. Nonetheless, the relevant concepts are presented here because, in practice, local pro-poor organizations can apply the scorecard to collect their own data and measure change through time.

7.1 Warning: Change is not impact

Scoring can estimate change. Of course, poverty could get better or worse, and scoring does not indicate what caused change. This point is often forgotten or confused, so it bears repeating: the scorecard simply estimates change, and it does not, in and of itself, indicate the reason for the change. In particular, estimating the impact of participation requires knowing what would have happened to participants if they had not been participants. Knowing this requires either strong assumptions or a control group that resembles participants in all ways except participation. To belabor the point, the scorecard can help estimate the impact of participation only if there is some way to know—or explicit assumptions about—what would have happened in the absence of participation. And that information must come from beyond the scorecard.

7.2 Estimating changes in poverty rates over time

Consider the illustration begun in the previous section. On 1 January 2013, an organization samples three households who score 20, 30, and 40 and so have poverty likelihoods of 63.0, 34.1, and 18.0 percent (national line, Figure 4). Adjusting for the known bias of –2.1 percentage points (Figure 9), the group's baseline estimated poverty rate is the households' average poverty likelihood of [(63.0 + 34.1 + 18.0) ÷ 3] – (–2.1) = 40.5 percent.

After baseline, two sampling approaches are possible for the follow-up round:

- Score a new, independent sample, measuring change across samples
- Score the same sample at both baseline and follow-up

By way of illustration, suppose that two years later on 1 January 2015, the organization samples three additional households who are in the same population as the three original households (or suppose that the same three original households are scored a second time) and finds that their scores are 25, 35, and 45 (poverty likelihoods of 47.7, 30.0, and 10.6 percent, national line, Figure 4). Adjusting for known bias, the average poverty likelihood at follow-up is [(47.7 + 30.0 + 10.6) ÷ 3] – (–2.1) = 31.5 percent, an improvement of 40.5 – 31.5 = 9.0 percentage points.[18]

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[18] Of course, such a huge reduction in poverty in two years is highly unlikely, but this is just an example to show how the scorecard can be used to estimate change.

Thus, about one in 11 participants in this hypothetical example cross the poverty line in 2013/5.[19] Among those who start below the line, about one in four or five (9.0 ÷ 40.5 = 22.2 percent) on net end up above the line.[20]

7.3 Accuracy for estimated change in two independent samples

With only the 2007 ECAM, it is not possible to measure the accuracy of scorecard estimates of changes in groups' poverty rates over time. In practice, of course, local pro-poor organizations in Cameroon can still use the scorecard to estimate change. The rest of this section suggests approximate formulas for standard errors that may be used until there is additional data.

7.4 Precision for estimates of change in two samples

For two equal-sized independent samples, the same logic as in the previous section can be used to derive a formula relating the confidence interval $\pm c$ with the standard error σ of a scorecard's estimate of the change in poverty rates over time:

$$\pm\, c = \pm z \cdot \sigma = \pm z \cdot \alpha \cdot \sqrt{\frac{2 \cdot \hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}}\,.$$

Here, z, c, $\hat{p}$ and N are defined as above, n is the sample size at both baseline and follow-up,[21] and α is the average (across a range of bootstrapped sample sizes) of

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[19] This is a net figure; some start above the line and end below it, and vice versa.
[20] The scorecard does not reveal the reasons for this change.

the ratio of the observed confidence interval from a scorecard and the theoretical confidence interval under direct measurement.

As before, the formula for standard errors can be rearranged to give a formula for sample sizes before indirect measurement via a scorecard, where $\widetilde{p}$ is based on previous measurements and is assumed equal at both baseline and follow-up:

$n = 2 \cdot N \cdot \left(\dfrac{z^2 \cdot \alpha^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p})}{z^2 \cdot \alpha^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p}) + c^2 \cdot (N - 1)} \right)$. If ϕ can be taken as one, then the

formula becomes $n = 2 \cdot \left(\dfrac{\alpha \cdot z}{c} \right)^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p})$.

This α has been measured for 11 countries (Schreiner, 2013a, 2013b, 2012c, 2010, 2009a, 2009b, 2009c, 2009d; Chen and Schreiner, 2009; and Schreiner and Woller, 2010a and 2010b). The simple average of α across countries—after averaging α across poverty lines and survey years within each country—is 1.15. This is as reasonable a figure as any to use for Cameroon.

To illustrate the use of this formula to determine sample size for estimating changes in poverty rates across two independent samples, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is ± 2 percentage points ($\pm c = \pm 0.02$), the poverty line is the national line, $\alpha = 1.15$, $\hat{p} = 0.291$ (the household-level poverty rate in 2007 for the national line in Figure 1), and the population N is large enough relative to the expected sample size n that the finite

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[21] This means that—given precision—estimating the change in a poverty rate between two points in time requires four times as many measurements (not twice as many) as does estimating a poverty rate at a point in time.

population correction ϕ can be taken as one. Then the baseline sample size is

$$n = 2 \cdot \left(\frac{1.15 \cdot 1.64}{0.02} \right)^2 \cdot 0.291 \cdot (1 - 0.291) \cdot 1 = 3{,}670,$$ and the follow-up sample size is also

3,670.

7.5 Precision for estimated change for one sample, scored twice

Analogous to previous derivations, the general formula relating the confidence interval $\pm c$ to the standard error σ when using a scorecard to estimate change for a single group of households, all of whom are scored at two points in time, is:[22]

$$\pm c = \pm z \cdot \sigma = \pm z \cdot \alpha \cdot \sqrt{\frac{\hat{p}_{12} \cdot (1 - \hat{p}_{12}) + \hat{p}_{21} \cdot (1 - \hat{p}_{21}) + 2 \cdot \hat{p}_{12} \cdot \hat{p}_{21}}{n}} \cdot \sqrt{\frac{N - n}{n - 1}},$$

where z, c, α, N, and n are defined as usual, $\hat{p}_{12}$ is the share of all sampled households that move from below the poverty line to above it, and $\hat{p}_{21}$ is the share of all sampled households that move from above the line to below it.

The formula for confidence intervals can be rearranged to give a formula for sample size before measurement. This requires an estimate (based on information available before measurement) of the expected shares of all households who cross the poverty line $\tilde{p}_{12}$ and $\tilde{p}_{21}$. Before measurement, a conservative assumption is that the change in the poverty rate will be zero, which implies $\tilde{p}_{12} = \tilde{p}_{21} = \tilde{p}_*$, giving:

$$n = 2 \cdot \left(\frac{\alpha \cdot z}{c} \right)^2 \cdot \tilde{p}_* \cdot \sqrt{\frac{N - n}{n - 1}}.$$

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[22] See McNemar (1947) and Johnson (2007). John Pezzullo helped find this formula.

Because $\widetilde{p}_*$ could be anything between 0 and 0.5, more information is needed to apply this formula. Suppose that the observed relationship between $\widetilde{p}_*$, the number of years y between baseline and follow-up, and $p_{\text{pre-baseline}} \cdot \left(1 - p_{\text{pre-baseline}}\right)$ is—as in Peru (Schreiner, 2009e)—close to:

$$\widetilde{p}_* = -0.02 + 0.016 \cdot y + 0.47 \cdot [p_{\text{pre-baseline}} \cdot \left(1 - p_{\text{pre-baseline}}\right)].$$

Given this, a sample-size formula for a group of households to whom the Cameroon scorecard is applied twice (once after December 2007 and then again later) is

$$n = 2 \cdot \left(\frac{\alpha \cdot z}{c}\right)^2 \cdot \left\{[-0.02 + 0.016 \cdot y + 0.47 \cdot [p_{\text{pre-baseline}} \cdot \left(1 - p_{\text{pre-baseline}}\right)]\right\} \cdot \sqrt{\frac{N-n}{n-1}} \,.$$

In Peru (the only source of a data-based estimate, Schreiner, 2009e), the average α across years and poverty lines is about 1.30.

To illustrate the use of this formula, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is ±2.0 percentage points ($\pm c = \pm0.02$), the poverty line is the national line, the sample will first be scored in 2013 and then again in 2016 ($y = 3$), and the population N is so large relative to the expected sample size n that the finite population correction ϕ can be taken as one. The pre-baseline poverty rate p_{2007} is taken as 29.1 percent (Figure 1), and α is assumed to be 1.30. Then the baseline sample size is

$$n = 2 \cdot \left(\frac{1.30 \cdot 1.64}{0.02}\right)^2 \cdot \left\{-0.02 + 0.016 \cdot 3 + 0.47 \cdot [0.291 \cdot \left(1 - 0.291\right)]\right\} \cdot 1 = 2{,}841. \text{ The}$$

same group of 2,841 households is scored at follow-up as well.

8. Targeting

When an organization uses the scorecard for targeting, households with scores at or below a cut-off are labeled *targeted* and treated—for program purposes—as if they are below a given poverty line. Households with scores above a cut-off are labeled *non-targeted* and treated—for program purposes—as if they are above a given poverty line.

There is a distinction between *targeting status* (scoring at or below a targeting cut-off) and *poverty status* (having consumption below a poverty line). Poverty status is a fact that is defined by whether consumption is below a poverty line as directly measured by a survey. In contrast, targeting status is an organization's policy choice that depends on a cut-off and on an indirect estimate from a scorecard.

Targeting is successful when households truly below a poverty line are targeted (*inclusion*) and when households truly above a poverty line are not targeted (*exclusion*). Of course, no scorecard is perfect, and targeting is unsuccessful when households truly below a poverty line are not targeted (*undercoverage*) or when households truly above a poverty line are targeted (*leakage*).

Figure 10 depicts these four possible targeting outcomes. Targeting accuracy varies by the cut-off score; a higher cut-off has better inclusion (but worse leakage), while a lower cut-off has better exclusion (but worse undercoverage).

Programs should weigh these trade-offs when setting a cut-off. A formal way to do this is to assign net benefits—based on a program's values and mission—to each of

the four possible targeting outcomes and then to choose the cut-off that maximizes total

net benefits (Adams and Hand, 2000; Hoadley and Oliver, 1998).

Figure 11 shows the distribution of households by targeting outcome for

Cameroon. For an example cut-off of 29 or less, outcomes for the national line in the

validation sample are:

- Inclusion: 20.6 percent are below the line and correctly targeted
- Undercoverage: 9.0 percent are below the line and mistakenly not targeted
- Leakage: 9.7 percent are above the line and mistakenly targeted
- Exclusion: 60.7 percent are above the line and correctly not targeted

Increasing the cut-off to 34 or less improves inclusion and undercoverage but

worsens leakage and exclusion:

- Inclusion: 23.2 percent are below the line and correctly targeted
- Undercoverage: 6.4 percent are below the line and mistakenly not targeted
- Leakage: 14.1 percent are above the line and mistakenly targeted
- Exclusion: 56.3 percent are above the line and correctly not targeted

Which cut-off is preferred depends on total net benefit. If each targeting outcome

has a per-household benefit or cost, then total net benefit for a given cut-off is:

Benefit per household correctly included   x   Households correctly included   –
Cost per household mistakenly not covered x   Households mistakenly not covered –
Cost per household mistakenly leaked   x   Households mistakenly leaked   +
Benefit per household correctly excluded   x   Households correctly excluded.

To set an optimal cut-off, a program would:

- Assign benefits and costs to possible outcomes, based on its values and mission
- Tally total net benefits for each cut-off using Figure 11 for a given poverty line
- Select the cut-off with the highest total net benefit

The most difficult step is assigning benefits and costs to targeting outcomes. A

program that uses targeting—with or without scoring—should thoughtfully consider

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how it values successful inclusion and exclusion versus errors of undercoverage and

leakage. It is healthy to go through a process of thinking explicitly and intentionally

about how possible targeting outcomes are valued.

A common choice of benefits and costs is "Total Accuracy" (IRIS Center, 2005;

Grootaert and Braithwaite, 1998). With "Total Accuracy", total net benefit is the

number of households correctly included or correctly excluded:

Total Accuracy = 1 x Households correctly included –
                    0 x Households mistakenly undercovered –
                    0 x Households mistakenly leaked +
                    1 x Households correctly excluded.

Figure 11 shows "Total Accuracy" for all cut-offs for the Cameroon scorecard.

For the national line in the validation sample, total net benefit is greatest (81.6) for a

cut-off of 24 or less, with more than four in five households in Cameroon correctly

classified.

"Total Accuracy" weighs successful inclusion of households below the line the

same as successful exclusion of households above the line. If a program values inclusion

more (say, twice as much) than exclusion, it can reflect this by setting the benefit for

inclusion to 2 and the benefit for exclusion to 1. Then the chosen cut-off will maximize

(2 x Households correctly included) + (1 x Households correctly excluded).[23]

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[23] Figure 11 also reports BPAC, the Balanced Poverty Accuracy Criteria adopted by
USAID for certifying poverty-assessment tools. IRIS Center (2005) made BPAC to
consider accuracy in terms of estimated poverty rates and in terms of targeting
inclusion. BPAC = (Inclusion – |Undercoverage – Leakage|) x [100 ÷ (Inclusion +
Undercoverage)].

As an alternative to assigning benefits and costs to targeting outcomes and then choosing a cut-off to maximize total net benefits, a program could set a cut-off to achieve a desired poverty rate among targeted households. The third column of Figure 12 ("% targeted HHs who are poor") shows, for the Cameroon scorecard applied to the validation sample, the expected poverty rate among households who score at or below a given cut-off. For the example of the national line, targeting households who score 29 or less would target 30.3 percent of all households (second column) and produce a poverty rate among those targeted of 67.9 percent (third column).

Figure 12 also reports two other measures of targeting accuracy. The first is a version of coverage ("% poor HHs who are targeted"). For the example of the national line with the validation sample and a cut-off of 29 or less, 69.6 percent of all poor households are covered.

The final targeting measure in Figure 12 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For the national line with the validation sample and a cut-off of 29 or less, covering 2.1 poor households means leaking to 1 non-poor household.

9. Context of poverty-assessment tools in Cameroon

This section discusses two existing poverty-assessment tools for Cameroon in terms of their goals, methods, definitions of *poverty*, data, indicators, cost, bias, and precision. In general, the advantages of the scorecard are its:

- Use of data from the latest nationally representative consumption survey
- Use of a definition of *poverty* that is simple to understand and used by government
- Reporting of bias and precision from out-of-sample tests, including formulas for standard errors
- Feasibility for local, pro-poor programs, due to its simplicity and transparency

9.1 Gwatkin *et al.*

Gwatkin *et al.* (2007) construct a poverty-assessment tool for Cameroon with an approach that they use in 56 countries with Demographic and Health Surveys (Rutstein and Johnson, 2004). They use Principal Components Analysis to make an asset index from simple, low-cost indicators available for the 10,462 households in Cameroon's 2004 DHS. The PCA index is like the scorecard here except that, because the DHS does not collect data on consumption, the index is based on a different conception of poverty, its accuracy vis-à-vis consumption-based poverty is unknown, and it can only be assumed to be a proxy for long-term wealth/economic status.[24] Well-known examples of the PCA

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[24] Nevertheless, the indicators are similar and the "flat maximum" is important, so carefully built PCA indexes and consumption-based poverty-assessment tools may pick up the same underlying construct (perhaps "permanent income", see Bollen, Glanville, and Stecklov, 2007), and they may rank households much the same. Comparisons of rankings by PCA indexes and consumption-based poverty-assessment tools include

asset-index approach include Stifel and Christiaensen (2007), Zeller *et al.* (2006), Filmer

and Pritchett (2001), and Sahn and Stifel (2000 and 2003).

The 16 indicators in Gwatkin *et al.* are similar to those in the scorecard here in

terms of their simplicity, low cost, and verifiability:

- Characteristics of the residence:
    — Type of floor
    — Presence of electricity
    — Type of cooking fuel
    — Source of drinking water
    — Type of toilet arrangement
- Whether the household has a domestic worker not related to the head
- Ownership of consumer durables:
    — Radios
    — Televisions
    — Land-line telephones
    — Mobile telephones
    — Electric or gas stoves
    — Refrigerators
    — Bicycles
    — Motorcycles/scooters
    — Cars/trucks
- Whether members of the household work their own or family's agricultural land

    Gwatkin *et al.* suggest three possible uses for their index:

- Segmenting households by their quintile score to see how health, population, and nutrition vary with socio-economic status
- Monitoring (via exit surveys) how well local health-service posts reach the poor
- Measuring local coverage of health services via small-scale surveys

    The first goal is akin to targeting, and the last two goals deal with performance

monitoring, so the asset index would be used much like the scorecard here.

Filmer and Scott (2012), Lindelow (2006), Sahn and Stifel (2003), Wagstaff and Watanabe (2003), and Montgomery *et al.* (2000).

Still, the Gwatkin *et al.* index is more difficult and costly than the scorecard. While the scorecard requires adding up 10 integers, some of which are usually zero, Gwatkin *et al.*'s asset index requires adding up 79 numbers, each with five decimal places and half with negative signs.

Unlike the asset index, the scorecard here is linked directly to an consumption-based poverty line. Thus, while both approaches can rank households, only the scorecard estimates consumption-based poverty status.

In essence, Gwatkin *et al.*—like all asset indexes—define *poverty* in terms of the indicators and the points in the index itself. Thus, the index is not a proxy standing in for something else (such as consumption) but rather a direct measure of a non-consumption-based definition of *poverty*. There is nothing wrong—and a lot right—about defining *poverty* in this way, but it is not as common as a consumption-based definition.

The asset-index approach defines people as *poor* if their assets (physical, human, financial, and social) fall below a threshold. Arguments for an asset-based view of development include Carter and Barrett (2006), Schreiner and Sherraden (2006), Sahn and Stifel (2003), and Sherraden (1991). The main advantages of the asset-based view are that:

- Asset ownership is easier to measure accurately than consumption
- Access to resources in the long term—and thus capacity to produce income and to consume—depends on the control of assets
- Assets get at capability more directly, the difference between, say, "Does income permit adequate sanitation?" versus "Does the toilet drain to a septic tank?"

While the asset view and the income/consumption view are distinct, they are also tightly linked. After all, income and consumption are flows of resources received/consumed from the use of stocks of assets. Both views are low-dimensional simplifications—due to practical limits on definitions and measurement—of a higher-dimensional and more complete conception of the production of human well-being.

9.2   Sahn and Stifel (2000)

Sahn and Stifel (2000) use factor analysis (a close relative of PCA that gives similar results) to construct an asset index meant to measure poverty in terms of long-term wealth. Their purpose relates to assessment (to inform governments and donors about the broad progress of poverty-reduction efforts in Africa) rather than operations (to provide a tool to help local, pro-poor organizations improve the design and management of their poverty-alleviation efforts).

Sahn and Stifel construct their index by pooling Cameroon's 1991 and 1997 DHS. Defining poverty status according to lines set at the 25th and 40th percentiles of the index, they then compare the distribution of the index and poverty rates over time (within Cameroon) and across countries (Cameroon and 10 other sub-Saharan countries).

For the cross-country analysis, Sahn and Stifel construct a single cross-country index from pooled DHS data for the 11 countries (plus five others for which only a

single DHS round is available). This is possible because the DHS generally uses a common set of indicators.

The nine indicators in Sahn and Stifel are similar to those in Gwatkin *et al.* and in the scorecard here in terms of their simplicity, low cost, and verifiability:

- Education of the head
- Characteristics of the residence:
    — Type of floor
    — Source of drinking water
    — Type of toilet arrangement
- Ownership of consumer durables:
    — Radio
    — Television
    — Refrigerator
    — Bicycle
    — Motorized transport

Like Gwatkin *et al.*, Sahn and Stifel shares many of the strengths of the approach here in that it can be used for targeting and in that it is flexible, low-cost, and adaptable to diverse contexts. Because an asset index does not require price adjustments over time or between countries—and because it does not require any consumption data at all—it is more adaptable in these ways than the scorecard here.

Sahn and Stifel also share with Gwatkin *et al.* the disadvantages of using a less-common definition of poverty and of not reporting standard errors.

10. Conclusion

Pro-poor programs in Cameroon can use the scorecard to segment clients for differentiated treatment as well as to estimate:

- The likelihood that a household has consumption below a given poverty line
- The poverty rate of a population at a point in time
- The change in the poverty rate of a population over time

The scorecard is inexpensive to use and can be understood by non-specialists. It is designed to be practical for pro-poor organizations in Cameroon that want to improve how they monitor and manage their social performance.

The scorecard is constructed with half of the data from Cameroon's 2007 ECAM, calibrated to seven poverty lines, and tested on data from the other half of the 2007 ECAM. Bias and precision are reported for estimates of households' poverty likelihoods, groups' poverty rates at a point in time, and changes in groups' poverty rates over time. Of course, the scorecard's estimates of change are not the same as estimates of program impact. Targeting accuracy is also reported.

When the scorecard is applied to the validation sample, the maximum absolute difference between estimates versus true poverty rates for groups of households at a point in time is 2.3 percentage points. The average bias across the seven poverty lines is about –1.3 percentage points. Unbiased estimates may be had by subtracting the known bias for a given poverty line from the original estimates. For $n = 16,384$ and 90-percent confidence, the precision of these differences is ±0.6 percentage points or better.

If an organization wants to use the scorecard for targeting, then the results here provide useful information for selecting a cut-off that fits its mission and values.

Although the statistical technique is innovative, and although technical accuracy is important, the design of the scorecard focuses on transparency and ease-of-use. After all, accuracy is irrelevant if an organization feels so daunted by a scorecard's complexity or its cost that it does not even try to use it.

For this reason, the scorecard is kept simple, using ten indicators that are straightforward, low-cost, and verifiable. Points are all zeros or positive integers, and scores range from 0 (most likely below a poverty line) to 100 (least likely below a poverty line). Scores are converted to poverty likelihoods via simple look-up tables, and targeting cut-offs are likewise straightforward to apply. The design attempts to facilitate voluntary adoption by helping managers to understand and trust scoring and by allowing non-specialists to add up scores quickly in the field.

In summary, the scorecard is a practical, objective way for pro-poor programs in Cameroon to estimate consumption-based poverty rates, track changes in poverty rates over time, and target services. The same approach can be applied to any country with similar data.

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Guidelines for the Interpretation
of Scorecard Indicators

The following is extracted from:

Institut National de la Statistique. (2007) "Manuel de l'Agent Enquêteur: Troisième Enquête Camerounaise Auprès des Ménages (ECAM3)", nada.stat.cm/index.php/ddibrowser/18/download/119, retrieved 24 August 2013. [the *Manual*],

and

Institut National de la Statistique. (2007) "Questionnaire Principal: Troisième Enquête Camerounaise Auprès des Ménages (ECAM3)", nada.stat.cm/index.php/ddibrowser/18/download/130, retrieved 24 August 2013. [the *Questionnaire*]

General advice

According to p. 4 of the *Manual*, "The quality of the survey's results depends on you, on how you administer the questionnaire, and on how you treat respondents.
 "Follow all the guidelines here scrupulously [including this one]. . . .
 "Explain to the respondent why you are doing the survey in simple terms [(your organization would like to understand better how its participants live).] Do not get involved in a household's internal issues, and do not broach subjects that might detract from the purpose of the survey."

According to p. 5 of the *Manual*, "To do well, you must understand and follow all the instructions in this [*Guide*, including this one]."

According to p. 15 of the *Manual*, "This [*Guide*] is your sole source of information for interpreting the items in the survey; you should always carry it with you."

How to establish a healthy rapport with the respondent

According to pp. 13–14 of the *Manual*:

Make a good first impression
"When you first meet the respondent, do your best to put him/her at ease. Try to make him/her comfortable and thus more likely to respond favorably to your request to be interviewed. Smile, and introduce yourself. After exchanging the customary greetings (such as 'Good morning, Sir', or 'Good morning, Ma'am'), introduce yourself as follows: 'My name is <your name>. I am doing a survey for <your organization>. The purpose of the survey is to better understand the lives of the participants of <your organization>. Your household has been chosen at random to participate, and I would appreciate your cooperation.'

Be positive
"Be calm and polite. Do not make excuses or act ashamed. Avoid saying things like 'Are you very busy?', 'Could you give me a few minutes?', or 'I am sorry to bother you, but could I impose on you to answer a few questions for me?' These types of questions run the risk of encouraging the respondent to refuse to cooperate even before the interview starts. Instead, tell the respondent 'I would like to ask you a few questions', or 'I would like to speak with you for a few minutes'.

If necessary, assure the respondent that all responses will be kept strictly confidential
"If some questions cause the respondent to hesitate, tell him/her that all the data collected by the survey will be kept strictly confidential, that it will be used only for statistical purposes, and that no report will ever mention the names of specific people nor associate responses with any specific household. Assure him/her that you are strictly prohibited from sharing the responses with anyone who is not authorized.

Respond frankly to any questions from the respondent
"If the respondent asks questions about the survey or about the length of the interview, give him/her a clear answer without getting annoyed. Always carry your organizational identity card and your letter of introduction, and show these to the respondent if it seems called for."

Show that you take your work seriously and that you respect respondents' time by being on-time for your appointments

<u>Who should be the respondent?</u>
"According to p. 20 of the *Manual*, the preferred respondent "is the head of the household. If he/she is not available, then the next-preferred respondent is the spouse of the head of the household. In the absence of the head and his/her spouse, the scorecard may be administered to any other adult who can provide the required information."

<u>Guidelines for conducting the interview</u>

According to p. 14 of the *Manual*:

<u>Be neutral</u>
"Be completely neutral throughout the entire interview. Do not do anything that might lead the respondent to feel that he/she has given a 'correct' or 'incorrect' response, whether by your tone of voice, facial expression, or body language. Never give the impression that you approve or disapprove of anything that the respondent says.

<u>Do not suggest an answer to the respondent (unless this *Guide* says to do so)</u>

<u>Do not change the meaning nor the sequencing of questions</u>
"If the respondent has misunderstood a question, then repeat it, slowly and clearly. If the respondent still does not understand, then reword the question, being careful not to change the original meaning. . . .

<u>Be tactful with reluctant respondents</u>
"If the respondent seems uninterested, distracted, refuses to answer some questions, or wants to discontinue the interview, then try to do something to revive his/her interest. For example, take a few minutes to chat about things unrelated to the survey, such as sports, the village, the weather, etc.

<u>Avoid preconceived notions of what responses should be</u>

<u>Do not rush the interview</u>
Ask questions slowly so that the respondent understands what is being asked. After asking a question, wait: give the respondent time to think. If the respondent feels hurried, then he/she may give sloppy or frivolous answers, or just say, "I don't know". If you suspect that the respondent feels pressured to answer quickly, then gently remind him/her, "There is no rush. Your opinion is very important, so please think about your answers carefully. I am happy to take all the time that you need."

<u>Language of the interview</u>
"[The scorecard] has official versions in French and English. Use the respondent's preferred language. If the respondent does not speak French nor English, then translate (or find someone to translate) the questions without changing their original meaning."

Guidelines for specific scorecard indicators

1. How many members does the household have?
   A. Seven or more
   B. Six
   C. Five
   D. Four
   E. Three
   F. One or two

According to pp. 6 and 20 of the *Manual*, a *household* "is a socio-economic unit of one or more people—regardless of whether they have a blood or marital relationship—who live in a single residence consisting of one or more buildings in the same compound, who share resources to cover living expenses, who usually eat together, and who recognize the authority of a single head."

According to page 20 of the *Manual*, "Do not confuse a *household* with a *family*. Even though all members of a family are related, they are not all necessarily members of the same household because they may live in different compounds, they may not share living expenses, they may not eat together, and they may not recognize the same head.

"Four criteria determine who is a *member of a household*:

- Lives together in the same residence (hut, house, apartment, compound/*saré*, etc.)
- Eats together, especially the evening meal
- Shares resources (partly or completely). The resources that come from a given household member benefit all the members of the household to some degree
- Recognizes of the authority of the same head. That recognition may be tacit or implicit. When in doubt, count the oldest member as the head

"A person who fulfills only one, two, or three of the four criteria does not qualify as a *member of the household*. The examples below show cases that do not qualify:

- A lodger lives in the same compound with his/her landlord but generally makes independent decisions. This lodger is not part of the landlord's household. This holds even if the lodger is sometimes invited to share a meal with the landlord's household or if the lodger usually pays to eat with the landlord's household
- An indigent neighbor (widow, invalid, unemployed person, etc.) may regularly be invited to eat with a household (or may receive food sent by the household). Nevertheless, the neighbor is not a member of the household. Even though the household helps such a neighbor, it is not responsible for his/her well-being
- A husband has been working in another country for more than six months. He is no longer counted as a household member. Likewise, a child who gone away to college and has been away for more than six months is no longer a household member"

There is also a fifth criteria that must be fulfilled. According to p. 21 of the *Manual*, to be a *member of a household*, "a person must have lived there for six months (or for less than six months, if the person intends to stay for at least six months, as is the case after moving and for newly-weds or newborns)."

Finally, a given person must be a member of one household, and that person cannot be a member of more than one household. This is especially relevant in polygamous marriages in which one or more wives—according to the five criteria above—have separate households. In such cases, the husband is a member of one (and only one) of the households. A wife in a household in which the husband is not a member is counted as the head of that household.

2. Do all household members ages 6 to 16 currently go to an officially recognized school or educational institution?
   A. No
   B. Yes
   C. No members ages 6 to 16

The definition of *household member* presented for first indicator applies equally here.

According to p. 21 of the *Manual*, "Age is counted in completed years as of the most recent birthday."

According to p. 32 of the *Manual*, "*school attendance* refers only to educational establishments or degree-granting institutions in the formal educational system that are recognized by the Ministry of Primary Education, Secondary Education, Post-Secondary Education, and Civil Service. Courses, trainings, or certificate programs offered by other institutions do not count for the purposes of this question, even if they are recognized by the Ministry of Labor, Employment, and Professional Training."

3. In the past four weeks, did any household member work with his/her main occupation in agriculture, animal husbandry, hunting, or fishing for at least one hour, whether self-employed, as a paid or unpaid employee, apprentice, or as an unpaid family worker?

   A. Yes

   B. No

The definition of *household member* presented for first indicator applies equally here.

According to p. 37 of the *Manual*, this question applies only to household members who are five-years-old or older.

According to p. 37 of the *Manual*, *work* is defined as "all activity done for at least one hour in return for remuneration in-kind or in-cash. A person who usually works is counted as having worked, even if he/she has not worked one hour in the past four weeks, as long as the inactivity is due to vacation, professional leave, sick leave, or maternity leave, or if work was suspended due to a strike, the fallow season, broken machinery, etc., and if the suspension has not lasted (and is not expected to last) more than one month. Furthermore, unpaid family workers, unpaid apprentices, and unpaid interns are counted as having worked."

According to p. 39 of the *Manual*, "The *main occupation* is that which the person usually performs. If the person has several jobs, then identify the main one. In general, the *main occupation* is that which the person says is the main one. If the respondent cannot decide on one, then you should record the one in which the person works the most time. If the person works the same amount of time in two or more jobs, then record the one that brings in the most income."

According to p. 38 of the *Manual*, "A mason or a repairperson who works out of a permanent workshop where he/she waits for clients to arrive is counted as having worked even if he/she has not had any customers in the past four weeks. . . . In contrast, a mason or repairperson who does not have a permanent workshop is counted as having worked only if he/she did indeed work in the past four weeks."

4. Can the male head/spouse read and write a simple sentence in French or English?
   A. No
   B. Only English
   C. Only French
   D. No male head/spouse
   E. Both French and English

According to p. 32 of the *Manual*, "The question seeks to determine *literacy*, that is, the ability to read and write a simple phrase in French or English. A *simple phrase* is a sentence made up of a subject, and verb, and an object."

For the purposes of the scorecard, the *male head/spouse* is defined as:

- The household head, if the head is a man
- The spouse/partner/companion of the household head, if the head is a woman
- Non existent, if neither of the previous two criteria are met (that is, if the head is a woman who has no spouse/partner/companion living in the same household)

According to p. 20 of the *Manual*, the *head of the household* is whomever is recognized as such by the other household members. This recognition is often tacit/implicit. When in doubt, count the oldest member as the head.

5. Can the (oldest) female head/spouse read and write a simple sentence in French or English?
   A. No
   B. No female head/spouse
   C. Only English
   D. Only French
   E. Both French and English

For the purposes of the scorecard, the *(oldest) female head/spouse* is defined as:

- The household head, if the head is a woman
- The oldest spouse/partner/companion of the household head, if the head is a man
- Non existent, if neither of the previous two criteria are met (that is, if the head is a man but he has no spouse/partner/companion living in the same household).

According to p. 20 of the *Manual*, the *head of the household* is whomever is recognized as such by the other household members. This recognition is often tacit/implicit. When in doubt, count the oldest member as the head.

6. What is the main material of the floor of the residence?
   A. Dirt, or other
   B. Wood, cement, or tile

According to p. 15 of the *Manual*, "Avoid asking questions [such as this one] if you can observe the response without asking."

According to p. 58 of the *Manual*, "Observe the main type of material of the floor, and mark the corresponding response option. If there are multiple types of materials, then ask the respondent which is the main one, that is, the one that accounts for the largest quantity."

7. What is the main type of fuel used for cooking?
    A. Collected/gifted firewood, or other
    B. Purchased firewood, kerosene/paraffin/petroleum, charcoal, sawdust/wood chips, electricity, or does not cook
    C. LPG

According to p. 57 of the *Manual*, « The *main type* is the type <u>most often used</u> by the household. If the household uses more than one type of cooking fuel and cannot decide which one is used most often, then record the most convenient type of fuel.

　　If a household normally uses LPG but, being out of cash, currently uses some other fuel temporarily (for example, kerosene/paraffin/petroleum), then the main type of cooking fuel should be recorded as LPG."

8. Does the household have an electric iron?
   A. No
   B. Yes

According to p. 58 of the *Manual*, "a household is considered to have an electric iron if its tenancy in non-precarious (having lasted for at least six months or being expected to last for at least six months), regardless of when or how the electric iron was acquired. Examples of such non-precarious tenure in the absence of ownership are:

- Three years ago, a household received an electric iron for safekeeping when a friend moved away. While the electric iron is in safekeeping, the true, original owner does not enjoy its services. Thus, for the purposes of the survey, the original owner does not possess it
- A high-level executive with a large private company has the use of, for example, a business vehicle, and is thus counted as possessing a vehicle

"Do not count electric irons that are usually used to produce goods or services for sale (for example, an iron that a family uses mainly to press clothes that it has taken in from other households to be washed). These are business assets, not household assets.
    "Likewise, do not count electric irons that do not work, are indefinitely out-of-order, and have zero residual value. An example is a broken electric iron that has been put in storage and will never be used again."

According to p. 60 of the *Manual*, "the question is concerned with electric irons of any kind, regardless of the model, brand, age, price, size, etc."

9. Does the household have a radio or television?
   A. No
   B. Radio only
   C. Television (regardless of radio)

Ask one question for each of the two items:

* Does the household have a radio?
* Does the household have a television?

Mark the responses as indicated by the following table:

Does the household have a . . . ?		Response to be marked
Radio	**Television**	
No	No	A. None
Yes	No	B. Radio only
No	Yes	C. Television (regardless of radio)
Yes	Yes	C. Television (regardless of radio)

In particular, if the household has a television, then mark "C", regardless of whether the household also has a radio.

According to p. 58 of the *Manual*, "a household is considered to have a radio or television if its tenancy in non-precarious (having lasted for at least six months or being expected to last for at least six months), regardless of when or how the radio or television was acquired. Examples of such non-precarious tenure in the absence of ownership are:

* Three years ago, a household received an television for safekeeping when a friend moved away. In the meantime, the true, original owner does not enjoy the services of the television. Thus, for the purposes of the survey, the original owner does not possess it
* A high-level executive with a large private company has the use of, for example, a business vehicle, and is thus counted as possessing a vehicle

"Do not count radios or televisions that are usually used to produce goods or services for sale (for example, a television in the dining room of a restaurant run by the household). These are business assets, not household assets.

   "Likewise, do not count radios or televisions that do not work, are indefinitely out-of-order, and have zero residual value. An example is a broken television that has been put in storage and will never be used again."

According to p. 60 of the *Manual*, "the question is concerned with radios and televisions of any kind, regardless of the model, brand, age, price, size, etc."

10. Does the household have a buffet or wardrobe?
    A. No
    B. Yes

According to p. 58 of the *Manual*, "a household is considered to have a buffet or wardrobe if its tenancy in non-precarious (having lasted for at least six months or being expected to last for at least six months), regardless of when or how the buffet or wardrobe was acquired. Examples of such non-precarious tenure in the absence of ownership are:

- Three years ago, a household received a wardrobe for safekeeping when a friend moved away. While the wardrobe is in safekeeping, the true, original owner does not enjoy its services. Thus, for the purposes of the survey, the original owner does not possess it
- A high-level executive with a large private company has the use of, for example, a business vehicle, and is thus counted as possessing a vehicle

"Do not count buffets or wardrobes that are usually used to produce goods or services for sale (for example, a wardrobe used to display dresses in a small shop run by the household). These are business assets, not household assets.

"Likewise, do not count buffets or wardrobes that do not work, are indefinitely out-of-order, and have zero residual value. An example is a broken buffet that has been put in storage and will never be used again."

According to p. 60 of the *Manual*, "the question is concerned with buffets or wardrobes of any kind, regardless of the model, brand, age, price, size, etc."

Figure 1: Poverty lines and poverty rates for all of Cameroon and for the construction/calibration and validation samples, by poverty line, and by households and people

| | Line or rate | Level | n | Poverty rates (% with expenditure less than a poverty line) and poverty lines (XAF/day per adult equivalent or per person) | | | | | | |
| | | | | National | | | USAID | Intl. 2005 PPP | | |
Sample				100%	150%	200%	'Extreme'	$1.25	$2.00	$2.50
All Cameroon	Line	People	11,391	666	998	1,331	361	394	631	789
	Rate	Households	11,391	29.1	51.1	66.0	12.9	19.5	41.3	52.9
		People		39.9	63.2	76.5	20.0	28.8	54.4	65.9
Construction and calibration										
Selecting indicators and points, and	Rate	Households	5,725	28.6	50.6	65.2	12.8	40.7	40.7	52.3
associating scores with likelihoods	Rate	People		39.9	63.2	76.3	20.0	28.6	54.3	65.8
Validation										
Measuring accuracy	Rate	Households	5,666	29.6	51.6	66.8	13.1	19.9	41.9	53.4
	Rate	People		39.9	63.1	76.7	19.9	29.1	54.5	65.9

Source: 2007 ECAM. Poverty lines in average prices from September to December 2007 in Yaoundé.

National poverty lines are in XAF per adult equivalent per day.

The USAID "extreme" and international 2005 PPP lines are in XAF per person per day.

Figure 2: Poverty lines and poverty rates for all of Cameroon and by urban/rural for each region, by poverty line, and by households and people

Region	Line or rate	Level	n	Poverty rates (% with expenditure less than a poverty line) and poverty lines (XAF/day per adult equivalent or per person)						
				National			USAID	Intl. 2005 PPP		
				100%	150%	200%	'Extreme'	$1.25	$2.00	$2.50
All Cameroon	Line		11,391	666	998	1,331	361	394	631	789
	Rate	Households		29.1	51.1	66.0	12.9	19.5	41.3	52.9
	Rate	People		39.9	63.2	76.5	20.0	28.8	54.4	65.9
Douala	Line		2,540	753	1,129	1,506	481	446	714	892
	Rate	Households		3.2	15.4	30.4	1.6	1.1	7.9	16.9
	Rate	People		5.5	24.2	42.5	2.8	2.0	13.6	26.8
Yaoundé	Line		580	738	1,107	1,476	475	437	700	875
	Rate	Households		3.3	14.1	28.9	1.7	0.7	7.1	15.5
	Rate	People		5.9	21.5	39.6	3.1	1.3	11.7	23.7
Adamaoua (urbain)	Line		920	710	1,065	1,420	373	421	673	842
	Rate	Households		13.6	26.6	47.8	6.6	8.0	20.3	30.4
	Rate	People		18.4	33.0	55.6	9.0	10.5	27.1	38.5
Adamaoua (rural)	Line		920	710	1,065	1,420	373	421	673	842
	Rate	Households		45.1	73.8	84.1	22.3	32.9	63.4	74.2
	Rate	People		59.4	85.3	92.0	29.6	44.1	77.8	87.0
Centre (urbain)	Line		920	712	1,069	1,425	414	422	675	844
	Rate	Households		17.0	52.1	70.1	9.3	10.6	36.6	54.1
	Rate	People		24.0	65.3	82.9	14.0	16.0	49.9	68.6
Centre (rural)	Line		760	712	1,069	1,425	414	422	675	844
	Rate	Households		31.5	61.8	77.9	15.5	17.2	47.4	60.4
	Rate	People		43.0	74.4	88.0	21.8	24.4	62.9	75.2

Source: 2007 ECAM. Poverty lines in average prices from September to December 2007 in Yaoundé.

National poverty lines are in XAF per adult equivalent per day.

The USAID "extreme" and international 2005 PPP lines are in XAF per person per day.

Figure 2 (cont.): Poverty lines and poverty rates for all of Cameroon and by urban/rural for each region, by poverty line, and by households and people

| Region | Line or rate | Level | n | Poverty rates (% with expenditure less than a poverty line) and poverty lines (XAF/day per adult equivalent or per person) | | | | | | |
| | | | | National | | | USAID | Intl. 2005 PPP | | |
				100%	150%	200%	'Extreme'	$1.25	$2.00	$2.50
Est (urbain)	Line		440	666	999	1,332	314	395	631	789
	Rate	Households		9.6	28.7	49.1	1.3	3.9	19.6	32.7
	Rate	People		16.2	42.5	63.5	2.1	6.5	30.2	46.2
Est (rural)	Line		920	666	999	1,332	314	395	631	789
	Rate	Households		40.4	64.5	82.4	17.4	28.5	55.8	70.8
	Rate	People		56.3	79.4	92.8	29.2	44.3	72.7	85.1
Extrême-Nord (urbain)	Line		1,120	596	895	1,193	248	353	566	707
	Rate	Households		13.6	31.5	48.8	2.7	7.7	24.5	35.3
	Rate	People		20.3	42.1	60.8	4.8	12.5	35.4	45.6
Extrême-Nord (rural)	Line		260	596	895	1,193	248	353	566	707
	Rate	Households		64.4	84.1	91.8	28.9	50.4	77.6	85.8
	Rate	People		72.1	88.9	95.0	36.6	59.8	83.9	90.9
Littoral (urbain)	Line		480	712	1,067	1,423	409	422	675	843
	Rate	Households		27.7	52.7	70.7	13.3	14.2	39.7	56.2
	Rate	People		34.5	60.3	77.6	19.8	20.5	48.3	64.5
Littoral (rural)	Line		320	712	1,067	1,423	409	422	675	843
	Rate	Households		20.6	53.7	74.0	7.6	9.3	35.6	55.5
	Rate	People		28.7	68.5	85.1	12.9	15.1	50.9	72.8

Source: 2007 ECAM. Poverty lines in average prices from September to December 2007 in Yaoundé.

National poverty lines are in XAF per adult equivalent per day.

The USAID "extreme" and international 2005 PPP lines are in XAF per person per day.

Figure 2 (cont.): Poverty Poverty lines and poverty rates for all of Cameroon and by urban/rural for each region, by poverty line, and by households and people

Region	Line or rate	Level	n	National 100%	National 150%	National 200%	USAID 'Extreme'	Intl. 2005 PPP $1.25	Intl. 2005 PPP $2.00	Intl. 2005 PPP $2.50
Nord (urbain)	Line		460	608	912	1,217	296	360	577	721
	Rate	Households		15.8	42.8	57.4	5.0	10.6	28.8	44.8
	Rate	People		24.7	56.1	69.2	8.1	15.9	43.2	59.4
Nord (rural)	Line		400	608	912	1,217	296	360	577	721
	Rate	Households		61.6	83.6	91.8	26.5	50.0	74.8	84.1
	Rate	People		73.6	89.6	94.9	37.8	63.6	85.3	91.5
Nord-Ouest (urbain)	Line		320	630	945	1,259	312	373	597	746
	Rate	Households		13.4	30.8	45.9	4.2	7.1	20.8	29.9
	Rate	People		19.6	39.4	56.0	7.6	12.0	28.3	40.0
Nord-Ouest (rural)	Line		360	630	945	1,259	312	373	597	746
	Rate	Households		42.2	71.1	83.8	18.5	28.8	59.7	71.7
	Rate	People		58.3	83.0	91.3	29.7	43.8	75.1	84.6
Ouest (urbain)	Line		360	625	937	1,249	359	370	592	740
	Rate	Households		14.9	38.7	56.5	6.6	7.6	28.6	43.9
	Rate	People		19.4	49.3	66.9	9.7	10.5	38.3	55.8
Ouest (rural)	Line		200	625	937	1,249	359	370	592	740
	Rate	Households		26.0	58.2	77.0	11.8	13.2	45.7	62.4
	Rate	People		33.0	68.4	85.4	16.5	18.7	56.8	73.4

Source: 2007 ECAM. Poverty lines in average prices from September to December 2007 in Yaoundé.

National poverty lines are in XAF per adult equivalent per day.

The USAID "extreme" and international 2005 PPP lines are in XAF per person per day.

Figure 2 (cont.): Poverty lines and poverty rates for all of Cameroon and by urban/rural for each region, by poverty line, and by households and people

Region	Line or rate	Level	n	Poverty rates (% with expenditure less than a poverty line) and poverty lines (XAF/day per adult equivalent or per person)						
				National			USAID	Intl. 2005 PPP		
				100%	150%	200%	'Extreme'	$1.25	$2.00	$2.50
Sud (urbain)	Line		460	685	1,028	1,370	407	406	650	812
	Rate	Households		8.6	25.1	46.1	2.4	2.4	12.2	26.0
	Rate	People		12.7	33.4	56.2	3.8	3.8	18.4	35.4
Sud (rural)	Line		400	685	1,028	1,370	407	406	650	812
	Rate	Households		21.5	47.4	65.4	10.8	10.2	39.4	47.7
	Rate	People		30.8	60.8	75.7	16.1	15.3	53.7	62.5
Sud-Ouest (urbain)	Line		320	696	1,044	1,392	401	413	660	825
	Rate	Households		3.9	18.8	36.3	0.8	0.9	10.9	18.9
	Rate	People		6.9	28.6	51.0	1.4	1.9	18.5	31.5
Sud-Ouest (rural)	Line		360	696	1,044	1,392	401	413	660	825
	Rate	Households		22.1	44.3	67.4	9.5	10.7	32.1	47.7
	Rate	People		33.7	60.3	80.2	17.4	19.4	50.5	63.8

Source: 2007 ECAM. Poverty lines in average prices from September to December 2007 in Yaoundé.

National poverty lines are in XAF per adult equivalent per day.

The USAID "extreme" and international 2005 PPP lines are in XAF per person per day.

Figure 3: Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
19,780	How many household members have as their main occupation in an agricultural operation (plantation, field, farm, animal husbandry, fishing) or with a non-profit association (cooperative, NGO, union, etc.)? (Five or more; Four; Three; Two; One; None)
17,746	In their main occupation, how many household members are manual laborers, self-employed without employees, unpaid family workers, or apprentices (paid or unpaid)? (Five or more; Four; Three; Two; One; None)
17,375	What is the main type of fuel used for cooking? (Collected/gifted firewood, or other; Purchased firewood, kerosene/paraffin/petroleum, charcoal, sawdust/wood chips, electricity, or does not cook; LPG)
15,355	In the past seven days, how many household members worked at least one hour in self-employment, as a paid or unpaid employee, as an apprentice, or as an unpaid family worker? (Five or more; Four; Three; Two; One; None)
14,751	In the past 12 months, has any household member farmed some land? If so, does the household have a parcel of land for growing crops or raising livestock etc.? Does the household have any steers, cows, goats, sheep, or pigs? (No one farmed; Someone farmed, but no one owns any agricultural land; Someone farmed, and the household has agricultural land, but no livestock; Someone farmed, and the household has agricultural land and also livestock)
14,554	What is the main material of the floor of the residence? (Dirt, or other; Wood, cement, or tile)
14,463	In the past 12 months, has any household member raised livestock or poultry, hunted, fished, kept bees or harvested honey, or farmed some land? If so, then does at least one member of the household have a parcel of land used for growing crops or raising livestock etc.? Does the household have any steers, cows, goats, sheep, or pigs? (No one farms or raises livestock etc. (regardless of ownership of agricultural land or livestock); Someone farms or raises livestock etc., but no one owns any agricultural land (regardless of livestock); Someone farms or raises livestock etc., and someone one owns agricultural land, but no one has any livestock; Someone farms or raises livestock etc., and someone one owns agricultural land, and the household also has livstock)

Figure 3 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
14,148	What is the main source of energy used by the household for lighting? (Kerosene/paraffin/petroleum, or other; Legal or pirated connection to SONEL, generator, or LPG)
14,047	In the past four weeks, did any household member work with their main occupation in agriculture, animal husbandry, hunting, or fishing for at least one hour, whether self-employed, as a paid or unpaid employee, apprentice, or as an unpaid family worker? (Yes; No)
14,033	In the past 12 months, has any household member collected forest products (including cutting or gathering firewood)? (Yes; No)
13,930	What is the highest grade that the (oldest) female head/spouse has passed? (None; Maternel, SIL, ou CP/CPS; CE1; No female head/spouse; CE2; CM1; Form 1 to Form 4; Form 6 or Form 6; Form 7 or higher)
13,805	Does the household have a kerosene/paraffin/petroleum stove, gas stove, gas stove, or LPG cylinder? (None; Only kerosene/paraffin/petroleum stove; Gas stove, stove, or LPG cylinder (regardless of kerosene/paraffin/petroleum stove))
13,695	How many cellular telephones does the household have? (None; One; Two or more)
13,677	What was the main occupation of the female head/spouse in the past seven days? (Agriculture, animal husbandry, hunting, and fishing; Craftspeople and manual laborers; Employees, and self-employed people in trade; Does not work; No (oldest) female head/spouse; Members of the executive and legislative branches of government, civil servants, board members of businesses, and the clergy, professionals and scientists, upper-level managers, mid-level managers, technicians, and clerks, or armed forces and police)
13,648	In the past 12 months, has any household member farmed some land? (Yes, as an owner; Yes, as a sharecropper; Yes, on land no one owns; No)
13,522	In the past 12 months, has any household member farmed some land? If so, does anyone have a parcel of land for growing crops or raising livestock etc.? (No one farmed; Someone farmed, but no one owns any agricultural land; Someone farmed, and the household has agricultural land)

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Figure 3 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
13,506	What is the tenancy status of the household in its residence? (Owned, without formal title, rent-to-own, or other; Housed by a relative or friend; Housed by an employer; Owned, with formal title; Rented)
13,484	Does the household have a land-line telephone or a cellular telephone? (No; Yes)
13,484	How many household members are 16-years-old or younger? (Five or more; Four; Three; Two; One; None)
13,393	How many household members are 18-years-old or younger? (Six or more; Five; Four; Three; Two; One; None)
13,290	In the past 12 months, has any household member raised livestock or poultry, hunted, fished, kept bees or harvested honey, or farmed some land? If so, then does at least one member of the household have a parcel of land used for growing crops or raising livestock etc.? (No one farms or raises livestock etc. (regardless of ownership of agricultural land); Someone farms or raises livestock etc., but no one owns any agricultural land; Someone farms or raises livestock etc., and someone one owns agricultural land)
13,285	How many household members are 17-years-old or younger? (Five or more; Four; Three; Two; One; None)
13,239	How many household members are 15-years-old or younger? (Five or more; Four; Three; Two; One; None)
13,192	The business where the female head/spouse has her main occupation is a . . .? (Agricultural operation (plantation, field, farm, animal husbandry, fishing . . .), or a business association (cooperative, NGO, union, etc.); Non-agricultural private firm, or an international organization; Does not work; No female head/spouse; Government entity, or a state or para-statal entity, or another household)
13,029	Can the (oldest) female head/spouse read and write a simple sentence in French or English? (No; No female head/spouse; Only English; Only French; Both French and English)
12,820	How many household members are 14-years-old or younger? (Five or more; Four; Three; Two; One; None)
12,609	In her main occupation, how is the female head/spouse paid, or how does she receive income? (In kind, or unremunerated; By the job, or via business profits; Does not work; No female head/spouse; Fixed slary (monthly, semi-monthly, or weekly), by the day or by the hour worked, or commission)

Figure 3 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
12,515	What is the status of the female head/spouse in her main occupation? (Unpaid family worker, or paid or unpaid apprentice; Self-employed without employees; Does not work, or not otherwise classified; No female head/spouse; Upper-level manager, engineer, or similar, middle-level manager or supervisor, salaried worker or highly skilled craftsman, salaried worker or low-skilled craftsman, manual laborer, or business owner with employees)
12,358	How many household members are 13-years-old or younger? (Five or more; Four; Three; Two; One; None)
12,277	What type of toilet arrangement does the household use? (No toilet arrangement, or other; Non-improved latrine; Improved latrine, or flush toilet)
12,226	In the past 12 months, has any household member raised livestock or poultry, hunted, fished, kept bees or harvested honey, or farmed some land? (Yes; No)
12,061	How many members does the household have? (Seven or more; Six; Five; Four; Three; One or two)
11,975	What is the main material of the roof of the residence? (Matting/thatch/metal sheets/leaves, earth, or other; Tile/metal sheets, or cement)
11,926	What is the main material of the walls of the residence? (Cut stone, earth/unbaked bricks, matting/thatch/metal sheets/leaves, or other; Mud/clay; Planks; *Carabot*; Concrete/cinder blocks/baked bricks)
11,895	Does the household have a radio or a television? (No; Only radio; Television (regardless of radio))
11,693	If at least one member of the household has a parcel of land used for growing crops or raising livestock etc., do any of those parcels have a formal title? (Someone has agricultural land, but none of it has a formal title; No has any agricultural land; Someone has agricultural land, and some of it has formal title)
11,629	How many household members are 12-years-old or younger? (Five or more; Four; Three; Two; One; None)

Figure 3 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
11,602	What is the main source of drinking water for the household? (Rainwater, uncovered well, river, lake, backwater, or spring; Other; Pumped from a well, or covered well or spring; Borehole; Public standpipe; Shared tap from SNEC/CAMWATER, or shared tap from a source other than SNEC/CAMWATER; Bottled water, or water vendor who sells tap water from SNEC/CAMWATER; Private tap from SNEC/CAMWATER, or private tap from a source other than SNEC/CAMWATER)
11,453	Does the household have a television with VCR or DVD or cable/satellite service? (No television (regardless of others); Only television; Only television with VCR or DVD; Television with cable/satellite service (regardless of VCR and DVD))
11,298	Does the household have an LPG cylinder? (No; Yes)
11,274	Do all household members ages 6 to 13 currently go to an officially recognized school or educational institution? (No; Yes; No members ages 6 to 13)
11,269	What is the highest grade that the male head/spouse has passed? (None; Pre-school, SIL, or CP/CPS; CE1, CE2, or CM1; No male head/spouse; Form 1 or Form 2; Form 3 or Form 4; Form 5, 6, or 7; First year of university or higher)
11,207	Do all household members ages 6 to 14 currently go to an officially recognized school or educational institution? (No; Yes; No members ages 6 to 14)
11,122	Do all household members ages 6 to 15 currently go to an officially recognized school or educational institution? (No; Yes; No members ages 6 to 15)
10,922	Do all household members ages 6 to 12 currently go to an officially recognized school or educational institution? (No; Yes; No members ages 6 to 12)
10,922	Does the household have a television? (No; Yes)
10,919	How many household members are 11-years-old or younger? (Five or more; Four; Three; Two; One; None)

Figure 3 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
10,784	Do all household members ages 6 to 16 currently go to an officially recognized school or educational institution? (No; Yes; No members ages 6 to 16)
10,450	Does at least one member of the household have a parcel of land used for growing crops or raising livestock etc.? If so, then what is the total area of those parcels in hectares? (No one owns any agricultural land; The household has less than 1 hectares of agricultural land; The household has 1 hectare of agricultural land; The household has 2 hectares of agricultural land; The household has 3 hectares of agricultural land; The household has 4 hectares ou plus of agricultural land)
10,141	Does the household have an electric iron? (No; Yes)
10,094	Do all household members ages 6 to 11 currently go to an officially recognized school or educational institution? (No; Yes; No members ages 6 to 11)
10,078	Does at least one member of the household have a parcel of land used for growing crops or raising livestock etc.? (Yes; No)
9,896	Do all household members ages 6 to 17 currently go to an officially recognized school or educational institution? (No; Yes; No members ages 6 to 17)
9,574	What was the main occupation of the male head/spouse in the past seven days? (Agriculture, animal husbandry, hunting, and fishing; Craftspeople and manual laborers; Employees, and self-employed people in trade; Does not work; No male head/spouse; Members of the executive and legislative branches of government, civil servants, board members of businesses, and the clergy, professionals and scientists, upper-level managers, mid-level managers, technicians, and clerks, or armed forces and police)
9,145	The business where the male head/spouse has his main occupation is a . . .? (Agricultural operation (plantation, field, farm, animal husbandry, fishing . . .), business association (cooperative, NGO, union, etc.), or another household; No male head/spouse; Does not work; Non-agricultual private firm ; Government entity, or a state or para-statal entity, or international organization)
8,791	Do all household members ages 6 to 18 currently go to an officially recognized school or educational institution? (No; Yes; No members ages 6 to 18)

Figure 3 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
8,595	How does the household dispose of its garbage? (Thrown on the ground; Buried/burned, or recycled; Trash truck or dumpster, or other)
8,368	The business where the female head/spouse has her main occupation is a . . .? (Non-agricultual private firm, agricultural operation (plantation, field, farm, animal husbandry, fishing . . .), business association (cooperative, NGO, union, etc.), or another household; Does not work; No female head/spouse; Government entity, state or para-statal entity, or international organization)
8,221	Does the household have a gas stove? (No; Yes)
8,206	Does the household have a VCR or DVD? (No; Yes)
7,984	What type of residence does the household have? (Concession/*saré*; Detached house; House divided into several residences; Modern villa, or apartment in an apartment building)
7,640	Can the male head/spouse read and write a simple sentence in French or English? (No; Only English; Only French; No male head/spouse; Both French and English)
7,543	How does the household dispose of its waste water? (Dumped on the ground, or other; Dumped in the yard; Drained into a gutter or ditch, river or stream, septic tank, or public sewage system)
7,543	Does the household have a fan? (No; Yes)
7,130	In the past seven days, has the female head/spouse worked at least one hour in self-employment, as a paid or unpaid employee, as an apprentice, or as an unpaid family worker? (Yes; No; No female head/spouse)
6,944	What is the marital status of the female head/spouse? (Polygamously married; Monogamously married; Widow; Divorced or separated; Cohabiting; No female head/spouse; Never-married)
6,739	How many household members are 6-years-old or younger? (Three or more; Two; One; None)
6,086	In their main occupation, how many household members are self-employed? (Three or more; Two; One; None)

Figure 3 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
5,905	What is the marital status of the male head/spouse? (Polygamously married; Monogamously married; No male head/spouse; Widower, divorced or separated, or cohabiting; Never-married)
5,894	Does your household possess any steers, cows, goats, sheep, or pigs? (Yes; No)
5,820	How many rooms does the residence have? (One; Two; Three; Four or more)
5,789	In the past seven days, how many household members in their main occupation worked outside of agriculture, animal husbandry, hunting, or fishing? (None; One; Two or more)
5,782	What is the status of the male head/spouse in his main occupation? (Self-employed without employees; Business owner with employees; No male head/spouse; Does not work, or not otherwise classified; Manual laborer, unpaid family worker, or paid or unpaid apprentice; Salaried worker or low-skilled craftsman; Upper-level manager, engineer, or similar, middle-level manager or supervisor, or salaried worker/highly skilled craftsman)
5,547	How many household members have their main occupation in government, a public or para-statal company, or a private non-agricultural firm? (None; One; Two or more)
5,427	Does the residence have cable/satellite television? (No; Yes)
5,336	In his main occupation, how is the male head/spouse paid, or how does he receive income? (Business profits; No male head/spouse; By the job; Does not work, or is not remunerated; Fixed salary (monthly, semi-monthly, or weekly fixed salary), by the day or by the hour worked; Commission, or in kind)
4,937	In your opinion, is your household very poor, poor, not poor nor rich, or rich? (Very poor; Poor; Not poor nor rich, or rich)
4,896	How many rooms does the household usually use for sleeping? (None, or one; Two; Three; Four or more)
4,615	Does the household have a refrigerator or a freezer? (No; Yes)
4,585	What is the structure of household headship? (Both male and female heads/spouses; Only female head/spouse; Only male head/spouse)

Figure 3 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
4,435	Does the household have a radio or a hi-fi stereo system? (None; Radio only; Only hi-fi stereo system only; Both)
4,294	Is there a field or uncleared land within 100m of the residence? (Yes; No)
3,897	Are there any high- or medium-tension electrical lines within 50m of the residence? (No; Yes)
3,892	In their main occupation, how many household members are paid (or receive income) from a fixed salary (monthly, semi-monthly, or weekly)? (None; One or more)
3,774	Does your household have a buffet or wardrobe? (No; Yes)
3,710	In the past seven days, how many household members were, in their main occupation, employees, self-employed people in trade, craftspeople, or manual laborers? (None; One or more)
3,397	Does the household have a bicycle, motorcycle/scooter, or vehicle? (None; Only bicycle; Motorcycle/scooter, without vehicle (regardless of bicycle); Vehicle (regardless of others))
3,255	Does the household have a horse/ass, bicycle, pushcart/wagon/wheelbarrow, motorcycle/scooter, or vehicle? (None; Only horse/ass; Bicycle, without motorcycle/scooter, pushcart/wagon/wheelbarrow, nor vehicle (regardless of horse/ass); Pushcart/wagon/wheelbarrow, without motorcycle/scooter and without vehicle (regardless of horse/ass or bicycle); Motorcycle/scooter, without vehicle (regardless of others); Vehicle (regardless of others))
3,052	In their main occupation, how many household members are business owners with employees, upper-level managers/engineer/similar, middle-level managers, supervisors, salaried employee, skilled employees/workers, or semi-skilled employees/workers? (None; One or more)
3,000	Does the household have a stove? (No; Yes)
2,945	What type of road does one use to get to the residence? (Footpath, or other; Unpaved road; Paved road)
2,851	Does the household have a kerosene/paraffin/petroleum stove? (No; Yes)
2,420	In their main occupation, how many household members are paid (or receive income) from a fixed salary (monthly, semi-monthly, or weekly), by the day or hour worked, by the job, or via commission?

Figure 3 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
2,397	How many household members can read and write a simple sentence in English? (None; One or more)
2,378	Does the household have a hi-fi stereo system? (No; Yes)
2,316	Does the household have a radio? (No; Yes)
2,301	The business where the male head/spouse has his main occupation is a . . .? (Non-agricultual private firm, agricultural operation (plantation, field, farm, animal husbandry, fishing . . .), business association (cooperative, NGO, union, etc.), or or another household; No male head/spouse; Does not work; Government entity, state or para-statal entity, or international organization)
1,877	Does the household have a bicycle or motorcycle/scooter? (None; Only bicycle; Motorcycle/scooter (regardless of bicycle))
1,749	Does the household have a mill? (No; Yes)
1,626	How many household members can read and write a simple sentence in French? (None; One or more)
1,621	Does the household have a bicycle? (No; Yes)
1,462	Does the household have a vehicle? (No; Yes)
1,320	How many household members can read and write a simple sentence in French or English? (None; One or more)
1,164	What is the area of your residence in meters squared? (0 to 15 ; 16 to 20 ; 21 to 30 ; 31 to 40 ; 41 to 50 ; 51 to 70 ; 71 to 90 ; 91 to 120 ; 121 or more)
710	Does the household have a horse or an ass? (No; Yes)
618	In the past four weeks, has the male head/spouse worked at least one hour in self-employment, as a paid or unpaid employee, as an apprentice, or as an unpaid family worker? (No; No male head/spouse; Yes)
547	Are any household members handicapped? (Yes; No)
268	On what type of geologic feature is the residence built? (Top of a mountain or hill, or other; Side of a mountain or hill; A flat or almost-flat area; Valley/lowland/swamp)

Figure 3 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
265	Does the household have a motorcycle or scooter? (No; Yes)
46	Does the household have a satellite dish? (No; Yes)
24	Is the residence encircled by a fence or other barrier? (No; Yes)
7	Is there a free-flowing body of water (stream, river, marsh, lake, etc.) within 100m of the residence? (No; Yes)
1	Does the household have a pushcart/wagon/wheelbarrow? (No; Yes)

Source: 2007 ECAM and the national poverty line

Tables for
100% of the National Poverty Line

(and Tables Pertaining to All Seven Poverty Lines)

Figure 4 (100% of the national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	94.4
5–9	83.3
10–14	81.7
15–19	72.1
20–24	63.0
25–29	47.7
30–34	34.1
35–39	30.0
40–44	18.0
45–49	10.6
50–54	8.3
55–59	4.3
60–64	3.6
65–69	1.7
70–74	0.9
75–79	0.9
80–84	0.5
85–89	0.0
90–94	0.0
95–100	0.0

Figure 5 (100% of the national line): Derivation of estimated poverty likelihoods associated with scores

Score	Households at score and < poverty line		All households at score		Poverty likelihood (%)
0–4	3,241	÷	3,434	=	94.4
5–9	2,439	÷	2,928	=	83.3
10–14	3,363	÷	4,118	=	81.7
15–19	3,975	÷	5,512	=	72.1
20–24	3,732	÷	5,925	=	63.0
25–29	4,016	÷	8,412	=	47.7
30–34	2,373	÷	6,965	=	34.1
35–39	2,661	÷	8,859	=	30.0
40–44	1,379	÷	7,646	=	18.0
45–49	846	÷	7,989	=	10.6
50–54	506	÷	6,104	=	8.3
55–59	287	÷	6,736	=	4.3
60–64	194	÷	5,353	=	3.6
65–69	72	÷	4,270	=	1.7
70–74	43	÷	4,514	=	0.9
75–79	32	÷	3,384	=	0.9
80–84	12	÷	2,617	=	0.5
85–89	0	÷	2,993	=	0.0
90–94	0	÷	1,715	=	0.0
95–100	0	÷	526	=	0.0

Number of all households normalized to sum to 100,000.

Figure 6 (Per-adult-equivalent poverty lines): Probability that a given household's per-adult-equivalent consumption falls in a range demarcated by two adjacent per-adult-equivalent poverty lines

	Likelihood (%) of having daily per-adult-equivalent expenditure in a range demarcated by per-adult-equivalent poverty lines			
	<100% Natl.	≥100% Natl. and <150% Natl.	≥150% Natl. and <200% Natl.	≥200% Natl.
Score	<XAF666	≥XAF666 and <XAF998	≥XAF998 and <XAF1,331	≥XAF1,331
0–4	94.4	5.6	0.0	0.0
5–9	83.3	13.7	2.2	0.8
10–14	81.7	15.2	2.0	1.1
15–19	72.1	23.3	2.6	1.9
20–24	63.0	26.8	7.7	2.4
25–29	47.7	35.1	12.3	4.8
30–34	34.1	40.2	19.5	6.3
35–39	30.0	33.8	20.4	15.8
40–44	18.0	34.5	23.4	24.1
45–49	10.6	32.2	24.8	32.5
50–54	8.3	25.2	22.9	43.7
55–59	4.3	21.5	22.0	52.3
60–64	3.6	13.6	20.0	62.8
65–69	1.7	6.7	16.8	74.9
70–74	0.9	4.7	15.0	79.3
75–79	0.9	2.6	9.8	86.7
80–84	0.5	2.4	6.4	90.7
85–89	0.0	1.2	5.8	93.0
90–94	0.0	1.1	2.2	96.7
95–100	0.0	0.0	0.0	100.0

Figure 6 (Per-capita poverty lines): Probability that a given household's per-capita consumption falls in a range demarcated by two adjacent per-capita poverty lines

	Likelihood (%) of having daily per-capita expenditure in a range demarcated by per-capita poverty lines				
	<USAID	≥USAID and <$1.25/day	≥$1.25/day and <$2.00/day	≥$2.00/day and <$2.50/day	≥$2.50/day
Score	<XAF361	≥XAF361 and <XAF394	≥XAF394 and <XAF631	≥XAF631 and <XAF789	≥XAF789
0–4	67.2	16.2	14.9	1.7	0.0
5–9	51.2	22.8	20.9	3.7	1.4
10–14	48.5	23.9	21.9	4.0	1.7
15–19	33.4	16.9	40.1	5.1	4.4
20–24	23.7	19.0	41.9	7.3	8.1
25–29	21.0	9.8	42.4	14.8	12.1
30–34	11.6	7.3	40.7	23.7	16.8
35–39	7.9	5.7	33.8	20.2	32.4
40–44	4.0	2.2	28.9	22.3	42.7
45–49	2.3	1.2	19.6	18.8	58.2
50–54	2.3	0.5	15.3	14.9	67.1
55–59	0.9	0.0	9.5	13.5	76.1
60–64	0.3	0.0	5.1	12.1	82.5
65–69	0.3	0.0	3.9	4.8	91.0
70–74	0.0	0.0	1.5	4.0	94.5
75–79	0.0	0.0	1.3	2.1	96.6
80–84	0.0	0.0	0.6	1.7	97.7
85–89	0.0	0.0	0.4	0.4	99.2
90–94	0.0	0.0	0.4	0.4	99.2
95–100	0.0	0.0	0.0	0.0	100.0

Figure 7 (100% of the national line): Average differences between estimated and true poverty likelihoods for households, with confidence intervals, from 1,000 bootstraps of $n = 16{,}384$ by score range, scorecard applied to the validation sample

| | | Difference between estimate and true value | | |
| | | Confidence interval (±percentage points) | | |
Score	Diff.	90-percent	95-percent	99-percent
0–4	−1.3	1.3	1.5	2.0
5–9	+2.4	3.3	4.1	5.3
10–14	+1.3	3.2	3.9	5.0
15–19	−1.6	2.6	3.1	3.9
20–24	+2.5	3.1	3.7	5.0
25–29	+1.0	2.5	3.0	3.9
30–34	−6.6	4.8	5.1	6.0
35–39	−8.4	5.7	6.0	6.5
40–44	−2.9	2.8	3.2	4.2
45–49	−4.4	3.3	3.4	3.9
50–54	−3.2	2.8	2.9	3.5
55–59	−5.2	3.7	3.9	4.4
60–64	+0.4	1.1	1.3	1.7
65–69	+0.8	0.5	0.6	0.8
70–74	+0.8	0.2	0.2	0.3
75–79	+0.9	0.0	0.0	0.0
80–84	−0.2	0.6	0.7	0.9
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 (100% of the national line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	−0.6	58.9	80.8	89.8
4	−1.9	36.8	43.1	55.3
8	−1.9	26.7	31.5	39.9
16	−2.2	19.7	23.7	30.1
32	−2.0	13.6	16.6	20.7
64	−2.0	9.9	12.0	15.9
128	−2.1	7.1	8.6	11.5
256	−2.1	5.3	6.2	8.1
512	−2.0	3.5	4.3	5.3
1,024	−2.1	2.6	3.0	3.8
2,048	−2.0	1.8	2.2	2.7
4,096	−2.1	1.3	1.5	2.1
8,192	−2.1	0.9	1.0	1.5
16,384	−2.1	0.6	0.8	1.0

Figure 9 (All poverty lines): Average differences between estimates and true values for poverty rates of a group of households at a point in time, precision, and the α factor for precision, scorecard applied to the validation sample

	Poverty line						
	National			USAID	Intl. 2005 PPP		
	100%	150%	200%	'Extreme'	$1.25	$2.00	$2.50
Estimate minus true value	–2,1	–0,6	–1,2	–0,4	–2,3	–1,3	–0,9
Precision of difference	0.6	0.6	0.5	0.5	0.6	0.6	0.6
α factor for precision	1.08	0.90	0.81	1.18	1.15	0.92	0.84

Precision is measured as 90-percent confidence intervals in units of ± percentage points.

Differences and precision estimated from 1,000 bootstraps with $n = 16{,}384$.

α is estimated from 1,000 bootstrap samples of $n = 256, 512, 1{,}024, 2{,}048, 4{,}096, 8{,}192$, and 16,384.

Figure 10: Possible outcomes of targeting

True poverty status		Targeting segment	
		Targeted	**Non-targeted**
Below poverty line		**Inclusion** Below poverty line Correctly Targeted	**Undercoverage** Below poverty line Mistakenly Non-targeted
Above poverty line		**Leakage** Above poverty line Mistakenly Targeted	**Exclusion** Above poverty line Correctly Non-targeted

Figure 11 (100% of the national line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	3.2	26.3	0.2	70.2	73.5	−77.5
≤9	5.6	23.9	0.7	69.7	75.3	−59.4
≤14	9.0	20.6	1.5	68.9	77.9	−34.2
≤19	13.0	16.6	3.0	67.4	80.3	−2.1
≤24	16.6	13.0	5.3	65.1	81.6	+30.1
≤29	20.6	9.0	9.7	60.7	81.3	+67.1
≤34	23.2	6.4	14.1	56.3	79.5	+52.3
≤39	25.7	3.8	20.4	50.0	75.8	+31.0
≤44	27.1	2.4	26.6	43.8	70.9	+9.9
≤49	28.2	1.4	33.6	36.8	65.0	−13.7
≤54	28.7	0.8	39.2	31.3	60.0	−32.5
≤59	29.3	0.3	45.3	25.1	54.4	−53.3
≤64	29.5	0.1	50.5	19.9	49.4	−70.8
≤69	29.5	0.0	54.7	15.7	45.3	−85.0
≤74	29.6	0.0	59.2	11.2	40.8	−100.2
≤79	29.6	0.0	62.6	7.8	37.4	−111.7
≤84	29.6	0.0	65.2	5.2	34.8	−120.5
≤89	29.6	0.0	68.2	2.2	31.8	−130.6
≤94	29.6	0.0	69.9	0.5	30.1	−136.4
≤100	29.6	0.0	70.4	0.0	29.6	−138.2

Inclusion, undercoverage, leakage, and exclusion normalized to sum to 100.

Figure 12 (100% of the national line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	3.4	94.0	10.9	15.7:1
≤9	6.4	88.6	19.1	7.8:1
≤14	10.5	85.7	30.4	6.0:1
≤19	16.0	81.0	43.8	4.3:1
≤24	21.9	75.6	56.0	3.1:1
≤29	30.3	67.9	69.6	2.1:1
≤34	37.3	62.2	78.4	1.6:1
≤39	46.2	55.8	87.1	1.3:1
≤44	53.8	50.5	91.8	1.0:1
≤49	61.8	45.6	95.2	0.8:1
≤54	67.9	42.3	97.1	0.7:1
≤59	74.6	39.3	99.1	0.6:1
≤64	80.0	36.9	99.7	0.6:1
≤69	84.3	35.1	99.9	0.5:1
≤74	88.8	33.3	99.9	0.5:1
≤79	92.1	32.1	99.9	0.5:1
≤84	94.8	31.2	100.0	0.5:1
≤89	97.8	30.2	100.0	0.4:1
≤94	99.5	29.7	100.0	0.4:1
≤100	100.0	29.6	100.0	0.4:1

Tables for

150% of the National Poverty Line

Figure 4 (150% of the national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	97.0
10–14	96.8
15–19	95.5
20–24	89.8
25–29	82.8
30–34	74.3
35–39	63.8
40–44	52.5
45–49	42.8
50–54	33.5
55–59	25.7
60–64	17.2
65–69	8.3
70–74	5.7
75–79	3.5
80–84	2.9
85–89	1.2
90–94	1.1
95–100	0.0

Figure 7 (150% of the national line): Average differences between estimated and true poverty likelihoods for households, with confidence intervals, from 1,000 bootstraps of $n = 16{,}384$ by score range, scorecard applied to the validation sample

| Score | Diff. | Difference between estimate and true value | | |
| | | Confidence interval ($\pm$percentage points) | | |
		90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+2.9	1.9	2.3	2.9
10–14	−0.7	0.9	1.1	1.4
15–19	+0.9	1.4	1.6	2.0
20–24	+6.9	2.8	3.5	4.5
25–29	+0.2	2.0	2.4	3.2
30–34	−2.8	2.6	2.8	3.4
35–39	−8.0	5.0	5.3	5.9
40–44	−1.3	2.8	3.5	4.7
45–49	+3.4	2.7	3.3	4.4
50–54	−1.6	3.0	3.5	4.7
55–59	−1.3	2.8	3.2	4.1
60–64	+1.1	2.3	2.8	3.6
65–69	−1.9	2.1	2.4	3.2
70–74	−1.2	1.8	2.1	2.9
75–79	−4.5	3.5	3.8	4.1
80–84	+1.0	1.0	1.1	1.5
85–89	+0.2	0.6	0.8	1.0
90–94	+1.0	0.2	0.2	0.3
95–100	+0.0	0.0	0.0	0.0

Figure 8 (150% of the national line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size n	Diff.	Difference between estimate and true value		
		Confidence interval ($\pm$percentage points)		
		90-percent	95-percent	99-percent
1	−0.1	65.2	78.5	92.8
4	−1.3	36.5	44.1	57.0
8	−0.0	24.9	30.0	41.8
16	−0.2	18.6	23.4	30.2
32	−0.3	12.5	15.4	19.3
64	−0.2	9.3	10.7	14.0
128	−0.3	6.3	7.8	10.0
256	−0.4	4.8	5.6	7.2
512	−0.5	3.3	3.8	4.7
1,024	−0.6	2.3	2.7	3.5
2,048	−0.6	1.6	2.0	2.7
4,096	−0.6	1.1	1.4	1.8
8,192	−0.6	0.8	1.0	1.2
16,384	−0.6	0.6	0.7	1.0

Figure 11 (150% of the national line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	3.4	48.2	0.0	48.4	51.8	−86.7
≤9	6.2	45.4	0.2	48.2	54.4	−75.7
≤14	10.2	41.4	0.3	48.1	58.3	−60.0
≤19	15.4	36.2	0.6	47.8	63.1	−39.2
≤24	20.6	31.0	1.3	47.0	67.6	−17.7
≤29	27.6	24.1	2.8	45.6	73.2	+12.1
≤34	32.8	18.8	4.5	43.9	76.7	+35.8
≤39	38.4	13.2	7.8	40.6	79.0	+63.8
≤44	42.4	9.2	11.4	37.0	79.4	+77.9
≤49	45.6	6.1	16.2	32.2	77.7	+68.6
≤54	47.6	4.0	20.3	28.1	75.8	+60.8
≤59	49.4	2.2	25.2	23.2	72.6	+51.2
≤64	50.4	1.2	29.6	18.8	69.2	+42.7
≤69	50.9	0.7	33.3	15.1	66.0	+35.4
≤74	51.3	0.4	37.5	10.9	62.1	+27.3
≤79	51.5	0.1	40.7	7.7	59.2	+21.2
≤84	51.6	0.0	43.2	5.2	56.8	+16.3
≤89	51.6	0.0	46.2	2.2	53.8	+10.6
≤94	51.6	0.0	47.9	0.5	52.1	+7.3
≤100	51.6	0.0	48.4	0.0	51.6	+6.3

Inclusion, undercoverage, leakage, and exclusion normalized to sum to 100.

Figure 12 (150% of the national line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	3.4	100.0	6.7	Only poor targeted
≤9	6.4	97.4	12.0	37.8:1
≤14	10.5	97.2	19.7	34.3:1
≤19	16.0	96.1	29.8	24.9:1
≤24	21.9	93.9	39.9	15.4:1
≤29	30.3	90.8	53.4	9.9:1
≤34	37.3	87.9	63.5	7.3:1
≤39	46.2	83.2	74.4	4.9:1
≤44	53.8	78.8	82.1	3.7:1
≤49	61.8	73.7	88.3	2.8:1
≤54	67.9	70.2	92.3	2.4:1
≤59	74.6	66.2	95.7	2.0:1
≤64	80.0	63.0	97.7	1.7:1
≤69	84.3	60.4	98.7	1.5:1
≤74	88.8	57.7	99.3	1.4:1
≤79	92.1	55.9	99.8	1.3:1
≤84	94.8	54.4	99.9	1.2:1
≤89	97.8	52.8	100.0	1.1:1
≤94	99.5	51.9	100.0	1.1:1
≤100	100.0	51.6	100.0	1.1:1

Tables for

200% of the National Poverty Line

Figure 4 (200% of the national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	99.2
10–14	98.9
15–19	98.1
20–24	97.6
25–29	95.2
30–34	93.7
35–39	84.2
40–44	75.9
45–49	67.5
50–54	56.3
55–59	47.7
60–64	37.2
65–69	25.1
70–74	20.7
75–79	13.3
80–84	9.3
85–89	7.0
90–94	3.3
95–100	0.0

Figure 7 (200% of the national line): Average differences between estimated and true poverty likelihoods for households, with confidence intervals, from 1,000 bootstraps of $n = 16,384$ by score range, scorecard applied to the validation sample

| | | Difference between estimate and true value | | |
| | | Confidence interval ($\pm$percentage points) | | |
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+1.3	1.3	1.5	2.0
10–14	–0.6	0.5	0.5	0.6
15–19	–0.6	0.6	0.6	0.7
20–24	+2.0	1.2	1.4	2.0
25–29	–0.8	0.9	1.1	1.4
30–34	+1.5	1.3	1.6	2.2
35–39	+0.7	1.6	2.0	2.6
40–44	–3.5	2.7	2.9	3.2
45–49	–0.3	2.5	3.0	3.9
50–54	–7.9	5.4	5.7	6.1
55–59	–8.3	5.6	5.9	6.3
60–64	+1.2	3.1	3.8	5.2
65–69	+2.1	2.8	3.4	4.5
70–74	–0.5	2.8	3.3	4.2
75–79	–14.1	9.1	9.6	10.3
80–84	+4.1	1.7	2.0	2.6
85–89	+4.0	1.2	1.4	1.7
90–94	–7.9	6.1	6.5	7.7
95–100	+0.0	0.0	0.0	0.0

Figure 8 (200% of the national line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size n	Difference between estimate and true value			
		Confidence interval (±percentage points)		
	Diff.	90-percent	95-percent	99-percent
1	+0.8	69.3	81.7	92.9
4	−1.2	31.5	38.6	50.3
8	−0.4	22.4	26.4	37.6
16	−0.8	16.4	19.4	26.6
32	−0.9	10.9	12.9	18.7
64	−1.0	8.0	9.5	13.5
128	−1.0	5.5	6.9	9.0
256	−1.1	4.0	4.8	6.0
512	−1.2	2.8	3.4	4.6
1,024	−1.2	2.0	2.4	3.1
2,048	−1.2	1.3	1.6	2.0
4,096	−1.2	0.9	1.1	1.4
8,192	−1.2	0.7	0.8	1.0
16,384	−1.2	0.5	0.6	0.7

Figure 11 (200% of the national line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	3.4	63.4	0.0	33.2	36.6	−89.7
≤9	6.3	60.5	0.0	33.2	39.5	−81.0
≤14	10.4	56.4	0.1	33.1	43.5	−68.7
≤19	15.8	51.0	0.2	33.0	48.8	−52.4
≤24	21.5	45.3	0.5	32.8	54.2	−35.0
≤29	29.5	37.3	0.9	32.4	61.8	−10.5
≤34	35.8	30.9	1.4	31.8	67.6	+9.5
≤39	42.8	24.0	3.3	29.9	72.7	+33.2
≤44	48.5	18.3	5.3	27.9	76.5	+53.2
≤49	53.9	12.9	7.9	25.3	79.2	+73.2
≤54	57.6	9.2	10.3	22.9	80.5	+84.6
≤59	61.2	5.6	13.4	19.8	81.0	+79.9
≤64	63.4	3.4	16.6	16.6	79.9	+75.1
≤69	64.5	2.2	19.7	13.5	78.0	+70.5
≤74	65.7	1.1	23.1	10.1	75.8	+65.4
≤79	66.4	0.4	25.8	7.4	73.8	+61.4
≤84	66.6	0.2	28.2	5.0	71.5	+57.8
≤89	66.7	0.1	31.1	2.1	68.8	+53.5
≤94	66.8	0.0	32.7	0.5	67.3	+51.1
≤100	66.8	0.0	33.2	0.0	66.8	+50.3

Inclusion, undercoverage, leakage, and exclusion normalized to sum to 100.

Figure 12 (200% of the national line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	3.4	100.0	5.1	Only poor targeted
≤9	6.4	99.3	9.5	148.1:1
≤14	10.5	99.3	15.6	142.2:1
≤19	16.0	98.9	23.7	86.1:1
≤24	21.9	97.9	32.1	47.6:1
≤29	30.3	97.2	44.1	34.2:1
≤34	37.3	96.1	53.7	24.8:1
≤39	46.2	92.8	64.1	12.8:1
≤44	53.8	90.2	72.7	9.2:1
≤49	61.8	87.2	80.7	6.8:1
≤54	67.9	84.8	86.2	5.6:1
≤59	74.6	82.0	91.6	4.6:1
≤64	80.0	79.2	94.9	3.8:1
≤69	84.3	76.6	96.6	3.3:1
≤74	88.8	74.0	98.3	2.8:1
≤79	92.1	72.0	99.4	2.6:1
≤84	94.8	70.2	99.6	2.4:1
≤89	97.8	68.2	99.8	2.1:1
≤94	99.5	67.1	100.0	2.0:1
≤100	100.0	66.8	100.0	2.0:1

Tables for

the USAID "Extreme" Poverty Line

Figure 4 (USAID "extreme" line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	67.2
5–9	51.2
10–14	48.5
15–19	33.4
20–24	23.7
25–29	21.0
30–34	11.6
35–39	7.9
40–44	4.0
45–49	2.3
50–54	2.3
55–59	0.9
60–64	0.3
65–69	0.3
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 7 (USAID "extreme" line): Average differences between estimated and true poverty likelihoods for households, with confidence intervals, from 1,000 bootstraps of $n = 16,384$ by score range, scorecard applied to the validation sample

Score	Diff.	Difference between estimate and true value		
		Confidence interval ($\pm$percentage points)		
		90-percent	95-percent	99-percent
0–4	−1.1	3.4	4.2	5.6
5–9	+17.8	3.7	4.4	6.0
10–14	+1.9	3.6	4.1	5.8
15–19	−3.2	3.0	3.4	4.6
20–24	−8.8	5.7	6.0	6.6
25–29	+6.7	1.7	2.0	2.6
30–34	−5.5	4.1	4.3	4.9
35–39	−2.9	2.4	2.6	3.1
40–44	−1.6	1.5	1.6	2.0
45–49	−1.5	1.2	1.3	1.6
50–54	+0.6	0.7	0.8	1.0
55–59	−0.2	0.4	0.5	0.7
60–64	+0.3	0.0	0.0	0.0
65–69	+0.3	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	−0.7	0.7	0.7	0.9
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 (USAID "extreme" line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	−0.5	54.9	65.1	81.6
4	−0.5	29.8	38.3	51.7
8	−0.7	22.1	27.5	35.0
16	−0.6	15.0	18.6	25.1
32	−0.4	11.6	13.7	18.3
64	−0.6	8.2	9.9	13.0
128	−0.7	5.8	7.4	9.9
256	−0.6	4.0	4.8	6.8
512	−0.5	2.9	3.5	4.4
1,024	−0.5	2.0	2.4	3.2
2,048	−0.4	1.4	1.7	2.2
4,096	−0.4	1.0	1.2	1.6
8,192	−0.4	0.7	0.8	1.1
16,384	−0.4	0.5	0.6	0.8

Figure 11 (USAID "extreme" line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	2.2	10.9	1.3	85.5	87.7	−57.0
≤9	3.3	9.8	3.1	83.7	87.0	−26.0
≤14	5.3	7.7	5.1	81.6	87.0	+21.0
≤19	7.4	5.6	8.5	78.3	85.7	+34.9
≤24	9.2	3.9	12.6	74.2	83.4	+3.4
≤29	10.4	2.7	19.8	67.0	77.4	−51.4
≤34	11.3	1.8	25.9	60.9	72.2	−97.9
≤39	12.1	1.0	33.9	52.9	65.0	−159.5
≤44	12.5	0.5	41.1	45.7	58.2	−214.6
≤49	12.8	0.2	48.8	38.0	50.8	−273.5
≤54	12.9	0.1	54.8	32.0	44.9	−319.4
≤59	13.0	0.0	61.4	25.4	38.4	−370.1
≤64	13.0	0.0	66.8	20.0	33.0	−411.0
≤69	13.0	0.0	71.1	15.7	28.8	−443.7
≤74	13.0	0.0	75.6	11.2	24.3	−478.2
≤79	13.0	0.0	78.9	7.8	20.9	−504.1
≤84	13.1	0.0	81.5	5.2	18.3	−524.0
≤89	13.1	0.0	84.5	2.2	15.3	−546.9
≤94	13.1	0.0	86.3	0.5	13.6	−560.0
≤100	13.1	0.0	86.8	0.0	13.1	−564.1

Inclusion, undercoverage, leakage, and exclusion normalized to sum to 100.

Figure 12 (USAID "extreme" line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	3.4	63.4	16.7	1.7:1
≤9	6.4	52.0	25.3	1.1:1
≤14	10.5	50.9	40.8	1.0:1
≤19	16.0	46.4	56.8	0.9:1
≤24	21.9	42.0	70.4	0.7:1
≤29	30.3	34.3	79.7	0.5:1
≤34	37.3	30.3	86.6	0.4:1
≤39	46.2	26.2	92.5	0.4:1
≤44	53.8	23.3	96.0	0.3:1
≤49	61.8	20.8	98.2	0.3:1
≤54	67.9	19.1	99.0	0.2:1
≤59	74.6	17.5	99.9	0.2:1
≤64	80.0	16.3	99.9	0.2:1
≤69	84.3	15.5	99.9	0.2:1
≤74	88.8	14.7	99.9	0.2:1
≤79	92.1	14.2	99.9	0.2:1
≤84	94.8	13.8	100.0	0.2:1
≤89	97.8	13.4	100.0	0.2:1
≤94	99.5	13.1	100.0	0.2:1
≤100	100.0	13.1	100.0	0.2:1

Tables for

the $1.25/day 2005 PPP Poverty Line

Figure 4 ($1.25/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	83.4
5–9	74.0
10–14	72.4
15–19	50.4
20–24	42.6
25–29	30.7
30–34	18.9
35–39	13.6
40–44	6.2
45–49	3.4
50–54	2.7
55–59	0.9
60–64	0.3
65–69	0.3
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 7 ($1.25/day line): Average differences between estimated and true poverty likelihoods for households, with confidence intervals, from 1,000 bootstraps of $n = 16{,}384$ by score range, scorecard applied to the validation sample

| Score | Diff. | Difference between estimate and true value | | |
| | | Confidence interval (±percentage points) | | |
		90-percent	95-percent	99-percent
0–4	−7.2	4.5	4.7	5.1
5–9	+5.9	3.8	4.6	5.9
10–14	+0.3	3.5	4.1	5.5
15–19	−6.9	4.9	5.2	5.7
20–24	−0.6	3.0	3.6	5.2
25–29	−0.7	2.3	2.8	3.8
30–34	−4.8	3.9	4.1	4.6
35–39	−10.1	6.4	6.7	7.1
40–44	−3.8	3.1	3.3	3.7
45–49	−0.3	1.0	1.2	1.5
50–54	+0.9	0.7	0.8	1.0
55–59	−0.5	0.5	0.6	0.8
60–64	+0.3	0.0	0.0	0.0
65–69	+0.3	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	−0.7	0.7	0.7	0.9
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 ($1.25/day line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size n	Diff.	Difference between estimate and true value		
		Confidence interval (±percentage points)		
		90-percent	95-percent	99-percent
1	−1.2	55.9	71.3	83.9
4	−2.1	33.1	40.4	57.3
8	−2.3	24.4	31.0	42.3
16	−2.4	17.4	21.3	27.7
32	−2.3	12.5	15.6	19.7
64	−2.3	9.1	10.7	14.4
128	−2.4	6.3	7.5	10.7
256	−2.3	4.7	5.6	7.4
512	−2.3	3.2	3.8	4.9
1,024	−2.3	2.4	2.8	3.5
2,048	−2.3	1.7	2.0	2.6
4,096	−2.3	1.2	1.4	1.8
8,192	−2.3	0.8	0.9	1.3
16,384	−2.3	0.6	0.7	0.9

Figure 11 ($1.25/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	3.0	16.8	0.4	79.7	82.8	−67.4
≤9	5.0	14.9	1.4	78.7	83.7	−43.0
≤14	7.8	12.0	2.6	77.5	85.3	−7.7
≤19	10.9	8.9	5.1	75.1	86.0	+35.5
≤24	13.5	6.4	8.5	71.7	85.1	+57.4
≤29	16.0	3.9	14.4	65.8	81.8	+27.7
≤34	17.4	2.5	19.9	60.2	77.6	−0.3
≤39	18.7	1.1	27.4	52.7	71.4	−38.1
≤44	19.3	0.6	34.5	45.6	64.9	−73.9
≤49	19.6	0.3	42.2	37.9	57.5	−112.4
≤54	19.7	0.1	48.2	32.0	51.7	−142.6
≤59	19.8	0.0	54.8	25.4	45.2	−175.9
≤64	19.8	0.0	60.1	20.0	39.8	−202.8
≤69	19.8	0.0	64.4	15.7	35.6	−224.3
≤74	19.8	0.0	68.9	11.2	31.1	−247.1
≤79	19.8	0.0	72.3	7.8	27.7	−264.1
≤84	19.9	0.0	74.9	5.2	25.1	−277.2
≤89	19.9	0.0	77.9	2.2	22.1	−292.2
≤94	19.9	0.0	79.6	0.5	20.4	−300.9
≤100	19.9	0.0	80.1	0.0	19.9	−303.5

Inclusion, undercoverage, leakage, and exclusion normalized to sum to 100.

Figure 12 ($1.25/day line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	3.4	88.3	15.3	7.5:1
≤9	6.4	78.0	25.0	3.5:1
≤14	10.5	74.8	39.5	3.0:1
≤19	16.0	68.3	55.0	2.2:1
≤24	21.9	61.4	67.7	1.6:1
≤29	30.3	52.7	80.4	1.1:1
≤34	37.3	46.6	87.4	0.9:1
≤39	46.2	40.6	94.3	0.7:1
≤44	53.8	35.8	97.0	0.6:1
≤49	61.8	31.7	98.7	0.5:1
≤54	67.9	29.0	99.3	0.4:1
≤59	74.6	26.6	99.9	0.4:1
≤64	80.0	24.8	99.9	0.3:1
≤69	84.3	23.5	99.9	0.3:1
≤74	88.8	22.4	99.9	0.3:1
≤79	92.1	21.5	99.9	0.3:1
≤84	94.8	21.0	100.0	0.3:1
≤89	97.8	20.3	100.0	0.3:1
≤94	99.5	20.0	100.0	0.2:1
≤100	100.0	19.9	100.0	0.2:1

Tables for

the $2.00/day 2005 PPP Poverty Line

Figure 4 ($2.00/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	98.3
5–9	94.9
10–14	94.3
15–19	90.5
20–24	84.5
25–29	73.1
30–34	59.5
35–39	47.4
40–44	35.1
45–49	23.0
50–54	18.0
55–59	10.4
60–64	5.4
65–69	4.2
70–74	1.5
75–79	1.3
80–84	0.6
85–89	0.4
90–94	0.4
95–100	0.0

Figure 7 ($2.00/day line): Average differences between estimated and true poverty likelihoods for households, with confidence intervals, from 1,000 bootstraps of $n = 16{,}384$ by score range, scorecard applied to the validation sample

Score	Diff.	Confidence interval (±percentage points) 90-percent	95-percent	99-percent
0–4	−0.4	0.7	0.9	1.1
5–9	+1.7	2.0	2.3	3.1
10–14	−1.1	1.1	1.4	1.8
15–19	+0.1	1.6	2.0	2.5
20–24	+6.5	2.9	3.6	4.7
25–29	+1.2	2.3	2.7	4.0
30–34	−6.9	4.7	5.0	5.4
35–39	−13.3	7.8	8.1	8.7
40–44	+1.7	2.6	3.4	4.3
45–49	+2.4	2.2	2.6	3.3
50–54	−1.9	2.5	3.0	4.0
55–59	−3.7	3.1	3.3	3.8
60–64	−0.4	1.3	1.6	1.9
65–69	+2.0	0.8	0.9	1.3
70–74	+0.8	0.4	0.4	0.5
75–79	+0.4	0.6	0.7	0.9
80–84	−0.5	0.7	0.8	1.1
85–89	−0.1	0.5	0.6	0.7
90–94	+0.3	0.2	0.2	0.3
95–100	+0.0	0.0	0.0	0.0

Figure 8 ($2.00/day line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.0	68.3	77.6	94.8
4	−1.2	34.9	42.4	52.9
8	−1.0	25.2	29.3	39.2
16	−1.4	18.7	21.8	27.4
32	−1.2	12.8	14.8	18.8
64	−1.2	9.1	11.0	14.4
128	−1.2	6.3	7.8	10.7
256	−1.3	4.5	5.4	7.2
512	−1.3	3.1	3.8	4.7
1,024	−1.3	2.3	2.7	3.4
2,048	−1.3	1.7	2.0	2.7
4,096	−1.3	1.2	1.5	1.9
8,192	−1.3	0.8	1.0	1.3
16,384	−1.3	0.6	0.7	1.0

Figure 11 ($2.00/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	3.4	38.5	0.1	58.1	61.4	−83.7
≤9	6.1	35.8	0.3	57.9	64.0	−70.2
≤14	9.9	31.9	0.5	57.6	67.5	−51.2
≤19	14.9	27.0	1.1	57.0	71.9	−26.3
≤24	19.7	22.2	2.2	55.9	75.6	−0.7
≤29	25.8	16.1	4.5	53.6	79.4	+34.1
≤34	30.3	11.6	7.0	51.1	81.4	+61.3
≤39	34.8	7.1	11.4	46.7	81.5	+72.8
≤44	37.4	4.5	16.4	41.7	79.1	+60.8
≤49	39.1	2.8	22.7	35.4	74.6	+45.9
≤54	40.3	1.6	27.6	30.5	70.8	+34.1
≤59	41.2	0.7	33.5	24.6	65.8	+20.1
≤64	41.6	0.3	38.4	19.7	61.2	+8.3
≤69	41.7	0.2	42.5	15.6	57.3	−1.6
≤74	41.8	0.1	47.0	11.1	52.9	−12.2
≤79	41.8	0.1	50.3	7.8	49.6	−20.1
≤84	41.9	0.0	52.9	5.2	47.1	−26.3
≤89	41.9	0.0	55.9	2.2	44.1	−33.4
≤94	41.9	0.0	57.6	0.5	42.4	−37.5
≤100	41.9	0.0	58.1	0.0	41.9	−38.7

Inclusion, undercoverage, leakage, and exclusion normalized to sum to 100.

Figure 12 ($2.00/day line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	3.4	98.4	8.1	62.6:1
≤9	6.4	96.0	14.6	23.8:1
≤14	10.5	94.9	23.7	18.6:1
≤19	16.0	93.0	35.5	13.2:1
≤24	21.9	89.8	47.0	8.8:1
≤29	30.3	85.2	61.7	5.7:1
≤34	37.3	81.2	72.3	4.3:1
≤39	46.2	75.3	83.0	3.1:1
≤44	53.8	69.5	89.2	2.3:1
≤49	61.8	63.3	93.4	1.7:1
≤54	67.9	59.3	96.2	1.5:1
≤59	74.6	55.2	98.3	1.2:1
≤64	80.0	52.0	99.2	1.1:1
≤69	84.3	49.5	99.6	1.0:1
≤74	88.8	47.1	99.8	0.9:1
≤79	92.1	45.4	99.9	0.8:1
≤84	94.8	44.2	99.9	0.8:1
≤89	97.8	42.8	100.0	0.7:1
≤94	99.5	42.1	100.0	0.7:1
≤100	100.0	41.9	100.0	0.7:1

Tables for

the $2.50/day 2005 PPP Poverty Line

Figure 4 ($2.50/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	98.6
10–14	98.3
15–19	95.6
20–24	91.9
25–29	87.9
30–34	83.2
35–39	67.6
40–44	57.3
45–49	41.8
50–54	32.9
55–59	23.9
60–64	17.5
65–69	9.0
70–74	5.5
75–79	3.4
80–84	2.3
85–89	0.8
90–94	0.8
95–100	0.0

Figure 7 ($2.50/day line): Average differences between estimated and true poverty likelihoods for households, with confidence intervals, from 1,000 bootstraps of $n = 16{,}384$ by score range, scorecard applied to the validation sample

Score	Diff.	Difference between estimate and true value Confidence interval (±percentage points) 90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+2.0	1.5	1.7	2.1
10–14	−0.0	0.7	0.8	1.1
15–19	+0.6	1.3	1.6	2.0
20–24	−1.5	1.5	1.7	2.3
25–29	+4.5	2.0	2.3	2.9
30–34	−0.3	2.0	2.4	2.8
35–39	−5.9	3.9	4.2	4.6
40–44	−3.1	3.0	3.4	4.6
45–49	+2.2	2.7	3.3	4.4
50–54	−7.1	5.1	5.4	5.9
55–59	+0.4	2.6	3.1	4.1
60–64	−2.6	2.7	3.2	4.2
65–69	−4.1	3.2	3.5	3.9
70–74	+0.2	1.3	1.5	2.0
75–79	−0.6	1.5	1.8	2.3
80–84	−0.4	1.1	1.4	1.9
85–89	−0.2	0.7	0.8	1.1
90–94	−0.4	1.0	1.2	1.6
95–100	+0.0	0.0	0.0	0.0

Figure 8 ($2.50/day line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size n	Difference between estimate and true value			
		Confidence interval (±percentage points)		
	Diff.	90-percent	95-percent	99-percent
1	−0.8	71.9	82.8	94.1
4	−1.1	34.7	41.6	55.2
8	−0.0	24.1	27.7	38.6
16	−0.4	17.9	21.2	28.4
32	−0.5	12.2	14.7	18.2
64	−0.5	8.9	10.7	13.8
128	−0.7	6.1	7.1	9.1
256	−0.8	4.2	5.0	6.5
512	−0.8	2.9	3.4	4.7
1,024	−0.9	2.1	2.5	3.3
2,048	−0.9	1.5	1.8	2.4
4,096	−0.9	1.1	1.3	1.7
8,192	−0.9	0.7	0.9	1.2
16,384	−0.9	0.6	0.7	0.9

Figure 11 ($2.50/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	3.4	50.0	0.0	46.6	50.0	−87.1
≤9	6.3	47.2	0.1	46.5	52.8	−76.4
≤14	10.3	43.1	0.2	46.4	56.7	−61.1
≤19	15.5	37.9	0.5	46.1	61.6	−41.0
≤24	21.0	32.4	0.9	45.7	66.7	−19.6
≤29	28.1	25.3	2.2	44.3	72.4	+9.3
≤34	33.8	19.6	3.5	43.1	76.9	+33.1
≤39	39.6	13.8	6.6	40.0	79.6	+60.5
≤44	43.9	9.5	9.9	36.7	80.5	+81.4
≤49	47.0	6.4	14.7	31.8	78.9	+72.4
≤54	49.4	4.1	18.5	28.0	77.4	+65.3
≤59	51.0	2.4	23.6	23.0	74.0	+55.8
≤64	52.2	1.3	27.8	18.8	70.9	+47.9
≤69	52.8	0.6	31.4	15.1	68.0	+41.2
≤74	53.1	0.3	35.6	10.9	64.1	+33.3
≤79	53.3	0.2	38.9	7.7	61.0	+27.2
≤84	53.4	0.1	41.4	5.2	58.5	+22.5
≤89	53.4	0.0	44.4	2.2	55.6	+17.0
≤94	53.4	0.0	46.0	0.5	54.0	+13.8
≤100	53.4	0.0	46.6	0.0	53.4	+12.8

Inclusion, undercoverage, leakage, and exclusion normalized to sum to 100.

Figure 12 ($2.50/day line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	3.4	100.0	6.4	Only poor targeted
≤9	6.4	98.6	11.7	68.7:1
≤14	10.5	98.2	19.3	54.5:1
≤19	16.0	97.1	29.1	33.5:1
≤24	21.9	96.0	39.4	23.8:1
≤29	30.3	92.6	52.6	12.6:1
≤34	37.3	90.6	63.3	9.7:1
≤39	46.2	85.8	74.1	6.0:1
≤44	53.8	81.6	82.1	4.4:1
≤49	61.8	76.1	88.1	3.2:1
≤54	67.9	72.7	92.4	2.7:1
≤59	74.6	68.4	95.5	2.2:1
≤64	80.0	65.2	97.6	1.9:1
≤69	84.3	62.7	98.9	1.7:1
≤74	88.8	59.9	99.5	1.5:1
≤79	92.1	57.8	99.7	1.4:1
≤84	94.8	56.3	99.9	1.3:1
≤89	97.8	54.6	99.9	1.2:1
≤94	99.5	53.7	100.0	1.2:1
≤100	100.0	53.4	100.0	1.1:1