

Simple Poverty Scorecard[®] Poverty-Assessment Tool Côte d'Ivoire

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1 July 2013

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Abstract

The Simple Poverty Scorecard poverty-assessment tool uses 10 low-cost indicators from Côte d'Ivoire's 2008 Household Living Standards 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 Côte d'Ivoire to measure poverty rates, to track changes in poverty rates over time, and to segment clients for differentiated treatment.

Acknowledgements

This work was funded by the International Finance Corporation (IFC) and was managed by Alexis Geaneotes of IFC's Inclusive Business Models Department. Data are from Côte d'Ivoire's *Institut National de la Statistique*. Thanks go to El Allassane Baguia, Rose Mungai, and Jean Paul Sossou. Matt Walsh of the Grameen Foundation helped with the user review. "Simple Poverty Scorecard" is a Registered Trademark of Microfinance Risk Management, L.L.C. for its brand of poverty-assessment tools. Copyright © 2017 Microfinance Risk Management.

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Simple Poverty Scorecard® Poverty-Assessment Tool

Interview ID: _____	<u>Name</u>	<u>Identifier</u>
Interview date: _____	Participant: _____	_____
Country: <u>CIV</u>	Field agent: _____	_____
Scorecard: <u>001</u>	Service point: _____	_____
Sampling wgt.: _____	Number of household members: _____	

Indicator	Response	Points	Score
1. How many members does the household have?	A. Nine or more	0	
	B. Seven or eight	8	
	C. Five or six	12	
	D. Four	20	
	E. Three	25	
	F. One or two	36	
2. Are all household members ages 7 to 11 attending school this year?	A. No	0	
	B. Yes	4	
	C. No one ages 7 to 11	4	
3. Can the male head/spouse read and write in French, Arabic, or a local language?	A. No male head/spouse	0	
	B. No	1	
	C. Yes	4	
4. What is the main material of the floors?	A. Earth/sand, or wood/planks	0	
	B. Cement	2	
	C. Tile, or other	9	
5. What is the source of water for the household?	A. Public standpipe, or other	0	
	B. Surface water, or HVA (improved village pump)	1	
	C. Well	2	
	D. Shared tap	4	
	E. Private tap	6	
	F. Water vendor	7	
6. What type of toilet arrangement does the household have?	A. None	0	
	B. Pit latrine, or flush	2	
7. Among the main cooking fuels that the household uses, which is the best/preferred/most-convenient type?	A. Does not cook	0	
	B. Collected firewood	3	
	C. Purchased firewood, petroleum, paraffin, kerosene, charcoal, electricity, or other	6	
	D. LPG	12	
8. How many fans does the household have in good working order?	A. None	0	
	B. One	4	
	C. Two or more	9	
9. Does the household have a radio, television, VCR/DVD player, or satellite dish in good working order?	A. None	0	
	B. Only radio and/or television (without VCR/DVD and without satellite dish)	3	
	C. VCR/DVD and/or satellite dish (regardless of radio or television)	7	
10. How many cellular telephones does the household have in good working order?	A. None	0	
	B. One	6	
	C. Two or more	10	

Back-page Worksheet:
Household Members, Age, and School Attendance

Write down the name, identification number, and service point of the client and of yourself as the enumerator, as well as the service point that the client uses. Record the date of the interview and the date when the client first participated with the organization. Then read to the respondent: *Please tell me the first name and the age of each member of your household. A household is a group of people—regardless of their relationship—who, for at least three of the past 12 months, has slept in the same residence and has usually shared meals. For each member, please also tell me whether he/she is attending school this year.*

Write down the first name and the age of each household member. Then write the total number of members in the scorecard header next to “# Household members:” and circle the response to the first indicator. Then count the members ages 7 to 11 who do not attend school, count the members ages 7 to 11 who do attend school, and record the response to the second indicator.

Please keep in mind the full definition of *household* found in the “Guidelines for the Interpretation of Scorecard Indicators”.

First name	Age	If <name> is 7- to 11-years old, is he/she attending school this year?		
1.		Not 7 to 11	No	Yes
2.		Not 7 to 11	No	Yes
3.		Not 7 to 11	No	Yes
4.		Not 7 to 11	No	Yes
5.		Not 7 to 11	No	Yes
6.		Not 7 to 11	No	Yes
7.		Not 7 to 11	No	Yes
8.		Not 7 to 11	No	Yes
9.		Not 7 to 11	No	Yes
10.		Not 7 to 11	No	Yes
11.		Not 7 to 11	No	Yes
12.		Not 7 to 11	No	Yes
13.		Not 7 to 11	No	Yes
14.		Not 7 to 11	No	Yes
15.		Not 7 to 11	No	Yes
16.		Not 7 to 11	No	Yes
Number of members:	—	Number “No”:		
		Number “Yes”:		

Look-up table to convert scores to poverty likelihoods

Score	Poverty likelihood (%)									
	National			USAID	Intl. 2005 PPP				Intl. 2011 PPP	
	100%	150%	200%	'Extreme'	\$1.25	\$2.00	\$2.50	\$8.00	\$1.90	\$3.10
0–4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
5–9	92.7	98.0	100.0	68.4	81.7	96.7	98.0	100.0	77.6	95.8
10–14	87.6	97.0	99.5	53.1	71.5	93.9	97.2	100.0	66.4	91.3
15–19	79.6	93.6	98.2	49.7	66.1	89.0	94.9	100.0	60.8	85.1
20–24	77.7	92.1	97.2	42.0	58.3	87.1	93.6	99.9	51.5	84.9
25–29	75.8	90.7	96.3	37.5	56.5	85.6	92.0	99.9	47.0	83.5
30–34	58.0	84.1	94.0	26.3	40.1	72.9	86.6	99.9	33.0	68.5
35–39	50.7	80.0	92.1	20.9	33.2	68.4	81.6	99.9	27.8	64.2
40–44	42.3	70.8	85.5	16.7	27.1	59.4	74.1	99.6	21.4	56.1
45–49	28.9	58.9	76.1	10.1	18.1	44.8	61.8	98.7	14.8	40.0
50–54	18.3	49.0	69.1	3.7	8.2	33.7	53.7	96.9	6.4	29.5
55–59	12.0	34.7	52.9	2.0	5.0	22.3	37.2	95.3	3.5	19.2
60–64	4.4	22.4	43.6	1.0	2.2	11.8	25.1	91.9	1.1	10.5
65–69	2.9	13.9	32.6	0.5	1.2	8.1	16.7	87.2	0.7	7.3
70–74	1.0	10.6	22.2	0.1	0.1	4.3	12.2	83.3	0.1	4.2
75–79	0.3	6.5	17.3	0.0	0.0	2.5	6.5	73.7	0.0	2.5
80–84	0.0	0.5	5.7	0.0	0.0	0.0	2.1	56.2	0.0	0.0
85–89	0.0	0.0	3.5	0.0	0.0	0.0	0.9	37.7	0.0	0.0
90–94	0.0	0.0	0.6	0.0	0.0	0.0	0.0	17.1	0.0	0.0
95–100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.8	0.0	0.0

Simple Poverty Scorecard[®] Poverty-Assessment Tool Côte d'Ivoire

1. Introduction

This paper presents the Simple Poverty Scorecard poverty-assessment tool. Pro-poor programs in Côte d'Ivoire can use it 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, Côte d'Ivoire's 2008 *Enquête sur le Niveau de Vie des Ménages* (ENV, Household Living Standards Survey) runs 50 pages. Enumerators interview at a rate of about two households per day, and—in addition to asking hundreds of non-consumption items—ask about 190 consumption items, one of which is, for example:

In the past three months, did the household eat any whole-grain millet? If yes, how much did it eat per day? Who paid for the whole-grain millet? In the past seven days, how much did the household spend on whole-grain millet? In the past month, how much did it spend? Out of the past 12 months, in how many months did the household buy whole-grain millet?

Did it eat any whole-grain millet that it received as a gift or as food aid? How many days per month did the household receive it? Out of the past 12 months, in how many months did the household receive it? How much of this gifted whole-grain millet did the household eat on average per day? If the household had bought this amount of whole-grain millet, how much would it have cost? Has the household eaten any whole-grain millet from its own harvest? How many days per month did the household eat it? How many months out of the past 12 did the household eat it? How much of the home-grown whole-grain millet did the household eat on average per day? How much would that home-grown whole-grain millet cost, if the household had bought it? Now then, in the past three months, did the household consume any millet flour? . . .”

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 floors?” and “Among the main cooking fuels that the household uses, which is the best/preferred/most-convenient type?”) to get a score that is highly correlated with poverty status as measured by the exhaustive ENV 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) or the International Finance Corporation’s \$8.00/day 2005 PPP standard for defining the *base of the pyramid*.²

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

² For market-driven investments, IFC defines the *base of the pyramid* as households who have consumption below \$8.00/day or who lack of access to basic socio-economic

USAID microenterprise partners in Côte d’Ivoire can use scoring with the \$1.25/day line to report how many of their participants are very poor.³ 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.

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

services such as shelter, utilities, water, and sanitation. For convenience, however, the rest of this document refers to \$8.00/day as a *poverty line*.

³ USAID defines a household as *very poor* if its daily per-capita consumption is less than the highest of the \$1.25/day line (XOF454 in average prices for the poorest decile of people in Abidjan from June to August 2008, Figure 1) or the USAID “extreme” line that divides people in households below the national line into two equal-size groups (XOF383).

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 2008 ENV from Côte d'Ivoire's Institut National de la Statistique. 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 Côte d'Ivoire

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-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 Côte d'Ivoire's national poverty line. Scores from this one scorecard are calibrated to poverty likelihoods for eight poverty lines.

The scorecard is constructed and calibrated using half of the data from the 2008 ENV. 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 specific 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 2008.⁴

⁴ Important examples include nationally representative samples at a later point in time or sub-groups that are not nationally representative (Tarozzi and Deaton, 2007).

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.

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 +0.6 percentage points. The average difference across all eight poverty lines is +0.7 percentage points, and the maximum absolute difference for any poverty line is 1.1 percentage points. These differences are due to sampling variation, not bias; the average difference would be zero if the whole 2008 ENV 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 ± 2.1 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 other poverty-assessment tools for Côte d'Ivoire. 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 12,600 households in the 2008 ENV. This is Côte d'Ivoire's most recent national consumption survey.

For the purposes of the scorecard, the households in the 2008 ENV 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 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-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 $\frac{1 \cdot 1 + 1 \cdot 0}{1 + 1} = \frac{1}{2} = 0.5 = 50$ percent. In the “1 · 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 · 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 of poverty statuses for households with participants, or $\frac{3 \cdot 1 + 4 \cdot 0}{3 + 4} = \frac{3}{7} = 0.43 = 43$ percent. In the “3 · 1” term in the numerator, the “3” is the first household’s weight because it has three members, and the “1” is its poverty status (poor). In the “4 · 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 · 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 · 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 eight poverty lines at the levels of households and people for Côte d’Ivoire as a whole in 2008 and for the construction and validation samples. (Figure 2 is similar, but reports at the level of each of Côte d’Ivoire’s 19

regions.) 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

For Côte d’Ivoire overall, the national poverty line (sometimes called here “100% of the national line”) is XOF578 per person per day (Figure 1). This implies country-level poverty rates of 37.1 percent (households) and 48.9 percent (people). This person-level rate matches that reported in International Monetary Fund (2009).

According to International Monetary Fund (2009), Côte d’Ivoire’s national poverty line was first defined as the highest value in the first decile of consumption observed for people in the 1985 *Enquête Permanente Auprès des Ménages* (Permanent Household Survey). For use with the 2008 ENV, this line is adjusted for price changes over time and also for price differences across geographic regions,⁵ with the base being average prices in Abidjan from June to August 2008.

⁵ It is not clear precisely how these geographic regions are defined.

The scorecard is constructed using the national poverty line. Because local, pro-poor programs in Côte d'Ivoire may want to use different or various poverty lines, this paper calibrates scores from its single scorecard to poverty likelihoods for eight 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
- \$8.00/day 2005 PPP

The USAID “extreme” line is defined as the median per-capita consumption of people (not households) in a given stratum of the 2008 ENV who are below 100% of the national line (United States Congress, 2004).

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

- 2005 PPP exchange rate of XOF325.81 per \$1.00 (World Bank, 2008)
- Consumer Price Index for Côte d'Ivoire:⁶
 - Average in 2005: 90.090
 - Average from June to August 2008 (during ENV fieldwork): 100.520
- Average all-Côte d'Ivoire national line (Figure 1): XOF578
- National line for each household as it appears in the data from Côte d'Ivoire's Institut National de la Statistique

⁶ edenpub.bceaoint/, retrieved 28 June 2013.

Using the formula from Sillers (2006), the all-Côte d’Ivoire \$1.25/day 2005 PPP line is:

$$\begin{aligned} & (2005 \text{ PPP exchange rate}) \cdot \$1.25 \cdot \left(\frac{\text{CPI}_{\text{June to Aug. 2008}}}{\text{CPI}_{2005}} \right) = \\ & \left(\frac{\text{XOF}325.81}{\$1.00} \right) \cdot \$1.25 \cdot \left(\frac{100.520}{90.090} \right) = \text{XOF}454. \end{aligned}$$

This line applies to Côte d’Ivoire on average. Each household’s \$1.25/day line is found by multiplying the all-Côte d’Ivoire \$1.25/day line by the household’s particular national line and then dividing it by Côte d’Ivoire’s average national line.⁷

USAID microenterprise partners in Côte d’Ivoire 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 (XOF454, Figure 1)
- USAID “extreme” line (XOF382).

⁷ For the 2008 ENV, the World Bank’s PovCalNet (iresearch.worldbank.org/PovcalNet/index.htm, retrieved 26 June 2013) uses the same \$1.25/day line (adjusted to prices from June to August 2008) as here. PovCalNet’s person-level poverty rate by this line (23.8 percent), however, is not close to the one here (35.2 percent, Figure 1). It seems PovCalNet may not have accounted for price changes between 2005 and the 2008 ENV, and perhaps also misapplied regional price deflators.

3. Scorecard construction

For Côte d'Ivoire, about 130 candidate indicators are initially prepared in the areas of:

- Household composition (such as number of members)
- Education (such as literacy)
- Housing (such as the type of floor)
- Ownership of durable assets (such as fans or cellular telephones)
- Employment (such as the number of household members who work)
- 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 number cellular telephones owned 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 based on “c” and judgment about how to balance the non-statistical criteria. These steps are repeated until the scorecard has 10 indicators that work together well.

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 statistical⁸ and non-statistical criteria. The non-statistical criteria can improve

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.

robustness through time and help ensure that indicators are simple, sensible, and acceptable to users.

The single scorecard here applies to all of Côte d'Ivoire. 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, Côte d'Ivoire'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 Côte d'Ivoire's paper scorecard would:

- Record the names and identifiers of the participant, the field worker, and 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, and school attendance
- Record household size in the scorecard header, and record the responses to the scorecard's first and second indicators based on the back-page worksheet
- Read each of the remaining eight 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 (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

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 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 Côte d’Ivoire’s Institut National de la Statistique did when it fielded the 2008 ENV.

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] 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 Côte d’Ivoire, if they use the scorecard for targeting.

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 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

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 Côte d'Ivoire, 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 35–39 have a poverty likelihood of 50.7 percent, and scores of 40–44 have a poverty likelihood of 42.3 percent (Figure 4).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 35–39 are associated with a poverty likelihood of 50.7 percent for the national line but of 33.2 percent for the \$1.25/day 2005 PPP line.¹¹

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

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-capita consumption below a given poverty line.

For the example of the national line (Figure 5), there are 8,430 (normalized) households in the calibration sub-sample with a score of 35–39. Of these, 4,272 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 35–39 is then 50.7 percent, because $4,272 \div 8,430 = 50.7$ percent.

To illustrate with the national line and a score of 40–44, there are 8,475 (normalized) households in the calibration sample, of whom 3,583 (normalized) are below the line (Figure 5). The poverty likelihood for this score range is then $3,583 \div 8,475 = 42.3$ percent.

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

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

¹² To ensure that poverty likelihoods never increase 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.

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 Côte d’Ivoire scorecard are transformed coefficients from a Logit regression, (untransformed) scores are not converted to poverty likelihoods via the Logit formula of $2.718281828^{\text{score}} \times (1 + 2.718281828^{\text{score}})^{-1}$. 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 Côte d'Ivoire's population. Thus, the scorecard will generally be biased when applied after August 2008 (the last month of fieldwork for the 2008 ENV) or when applied with sub-groups that are not nationally representative.

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 Côte d'Ivoire 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 new 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

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

- 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 35–39 in the validation sample is too high by 0.6 percentage points. For scores of 30–34, the estimate is too low by 0.2 percentage points.¹⁴

The 90-percent confidence interval for the differences for scores of 35–39 is ± 2.4 percentage points (national line, Figure 7). This means that in 900 of 1,000 bootstraps, the difference between the estimate and the true value is between -1.8 and $+3.0$ percentage points (because $+0.6 - 2.4 = -1.8$, and $+0.6 + 2.4 = +3.0$). In 950 of 1,000 bootstraps (95 percent), the difference is $+0.6 \pm 2.8$ percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is $+0.6 \pm 3.7$ percentage points.

Figure 7 shows some differences—usually small—between estimated poverty likelihoods and true values. There are differences because the validation sample is a single sample that—thanks to sampling variation—differs in distribution from the construction/calibration sub-samples and from Côte d’Ivoire’s population. For targeting, however, what matters is less the difference in all score ranges and more the

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.

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 ENV fieldwork in August 2008. That is, it may fit the data from the 2008 ENV 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 2008 ENV but not in the overall population of Côte d'Ivoire. 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 77.7, 58.0, and 42.3 percent (national line, Figure 4). The group's estimated poverty rate is the households' average poverty likelihood of $(77.7 + 58.0 + 42.3) \div 3 = 59.3$ 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 58.0 percent. This differs from the 59.3 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 Côte d'Ivoire 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 1.1 percentage points (Figure 9, summarizing Figure 8 across all eight poverty lines). The average difference across poverty lines is +0.7 percentage points. At least part of these differences is due to sampling variation in the division of the 2008 ENV 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 Côte d'Ivoire scorecard and the national line, bias is +0.6 percentage points, so the unbiased estimate in the three-household example above is $59.3 - (+0.6) = 58.7$ 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 Côte d'Ivoire scorecard and the national line is 59.3 percent. Then estimates in 90 percent of such samples would be expected to fall in the range of $59.3 - (+0.6) - 0.6 = 58.1$ percent to $59.3 - (+0.6) + 0.6 = 59.3$ percent, with the most likely true value being the unbiased estimate in the middle of this range ($59.3 - (+0.6) = 58.7$

percent). This is because the original (biased) estimate is 59.3 percent, bias is +0.6 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-assessment 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, $\sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \phi$,

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

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

N is the population size, and

n is the sample size.

For example, Côte d’Ivoire’s 2008 ENV gives a direct-measurement estimate of the household-level poverty rate for the national line of $\hat{p} = 37.1$ percent (Figure 1). If

this estimate came from a sample of $n = 16,384$ households from a population N of 4,300,000 (a rough estimate of the number of households in Côte d'Ivoire in 2008), then

the finite population correction ϕ is $\sqrt{\frac{4,300,000 - 16,384}{4,300,000 - 1}} = 0.9981$, 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 $\pm z \cdot \sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}} = \pm 1.64 \cdot \sqrt{\frac{0.371 \cdot (1 - 0.371)}{16,384}} \cdot 1 = \pm 0.619$

percentage points.

The scorecard, however, does not measure poverty directly, so this formula is not applicable. To derive a formula for the Côte d'Ivoire 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 ± 0.570 percentage points.¹⁵

Thus, the 90-percent confidence interval with $n = 16,384$ is ± 0.570 percentage points for the Côte d'Ivoire scorecard and ± 0.619 percentage points for direct measurement. The ratio of the two intervals is $0.570 \div 0.619 = 0.92$.

¹⁵ Due to rounding, Figure 8 displays 0.6, not 0.570.

Now consider the same exercise, but with $n = 8,192$. The confidence interval under direct measurement and the national line is $\pm 1.64 \cdot \sqrt{\frac{0.371 \cdot (1 - 0.371)}{8,192}} \cdot 1 = \pm 0.875$ percentage points. The empirical confidence interval with the Côte d'Ivoire scorecard (Figure 8) is ± 0.760 percentage points. Thus for $n = 8,192$, the ratio of the two intervals is $0.760 \div 0.875 = 0.87$.

This ratio of 0.87 for $n = 8,192$ is not too far from the ratio of 0.92 for $n = 16,384$. Across all sample sizes of 256 or more in Figure 8, the average ratio turns out to be 0.87, implying that confidence intervals for indirect estimates of poverty rates via the Côte d'Ivoire scorecard and the national poverty line are—for a given sample size—about 13-percent narrower than confidence intervals for direct estimates via the 2008 ENV. This 0.87 appears in Figure 9 as the “ α factor” because if $\alpha = 0.87$, then the formula for confidence intervals c for the Côte d'Ivoire 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

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

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 seven of the eight 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

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

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),

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

To illustrate how to use this, suppose the population N is 4,300,000 (a rough estimate of the number of households in Côte d’Ivoire in 2008), suppose $c = 0.04500$, $z = 1.64$ (90-percent confidence), and the relevant poverty line is the national line so that the most sensible expected poverty rate \tilde{p} is Côte d’Ivoire’s overall poverty rate for that line in 2008 (37.1 percent at the household level, Figure 1). The α factor is 0.87 (Figure 9). Then the sample-size formula gives

$$n = 4,300,000 \cdot \left(\frac{1.64^2 \cdot 0.87^2 \cdot 0.371 \cdot (1 - 0.371)}{1.64^2 \cdot 0.87^2 \cdot 0.371 \cdot (1 - 0.371) + 0.04500^2 \cdot (4,300,000 - 1)} \right) = 235, \text{ which}$$

is not 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

$$\text{answer, as } n = \left(\frac{0.87 \cdot 1.64}{0.04500} \right)^2 \cdot 0.371 \cdot (1 - 0.371) = 235.^{16}$$

¹⁶ Although USAID has not specified required 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 Côte d’Ivoire should report using the \$1.25/day 2005 PPP line. Given the α factor of 0.89 for this line (Figure 9), an expected before-measurement household-level poverty rate of 37.1 percent (the all-Côte d’Ivoire

Of course, the α factors in Figure 9 are specific to Côte d'Ivoire, 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 ENV in August 2008, 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 \tilde{p} (perhaps based on a previous measurement such as the household-level poverty rate for the national line for Côte d'Ivoire of 37.1 percent in the 2008 ENV in Figure 1), look up α (here, 0.87 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

$$\text{illustration, } n = 10,000 \cdot \left(\frac{1.64^2 \cdot 0.87^2 \cdot 0.371 \cdot (1 - 0.371)}{1.64^2 \cdot 0.87^2 \cdot 0.371 \cdot (1 - 0.371) + 0.02^2 \cdot (10,000 - 1)} \right) = 1,062.$$

rate for 2008, Figure 1), and a confidence level of 90 percent, then $n = 300$ implies a confidence interval of $\pm 1.64 \cdot 0.89 \cdot \sqrt{\frac{0.371 \cdot (1 - 0.371)}{300}} = \pm 4.1$ 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 August 2008 will resemble that in the 2008 ENV 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 2008 ENV, this paper cannot test estimates of change over time for Côte d'Ivoire, 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 77.7, 58.0, and 42.3 percent (national line, Figure 4). Adjusting for the known bias of +0.6 percentage points (Figure 9), the group's baseline estimated poverty rate is the households' average poverty likelihood of $[(77.7 + 58.0 + 42.3) \div 3] - (+0.6) = 58.7$ 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 75.8, 50.7, and 28.9 percent, national line, Figure 4). Adjusting for known bias, the average poverty likelihood at follow-up is $[(75.8 + 50.7 + 28.9) \div 3] - (+0.6) = 51.2$ percent, an improvement of $58.7 - 51.2 = 7.5$ percentage points.¹⁸

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 13 participants in this hypothetical example cross the poverty line in 2013/5.¹⁹ Among those who start below the line, about one in eight ($7.5 \div 58.7 = 12.8$ percent) on net end up above the line.²⁰

7.3 Accuracy for estimated change in two independent samples

With only the 2008 ENV, 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 Côte d'Ivoire 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 poverty-assessment tool's estimate of the change in poverty rates over time:

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

¹⁹ This is a net figure; some people start above the line and end below it, and vice versa.

²⁰ The scorecard does not reveal the reasons for this change.

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 the ratio of the observed confidence interval from a poverty-assessment tool 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 \bar{p} is based on previous measurements and is assumed equal at both baseline and follow-up:

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

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

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 Côte d’Ivoire.

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

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.

percentage points ($\pm c = \pm 0.02$), the poverty line is the national line, $\alpha = 1.15$, $\hat{p} = 0.371$ (the household-level poverty rate in 2008 for the national line in Figure 1), and the population N is large enough relative to the expected sample size n that the finite population correction ϕ can be taken as one. Then the baseline sample size is

$n = 2 \cdot \left(\frac{1.15 \cdot 1.64}{0.02} \right)^2 \cdot 0.371 \cdot (1 - 0.371) \cdot 1 = 4,151$, and the follow-up sample size is also 4,151.

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

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

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:

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

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

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

Given this, a sample-size formula for a group of households to whom the Côte d'Ivoire scorecard is applied twice (once after August 2008 and then again later) is

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

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 ($\pm c = \pm 0.02$), 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_{2008} is taken as 37.1 percent (Figure 1), and α is assumed to be 1.30. Then the baseline sample size is

$$n = 2 \cdot \left(\frac{1.30 \cdot 1.64}{0.02} \right)^2 \cdot \left\{ -0.02 + 0.016 \cdot 3 + 0.47 \cdot [0.371 \cdot (1 - 0.371)] \right\} \cdot 1 = 3,130. \text{ The same}$$

group of 3,130 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 Côte d’Ivoire. For an example cut-off of 35–39, outcomes for the national line in the validation sample are:

- Inclusion: 26.8 percent are below the line and correctly targeted
- Undercoverage: 10.4 percent are below the line and mistakenly not targeted
- Leakage: 12.4 percent are above the line and mistakenly targeted
- Exclusion: 50.4 percent are above the line and correctly not targeted

Increasing the cut-off to 40–44 improves inclusion and undercoverage but worsens leakage and exclusion:

- Inclusion: 30.3 percent are below the line and correctly targeted
- Undercoverage: 6.8 percent are below the line and mistakenly not targeted
- Leakage: 17.4 percent are above the line and mistakenly targeted
- Exclusion: 45.4 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 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:

$$\begin{array}{rclcl}
 \text{Total Accuracy} = & 1 & \times & \text{Households correctly included} & - \\
 & 0 & \times & \text{Households mistakenly undercovered} & - \\
 & 0 & \times & \text{Households mistakenly leaked} & + \\
 & 1 & \times & \text{Households correctly excluded.} &
 \end{array}$$

Figure 11 shows “Total Accuracy” for all cut-offs for the Côte d’Ivoire scorecard. For the national line in the validation sample, total net benefit is greatest (77.2) for a cut-off of 39 or less, with more than three in four households in Côte d’Ivoire 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 valued inclusion more (say, twice as much) than exclusion, it could reflect this by setting the benefit for

inclusion to 2 and the benefit for exclusion to 1. Then the chosen cut-off would maximize $(2 \times \text{Households correctly included}) + (1 \times \text{Households correctly excluded})$.²³

As an alternative to assigning benefits and costs to targeting outcomes and then choosing a cut-off to maximize total net benefit, 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 Côte d’Ivoire 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 39 or less would target 39.2 percent of all households (second column) and produce a poverty rate among those targeted of 68.3 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 39 or less, 72.1 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 39 or less, covering 2.2 poor households means leaking to 1 non-poor household.

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. $BPAC = (\text{Inclusion} - |\text{Undercoverage} - \text{Leakage}|) \times [100 \div (\text{Inclusion} + \text{Undercoverage})]$.

9. Context of poverty-assessment tools in Côte d’Ivoire

This section discusses four existing poverty-assessment tools for Côte d’Ivoire 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
- 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 Côte d’Ivoire 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 5,935 households in Côte d’Ivoire’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

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

examples of the PCA asset-index approach include Stifel and Christiaensen (2007), Zeller *et al.* (2006), Filmer and Pritchett (2001), and Sahn and Stifel (2000 and 2003).

The 13 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
 - Source of drinking water
 - Type of toilet arrangement
 - Number of people per sleeping room
- Whether the household has a domestic worker not related to the head
- Ownership of consumer durables:
 - Radios
 - Televisions
 - Refrigerators
 - Bicycles
 - Motorcycles
 - Cars
- 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 the quintile of their index 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.

Still, the Gwatkin *et al.* index is more difficult and costly than the scorecard.

While the scorecard here requires adding up 10 integers, some of which are usually zero,

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

Gwatkin *et al.*'s asset index requires adding up 64 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 can estimate 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 an 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 the asset-based view 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 (2003)

Like Gwatkin *et al.* and like this paper, Sahn and Stifel (2003) seek a low-cost, practical way to measure poverty. They build an asset index using factor analysis (a sister of PCA) with the 1,600 households in Côte d’Ivoire’s 1987/8 Living Standards Survey (CILSS). They seek “to see if there exist simpler and less demanding alternatives to collecting data on expenditure for purposes of measuring economic welfare and ranking households” (p. 484). Their motivation is similar to that of the scorecard here: they want tools that are affordable and feasible given constraints on budgets and non-specialists’ technical resources, and they want to make comparisons over time and across countries without the complications and assumptions required for direct measurement via consumption surveys. Like this paper, they also seek a tool for targeting.

Sahn and Stifel's nine indicators are simple, inexpensive, and verifiable:

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

To check coherency between the asset index and reported consumption in the 1987/8 CILSS²⁵ and between the asset index and child nutrition, Sahn and Stifel rank households in Côte d'Ivoire based on the index, on consumption, and on height-for-age. For each pair, they judge the coherence of the two rankings by the distance between a given household's decile ranks. They conclude that the asset index predicts long-term nutritional status no worse than does current consumption, and that the index does so more simply and inexpensively. They also report that the asset index predicts consumption worse than does a poverty-assessment tool (that is, a least-squares regression that predicts consumption based on household demographics, education, residence quality, and access to public services). Finally, they find that measurement error is worse for consumption than for their index.

²⁵ Sahn and Stifel check the index against consumption because it is a common proxy for living standards, not because they believe consumption should be the benchmark.

Sahn and Stifel report only *in-sample* tests; that is, they check accuracy with the same data that is used to construct the index in the first place. In-sample tests overstate accuracy. In contrast, this paper reports only *out-of-sample* tests with data that is not used to construct the scorecard. This is the most stringent—and most appropriate—way to test accuracy.

Sahn and Stifel do not report measures that would allow a comparison of the ranking ability—with consumption as the benchmark—of their asset index versus the scorecard.

9.3 Morris *et al.*

Morris *et al.* (2000) seek low-cost indicators to add to health surveys and then to add to epidemiological regressions as control variables for socio-economic position. They use data on 910 rural households from Côte d'Ivoire's 1986/7 CILSS to build a poverty-assessment tool, choosing as indicators the 10 individual consumption items that maximize the correlation between the sum of the logarithm of each of the 10 items (Morris *et al.*'s index) and the logarithm of total consumption. In out-of-sample, out-of-time²⁶ tests with 856 rural households from the 1988/9 CILSS, the correlation between their index and the logarithm of total consumption is 0.72, leading Morris *et al.* (p. 381)

²⁶ *Out-of-time* tests apply the scorecard to data collected after the data that was used to construct the scorecard, providing a more realistically stringent measure of accuracy.

to conclude that “it is feasible to approximate . . . household consumption in rural African settings without dramatically lengthening questionnaires.”

Morris *et al.*'s 10 consumption items are:

- School costs (not including books, notebooks, etc.)
- Books, notebooks, etc. for school
- Expenses related to home repairs, home painting, home insurance, etc.
- Purchases of cars, bicycles, or other means of transport
- Repairs and other expenses for vehicles
- Public transport and taxis
- Purchases of domestic and imported cloth
- Modern and traditional medicine
- Funerals
- Loan installments

The scorecard here differs from the tool of Morris *et al.* in that it is based on newer data, it applies to all of Côte d'Ivoire rather than only to rural areas, and uses simpler, less-costly indicators. While it is simpler to collect 10 consumption indicators than to collect hundreds of consumption indicators, it is even simpler still to collect 10 non-consumption indicators.

Which tool is more accurate? For the scorecard with the validation sample from the 2008 ENV for Côte d'Ivoire as a whole, the logarithm of per-capita consumption has a correlation of 0.74 with the score and 0.70 with the poverty likelihood (national line). In rural areas, both correlations are 0.62. Thus, while Morris *et al.* is more costly, it is also a better proxy for consumption in rural areas.

9.4 Glewwe

Glewwe (1992) applies non-linear mathematical programming to data from Côte d’Ivoire’s 1985/6 CILSS to derive point values²⁷ for two poverty-assessment tools (urban and rural) that give the level of cash transfers for a given household that—for a fixed budget—provides the biggest improvement in a set of welfare functions strongly focused on the poorest. Accuracy is tested out-of-sample and out-of-time on the 1986/7 CILSS.

The paper’s purpose is mostly methodological; it is applied to Côte d’Ivoire “primarily because of data availability” (p. 305). Glewwe points out that a drawback of the approach is the high cost of its complex algorithm. The paper’s last sentence (p. 320) also nods toward the likely difficulty of implementation (“Even if another method is found which is more practical than the method presented here, . . .”).

Nevertheless, Glewwe is more conscious of practical considerations than the paper’s mathematics and self-effacing tone let on. For example, it notes that:

- Households may change their behavior to qualify for targeted transfers
- It may be difficult to keep the targeting formula secret
- Transfers must be funded by taxes
- Administrative issues and costs matter when collecting indicators for targeting

²⁷ Glewwe (1992) pre-selects indicators, probably based on regression-based scorecards.

What is more, the tools' indicators and points are reported, so a local pro-poor organization in Côte d'Ivoire could use them. The main obstacle is the many decimal places, negative signs, logarithms, and exponents in the point values. The 15 indicators across the urban and rural tools are:

- Demographics: Ethnic group
- Characteristics of the residence:
 - Region
 - Distance in kilometers by air from Abidjan (and its square)
 - Type of dwelling
 - Type of wall
 - Type of toilet arrangement
 - Source of drinking water
 - Logarithm of the floor area (in square meters)
- Education of the head of the household
- Employment: Logarithm of the male agricultural wage rate
- Ownership of consumer durables:
 - Refrigerator
 - Bicycle
 - Car
- Agriculture: Logarithm of hectares of land:
 - Under cultivation, other than cocoa and coffee
 - With mature cocoa trees

10. Conclusion

Pro-poor programs in Côte d'Ivoire 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 Côte d'Ivoire that want to improve how they monitor and manage their social performance.

The scorecard is constructed with half of the data from Côte d'Ivoire's 2008 ENV, calibrated to eight poverty lines, and tested on data from the other half of the ENV. 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 changes 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 1.1 percentage points. The average bias across the eight poverty lines is about +0.7 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 Côte d'Ivoire 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 comes from :

Institut National de la Statistique. (2008) “Enquête Niveau de Vie des Ménages : Manuel de l’Agent”. [the *Manual*]

and

Institut National de la Statistique. (2008) “Enquête Niveau de Vie des Ménages : Questionnaire”, Ministère d’Etat, Ministère du Plan et du Développement, <http://www.socialsecurityextension.org/gimi/gess/RessFileDownload.do;jsessionid=ef64fe85062c756a3e8a4c5e4a247764e00ca0d045091ac6e5e48faf0aa04c93.e3aTbhULbNmSe3uKa40?ressourceId=29126>, retrieved 28 June 2013.

Advice for interviewing

According to p. 7 of the *Manual*, “You should scrupulously observe . . . the instructions in the *Enumerator Manual* [as summarized in this *Guide*]. This is the only source of technical rules to guide you in the completion of the questionnaire.

“The data you collect are strictly confidential and should never be divulged—except to authorized persons—for any reason.”

According to p. 8 of the *Manual*, “as an enumerator, you play a key role in the survey. The quality of your work will determine the quality of the data and thus the quality of the entire survey effort. This is why you should strictly follow all the instructions in this *Manual* [including this one].”

Steps and hints to follow when interviewing (pp. 7–9 of the *Manual*)

- “When you first enter a household, introduce yourself as an enumerator working with [your organization]. Explain that:
 - You are doing a survey to measure . . . the living conditions of households [where clients of your organization lives]
 - The household was selected at random
 - The survey has nothing to do with taxes nor politics
 - All data will be kept strictly confidential
- If necessary, show the household your organizational identification or any other official identification to demonstrate good faith and legitimacy
- To protect the confidentiality of the data, insist that people who are not household members stay out of earshot of the interview, unless, of course, they are serving as interpreters with the permission of the respondent
- Ask each question of the household member who is available and best able to answer. If different household members are better able to answer different questions, then there will be different respondents for different questions
- Read the questions word-for-word, exactly as they are written. If necessary, you can also read the response options to the respondent
- Record the responses in the appropriate places
- Do not interrupt the respondent, even if he/she hesitates or pauses; he/she may need a chance to remember something
- Before recording anything on paper, wait for the respondent to finish speaking
- If a response seems incomplete or does not seem to make sense, then probe to make sure that that the respondent understands the question
- At all times, avoid contradicting the respondent so that he/she does not feel like you doubt the accuracy of his/her responses
- You should never change a response that you have already recorded without first asking the question again of the respondent, even if you believe that you know what the response should be or will be
- At the end of each interview, . . . be sure to check that all questions have responses, that they are correctly recorded, and that everything is legible
- When the interview is complete, warmly thank the respondent for his/her time and kind-hearted collaboration, even if he/she was not in fact very cooperative

According to p. 9 of the *Manual*, you scrupulously follow these rules of behavior when you in the presence of other people in your official role:

- “Always be courteous with everyone (the respondent, other household members, neighbors, etc.). Your behavior has a tremendous influence on the respondent’s opinion about of the legitimacy of the survey and whether it is worthwhile to participate
- Avoid shocking or bothering anyone with any aspect of your behavior
- Dress appropriately so as to show the respondent that you are serious and responsible
- Show up at the time arranged; do not make the respondent wait on you
- Demonstrate patience and professional competence so as not to annoy the respondent or lead him/her to give false or frivolous responses

Respondent

According to p. 16 of the *Manual*, the preferred respondent “is the head of the household. In general, try to interview the household member who is responsible for important decisions. If such a person is not the head and is not available, and if the head is also not available, then the respondent can be any adult with good knowledge of the household and its members.”

According to p. 16 of the *Manual*, “other members of the household may also give responses, additional details, or clarifications, especially when the questions relate to something about which these other members are particularly knowledgeable.”

Guidelines for specific indicators in the scorecard

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

According to p. 18 of the *Manual*, a *household* is defined as “a single person or a group of people, regardless of blood relationship, who, for at least three of the past 12 months, have usually slept under the same roof and shared meals together, and who all recognize the authority of the same person (the *head of the household*).

“Examples of households include:

- A man, his spouse(s), his children, his father, and other people (with whom the man may or may not have a blood relationship) who have—for at least three of the 12 months leading up to the interview—usually slept in the same residence and shared meals together
- A single adult (and no one else)
- A couple, with or without children

“Be sure to record all household members. Keep in mind these rules:

- Lodgers and domestic servants (maids, guards, etc.) should be counted as *household members* if they sleep under the same roof with the household and share meals with them. (Lodgers are people pay the household in return for food and shelter.)
- People who have passed away in the past 12 months are not counted as *household members*, even if they lived with the household for at least three of the past 12 months. In other words, people who are dead on the day of the interview do not count as *household members*
- Newborns younger than three-months-old are still counted as *household members*
- The head of the household is always counted as a *household member*, even if he/she does not currently live in the residence”

According to p. 19 of the *Manual*, “people who have recently arrived in the residence, who share meals there, and who intend to stay for at least three months should be counted as *household members*.”

2. Are all household members ages 7 to 11 attending school this year?
- A. No
 - B. Yes
 - C. No one ages 7 to 11

If no household members are 7- to 11-years-old, then mark response “C”.

If some household members are 7- to 11-years-old, and if one or more of them are not attending school this school year, then mark response “A”.

If some household members are 7- to 11-years-old, and if all are attending school this school year, then mark response “B”.

According to p. 20 of the *Manual*, “record age in completed years. . . . Ask the respondent for the person’s age, and record what he/she says. If the respondent cannot give an answer, then ask the respondent to relate the birth of the person to a historic event. Use the answer to infer age. . . . Age can also be determined from an official document such as a birth certificate, identity card, passport, employment card, or student-identity card.”

For the purposes of the scorecard, determining an exact age is necessary only for household members who may be close to the cut-off for this question (7 and 11 years).

According to p. 26 of the *Manual*, “the educational system includes the entire gamut of schools and colleges/universities that offer children and young adults a step-by-step process by which they may advance from pre-school or grade school through secondary education and beyond, regardless of who administers the institution and regardless of whether the institution is publicly or privately owned. This includes institutions of general learning (grade schools, secondary schools, and post-secondary schools) as well as all technical schools and vocational/professional schools.”

3. Can the male head/spouse read and write in French, Arabic, or a local language?
- A. No male/head/spouse
 - B. No
 - C. Yes

According to p. 27 of the *Manual*, “this question seeks to find out whether a person can read and write a simple phrase.”

According to p. 18 of the *Manual*, the *head of the household* is the person whose authority as head is recognized by the other members of the household.

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

4. What is the main material of the floors?
 - A. Earth/sand, or wood/planks
 - B. Cement
 - C. Tile, or other

According to p. 60 of the *Manual*, “If you can clearly see the flooring material in the residence, then it may not always be necessary to pose this question to the respondent. The following definitions may be useful:

- *Earth*: Dirt such as that which covers the surface of the Earth
- *Wood*: Dense, more-or-less hard material with high tensile strength, made of the trunks, roots, and branches of trees
- *Planks*: Rough-hewn pieces of wood, longer than they are wide, of the type often used in carpentry
- *Cement*: Construction material made by mixing water with various dry ingredients to make a pliant paste that can be shaped before it hardens
- *Tile*: Small ceramic or marble pieces, often in the shape of squares, that can be placed together side-by-side to pave floors
- *Other*: Any type of material not otherwise listed”

According to p. 11 of the *Manual*, “The listed response options are not exhaustive. Thus, the respondent’s answer may not be found in the pre-coded list. In such cases, you should mark the scorecard’s option “C”, corresponding to *other*.”

5. What is the source of water for the household?
 - A. Public standpipe, or other
 - B. Surface water, or HVA (improved village pump)
 - C. Well
 - D. Shared tap
 - E. Private tap
 - F. Water vendor

According to p. 61 of the *Manual*, “The types of sources of water are:

- *Public standpipe*: A pump—also known as a *village pump*—that extracts sub-surface water from wells and boreholes to supply rural areas
- *Other*: Any source of water for human consumption that does not appear elsewhere in this list, including, for example, water trucks and rainwater
- *Surface water*: A body of water such as a lake, creek, stream, or river
- *HVA*: An improved village pump that uses a small electric pump and a borehole to move water to an elevated reservoir (with a capacity of 5 to 20 cubic meters) that then supplies a simple network of taps strategically placed in a rural village
- *Well*: A hole dug in the ground (protected or unprotected) to collect water
- *Shared tap*: A household shares a tap if its account with SODECI is shared with other households, such as may be the case in apartment buildings or for residences built around a common courtyard
- *Private tap*: A household has its own private tap if it has its own, unshared account with SODECI
- *Water vendor*: A water vendor obtains water from a source and then sells it”

According to p. 11 of the *Manual*, “The listed response options are not exhaustive. Thus, the respondent’s answer may not be found in the pre-coded list. In such cases, you should mark the scorecard’s option “A”, corresponding to *other*.”

6. What type of toilet arrangement does the household have?
 - A. None
 - B. Pit latrine, or flush toilet

According to p. 65 of the *Manual*, “The possible response options are:

- *None*: The household has no toilet arrangement in the residence or yard
- *Pit latrine*: A hole designed to receive human waste
- *Flush toilet*: An improved toilet that uses water to carry human waste away. The water for flushing may be stored in a tank above the toilet and be released by pulling a cord, or it may be placed lower and be released by flipping a lever”

7. Among the main cooking fuels that the household uses, which is the best/preferred/most-convenient type?
- A. Does not cook
 - B. Collected firewood
 - C. Purchased firewood, petroleum, paraffin, kerosene, charcoal, electricity, or other
 - D. LPG

According to pp. 62–63 of the *Manual*, “If the respondent says that the question does not apply, then mark ‘Does not cook’ (response A). In general, these are cases where the household does not cook and/or always eats outside the home.

“The most common types of cooking fuels are:

- *Collected firewood*: Hand-gathered tree branches or bits of wood, usually taken from land owned by the household, and cut up to serve as a cooking fuel
- *Purchased firewood*: Wood that is bought—often in a bundle—for use in cooking
- *Petroleum, paraffin, or kerosene*: The fuel used in cooking appliances that consume these types of fuels
- *Charcoal*: The solid that remains after carbonizing wood
- *Electricity*: The fuel used in electronic cooking appliances such as coffee makers, stoves, hot-plates, water heaters, etc.
- *Other*: Any cooking fuel that does not appear elsewhere in this list
- *LPG*: Liquefied hydrocarbons that are usually come in cylinders of 6, 12.5, or 28 kilograms for use with a gas burner, gas cooker, or gas stove”

According to p. 11 of the *Manual*, “The listed response options are not exhaustive. Thus, the respondent’s answer may not be found in the pre-coded list. In such cases, you should mark option C, corresponding to *other*.”

8. How many fans does the household have in good working order?
- A. None
 - B. One
 - C. Two or more

According to p. 56 of the *Manual*, a *fan* “is an appliance that blows air by rotating blades.”

According to p. 56 of the *Manual*, having a fan means meeting two criteria. “The first is possession, and the second is whether the item is in good working order.”

According to p. 55 of the *Manual*, fans that are possessed by members of the household should be counted, even if they were bought on credit. Do not count fans that the household shares with other households.

9. Does the household have a radio, television, VCR/DVD player, or satellite dish in good working order?
- A. None
 - B. Only radio and/or television (without VCR/DVD and without satellite dish)
 - C. VCR/DVD and/or satellite dish (regardless of radio or television)

According to p. 56 of the *Manual*, a *radio* “is an appliance that reproduces sound transmitted via radio waves. A *television* is an appliance that receives and displays televised images. A *satellite dish* is an antenna—shaped like a three-dimensional crescent—that captures and relays television signals transmitted via satellite. A *VCR/DVD player* is an appliance that reads stored images (and sends signals to a television to display the stored images) recorded in standard formats.”

According to p. 56 of the *Manual*, having a radio, television, VCR/DVD player, or satellite dish means meeting two criteria. “The first is possession, and the second is whether the item is in good working order.”

According to p. 55 of the *Manual*, radios, televisions, VCR/DVD players, and satellite dishes that are possessed by members of the household should be counted, even if they were bought on credit. Do not count radios, televisions, VCR/DVD players, or satellite dishes that the household shares with other households.

After asking whether the household has each of the four types of items in this question, mark the response option as shown below:

Does the household have a . . . ?				Reponse to mark
Radio	Television	VCD/DVD Player	Satellite dish	
No	No	No	No	A
Yes	No	No	No	B
No	Yes	No	No	B
Yes	Yes	No	No	B
No	No	Yes	No	C
Yes	No	Yes	No	C
No	Yes	Yes	No	C
Yes	Yes	Yes	No	C
No	No	No	Yes	C
Yes	No	No	Yes	C
No	Yes	No	Yes	C
Yes	Yes	No	Yes	C
No	No	Yes	Yes	C
Yes	No	Yes	Yes	C
No	Yes	Yes	Yes	C
Yes	Yes	Yes	Yes	C

10. How many cellular telephones does the household have in good working order?
- A. None
 - B. One
 - C. Two or more

According to p. 56 of the *Manual*, a *cellular telephone* “is an appliance for sending and receiving voice-communication signals. Unlike traditional land-line telephones, it is portable and connects with the mobile-phone network.”

According to p. 56 of the *Manual*, “this indicator covers two criteria. The first is possession, and the second is whether the item is in good working order.”

According to p. 56 of the *Manual*, having a cellular telephone means meeting two criteria. “The first is possession, and the second is whether the item is in good working order.”

Figure 1: Poverty lines and poverty rates for all of Côte d’Ivoire, by poverty line, and by households and people

Sample	Line or rate	Level	n	Poverty rates (% with expenditure less than a poverty line) and poverty lines (XOF/person/day)									
				National			USAID	Intl. 2005 PPP				Intl. 2011 PPP	
				100%	150%	200%	'Extreme'	\$1.25	\$2.00	\$2.50	\$8.00	\$1.90	\$3.10
All Côte d’Ivoire	Line	People	12,600	578	867	1,156	382	454	727	909	2,908	419.9	685.1
	Rate	Households	12,600	37.1	57.6	70.5	17.3	25.8	48.3	59.9	94.1	22.3	45.5
		People	—	48.9	70.2	81.9	24.5	35.2	61.0	72.7	97.4	30.9	58.1
Construction and calibration: Selecting indicators and points, and associating scores with likelihoods													
	Rate	Households	6,436	37.1	57.6	70.5	17.3	25.9	48.2	59.9	94.2	22.1	45.4
	Rate	People	—	49.0	70.3	82.1	24.4	35.1	61.1	72.9	97.5	30.3	58.0
Validation													
Measuring accuracy	Rate	Households	6,164	37.2	57.6	70.5	17.3	25.7	48.3	60.0	94.1	22.6	45.7
	Rate	People	—	48.8	70.2	81.7	24.5	35.3	60.9	72.6	97.3	31.4	58.3

Source: 2008 ENV. Poverty lines in prices for the 10 percent of the poorest people in Abidjan from June to August 2008.

Figure 2: Poverty lines and poverty rates for all of Côte d'Ivoire and for each region, by poverty line, and by households and people

Poverty rates (% with expenditure less than a poverty line) and poverty lines (XOF/person/day)													
Region	Line or rate	Level	n	National			USAID	Intl. 2005 PPP				Intl. 2011 PPP	
				100%	150%	200%	'Extreme'	\$ 1.25	\$ 2.00	\$ 2.50	\$ 8.00	\$1.90	\$3.10
All Côte d'Ivoire	Line		12,600	578	867	1,156	382	454	727	909	2,908	420	685
	Rate	Households		37.1	57.6	70.5	17.3	25.8	48.3	59.9	94.1	22.3	45.5
	Rate	People		48.9	70.2	81.9	24.5	35.2	61.0	72.7	97.4	30.9	58.1
Lagunes	Line		2,540	643	965	1,286	486	506	809	1,011	3,235	467	762
	Rate	Households		15.5	34.0	49.1	6.8	7.6	24.4	36.4	86.1	6.5	22.0
	Rate	People		23.9	47.5	63.7	11.6	12.7	35.8	50.8	93.0	10.9	32.6
Haut-Sassandra	Line		580	583	875	1,167	356	459	734	917	2,935	424	692
	Rate	Households		50.7	74.9	86.6	24.7	36.6	65.8	76.8	99.1	32.3	62.2
	Rate	People		63.3	84.5	93.5	34.1	47.2	76.6	86.0	99.8	42.8	73.6
Savanes	Line		920	503	755	1,007	255	396	633	791	2,533	366	597
	Rate	Households		66.2	83.1	89.8	30.4	52.7	76.1	84.7	98.6	48.3	74.2
	Rate	People		77.3	90.5	95.5	38.6	64.6	85.8	92.2	99.7	60.1	84.4
Vallée du Bandama	Line		920	521	781	1,041	296	409	655	819	2,619	378	617
	Rate	Households		46.1	65.7	76.3	22.7	34.8	56.9	67.3	97.2	31.4	54.4
	Rate	People		57.0	76.9	86.1	28.5	43.4	69.2	79.0	98.9	39.1	66.5
Moyen-Comoé	Line		920	572	858	1,144	357	450	720	900	2,879	416	678
	Rate	Households		39.5	60.7	72.0	17.8	28.3	51.8	62.7	96.1	24.0	49.2
	Rate	People		53.7	76.8	87.1	27.0	39.6	66.6	78.9	98.7	35.8	63.7
Dix-Huit Montagnes	Line		760	582	873	1,164	358	458	732	915	2,929	423	690
	Rate	Households		55.1	74.5	84.3	28.7	44.9	64.8	76.6	99.2	38.9	62.4
	Rate	People		68.9	86.1	92.9	36.4	56.7	78.0	87.9	99.8	49.9	75.9

Source: 2008 ENV. Poverty lines in prices for the 10 percent of the poorest people in Abidjan from June to August 2008.

Figure 2 (cont.): Poverty lines and poverty rates for all of Côte d'Ivoire and 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 (XOF/person/day)									
				National			USAID	Intl. 2005 PPP				Intl. 2011 PPP	
				100%	150%	200%	'Extreme'	\$ 1.25	\$ 2.00	\$ 2.50	\$ 8.00	\$1.90	\$3.10
Lacs	Line		440	578	867	1,156	360	454	727	909	2,908	420	685
	Rate	Households		39.0	60.5	77.2	13.1	23.0	50.1	63.6	97.9	19.2	47.5
	Rate	People		54.4	74.8	87.3	23.1	36.1	64.4	77.9	98.4	32.0	62.2
Zanzan	Line		920	495	743	991	318	389	623	779	2,493	360	587
	Rate	Households		42.5	64.5	77.2	19.9	31.6	55.9	67.7	96.3	25.1	52.3
	Rate	People		54.7	77.0	87.9	27.3	42.9	69.9	79.6	98.6	35.4	65.5
Bas-Sassandra	Line		1,120	578	867	1,156	410	454	727	909	2,908	420	685
	Rate	Households		31.2	52.1	67.8	14.8	19.2	41.7	54.5	94.2	15.4	39.1
	Rate	People		45.5	67.5	81.9	22.7	29.2	56.7	69.7	97.9	23.3	54.5
Denguélé	Line		260	501	751	1,002	265	394	630	788	2,521	364	594
	Rate	Households		81.1	88.4	94.2	56.9	75.1	87.0	89.4	99.0	72.5	86.1
	Rate	People		88.0	94.1	97.1	63.4	79.3	92.6	94.5	99.7	76.8	92.1
N'zi-Comoé	Line		480	571	856	1,142	360	449	718	898	2,872	415	677
	Rate	Households		45.8	67.7	78.0	21.7	32.5	58.1	69.4	98.8	28.8	55.4
	Rate	People		57.1	77.2	87.3	31.2	43.0	69.9	80.7	99.3	39.3	67.1
Marahoué	Line		320	583	874	1,165	356	458	733	916	2,931	423	690
	Rate	Households		55.0	75.0	87.7	23.6	37.9	68.5	78.1	98.7	33.8	66.4
	Rate	People		68.2	86.5	94.5	32.7	50.0	81.9	89.3	99.7	45.2	79.8
Sud-Comoé	Line		320	572	858	1,144	393	450	719	899	2,878	416	678
	Rate	Households		22.9	50.4	64.7	7.2	12.1	38.1	52.1	92.8	8.0	31.9
	Rate	People		31.6	63.7	77.0	11.1	16.8	49.8	64.8	96.3	12.3	42.9

Source: 2008 ENV. Poverty lines in prices for the 10 percent of the poorest people in Abidjan from June to August 2008.

Figure 2 (cont.): Poverty lines and poverty rates for all of Côte d'Ivoire and for each region, by poverty line, and by households and people

		Poverty rates (% with expenditure less than a poverty line) and poverty lines (XOF/person/day)											
Region	Line or rate	Level	n	National			USAID	Intl. 2005 PPP				Intl. 2011 PPP	
				100%	150%	200%	'Extreme'	\$ 1.25	\$ 2.00	\$ 2.50	\$ 8.00	\$1.90	\$3.10
Worodougou	Line		460	498	747	996	265	391	626	783	2,505	361.71	590.16
	Rate	Households		30.6	53.7	66.3	7.0	19.1	40.2	55.9	93.7	16.9	38.1
	Rate	People		45.5	68.2	80.8	13.3	31.5	55.3	70.1	98.6	28.7	52.9
Sud-Bandama	Line		400	569	854	1,139	393	448	716	895	2,865	413.63	674.87
	Rate	Households		42.6	66.1	78.5	23.1	30.6	55.6	68.4	98.1	25.3	52.3
	Rate	People		52.6	76.2	87.1	28.5	38.5	67.2	78.3	99.5	31.4	63.5
Agnéby	Line		320	574	862	1,149	393	452	722	903	2,890	417.27	680.81
	Rate	Households		45.5	70.1	81.7	24.5	32.2	60.9	74.2	96.8	28.5	57.4
	Rate	People		56.6	80.6	89.6	31.7	40.7	70.8	83.4	98.9	37.1	68.4
Fromager	Line		360	582	873	1,164	356	458	732	915	2,929	422.88	689.96
	Rate	Households		42.7	67.2	80.2	16.0	26.8	58.1	70.3	96.1	21.5	53.9
	Rate	People		57.8	81.5	90.5	26.1	40.6	72.4	84.0	98.5	32.0	68.8
Moyen-Cavally	Line		360	581	872	1,162	358	457	731	914	2,924	422.16	688.79
	Rate	Households		40.2	61.4	75.0	16.6	26.8	53.4	63.7	96.9	22.7	51.1
	Rate	People		53.2	72.4	85.6	23.2	37.1	65.0	74.6	98.8	32.1	63.5
Bafing	Line		200	497	746	995	265	391	626	782	2,503	361.37	589.61
	Rate	Households		46.0	61.1	75.4	23.5	36.5	53.4	63.1	96.0	35.0	49.4
	Rate	People		59.5	72.9	85.7	34.5	48.7	66.2	74.9	97.7	47.6	63.0

Source: 2008 ENV. Poverty lines in prices for the 10 percent of the poorest people in Abidjan from June to August 2008.

Figure 3: Poverty indicators by uncertainty coefficient

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
13,354	How many members 15-years-old or younger does the household have? (Five or more; Four; Three; Two; One; None)
13,222	How many members 16-years-old or younger does the household have? (Five or more; Four; Three; Two; One; None)
13,081	How many members 13-years-old or younger does the household have? (Five or more; Four; Three; Two; One; None)
13,080	How many members 14-years-old or younger does the household have? (Five or more; Four; Three; Two; One; None)
12,998	How many members 12-years-old or younger does the household have? (Five or more; Four; Three; Two; One; None)
12,945	How many members 11-years-old or younger does the household have? (Five or more; Four; Three; Two; One; None)
12,530	How many members 17-years-old or younger does the household have? (Six or more; Five; Four; Three; Two; One; None)
12,500	How many household members, in their occupation or profession, are skilled workers in agriculture or fishing? (Three or more; Two; One; None)
12,392	How many members does the household have? (Nine or more; Seven or eight; Five or six; Four; Three; One or two)
12,361	How many members 18-years-old or younger does the household have? (Six or more; Five; Four; Three; Two; One; None)
12,337	Among the main cooking fuels that the household uses, which is the best/preferred/most-convenient type? (Does not cook; Collected firewood; Purchased firewood, petroleum, paraffin, kerosene, charcoal, electricity, or other; LPG)
11,401	How many household members, in their current employment, are family farmers, sharecroppers, or agricultural day laborers? (Three or more; Two; One; None)

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

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
11,269	In their main line of work, how many household members are in the informal agricultural sector? (Three or more; Two; One; None)
10,760	How many household members farm, hunt, or raise cattle, poultry, or other livestock? (Three or more; Two; One; None)
10,400	How many fans does the household have in good working order? (None; One; Two or more)
10,072	How many household members worked for at least one hour in the past seven days and are, in their main occupation, day laborers (agricultural or non-agricultural), sharecroppers, unskilled employees, unskilled laborers, domestic servants, trainees, apprentices, or unpaid family workers? (Three or more; Two; One; None)
9,591	How many household members ages 7 to 15 are attending a public or private school (institutional, religious, or secular) this year? (None; All go to a public school; At least one goes to a private school; No one ages 7 to 15)
9,518	If any household members farm, hunt, or raise cattle, poultry, or other livestock, does the household own any sheep, goats, cattle, or pigs? (Someone is a farmer, hunter, or livestock-raiser, and the household does own some sheep, goats, cattle, or pigs; Someone is a farmer, hunter, or livestock-raiser, but no one owns any sheep, goats, cattle, or pigs; No one is a farmer, hunter, or livestock-raiser, and no one owns any sheep, goats, cattle, or pigs; No one is a farmer, hunter, or livestock-raiser, but the household does own some sheep, goats, cattle, or pigs)
9,492	Are all household members ages 7 to 11 attending school this year? (No; No one ages 7 to 11; Yes)

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

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
9,481	If any household members farm, hunt, or raise cattle, poultry, or other livestock, does the household own any sheep, goats, cattle, pigs, chickens, guinea fowl, other poultry, rabbits, guinea pigs, snails, or agouti? (Someone is a farmer, hunter, or livestock-raiser, and the household does own some sheep, goats, cattle, pigs, chickens, guinea fowl, other poultry, rabbits, guinea pigs, snails, or agouti; Someone is a farmer, hunter, or livestock-raiser, but no one owns any sheep, goats, cattle, pigs, chickens, guinea fowl, other poultry, rabbits, guinea pigs, snails, or agouti; No one is a farmer, hunter, or livestock-raiser, and no one owns any sheep, goats, cattle, pigs, chickens, guinea fowl, other poultry, rabbits, guinea pigs, snails, or agouti; No one is a farmer, hunter, or livestock-raiser, but the household does own some sheep, goats, cattle, pigs, chickens, guinea fowl, other poultry, rabbits, guinea pigs, snails, or agouti)
9,438	If any household members farm, hunt, or raise cattle, poultry, or other livestock, then how many hectares of agricultural land does the household own? (Someone is a farmer, hunter, or livestock-raiser, and the household owns 1 to <2 hectares of agricultural land; Someone is a farmer, hunter, or livestock-raiser, and the household owns 2 to <3 hectares of agricultural land; No one is a farmer, hunter, or livestock-raiser, and no one owns any agricultural land; Someone is a farmer, hunter, or livestock-raiser, but no one owns any agricultural land; No one is a farmer, hunter, or livestock-raiser, but the household does own some agricultural land; Someone is a farmer, hunter, or livestock-raiser, and the household owns >0 to <1 hectares of agricultural land; Someone is a farmer, hunter, or livestock-raiser, and the household owns 3 to <5 hectares of agricultural land; Someone is a farmer, hunter, or livestock-raiser, and the household owns 5 or more hectares of agricultural land)
9,431	How many household members ages 7 to 17 are attending a public or private school (institutional, religious, or secular) this year? (None; All go to a public school; At least one goes to a private school; No one ages 7 to 17)

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

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
9,394	If any household members farm, hunt, or raise cattle, poultry, or other livestock, does the household own any chickens, guinea fowl, other poultry, rabbits, guinea pigs, snails, or agouti? (Someone is a farmer, hunter, or livestock-raiser, and the household does own some chickens, guinea fowl, other poultry, rabbits, guinea pigs, snails, or agouti; Someone is a farmer, hunter, or livestock-raiser, but no one owns any chickens, guinea fowl, other poultry, rabbits, guinea pigs, snails, or agouti; No one is a farmer, hunter, or livestock-raiser)
9,290	How many household members ages 7 to 16 are attending a public or private school (institutional, religious, or secular) this year? (None; All go to a public school; At least one goes to a private school; No one ages 7 to 16)
9,211	How many members 6-years-old or younger does the household have? (Three or more; Two; One; None)
9,183	How many household members ages 7 to 13 are attending a public or private school (institutional, religious, or secular) this year? (None; All go to a public school; At least one goes to a private school; No one ages 7 to 13)
9,143	How many household members ages 7 to 14 are attending a public or private school (institutional, religious, or secular) this year? (None; All go to a public school; At least one goes to a private school; No one ages 7 to 14)
9,075	How many household members ages 7 to 12 are attending a public or private school (institutional, religious, or secular) this year? (None; All go to a public school; At least one goes to a private school; No one ages 7 to 12)
9,067	How many household members ages 7 to 18 are attending a public or private school (institutional, religious, or secular) this year? (None; All go to a public school; At least one goes to a private school; No one ages 7 to 18)
8,925	What is the source of water for the household? (Public standpipe, or other; Surface water, or HVA (improved village pump); Well; Shared tap; Private tap; Water vendor)
8,805	Are all household members ages 7 to 11 attending school this year? (No; No one ages 7 to 11; Yes)

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

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
8,743	What is the occupation or profession of the female head/spouse? (Skilled farmers and workers in agriculture and fishing; None, or not otherwise classified; Service workers and retail and wholesale salespeople, or unskilled workers and laborers; No female head/spouse; Others)
8,647	Are all household members ages 7 to 15 attending school this year? (No; No one ages 7 to 15; Yes)
8,445	Are all household members ages 7 to 13 attending school this year? (No; No one ages 7 to 13; Yes)
8,439	What is the tenure status of the household in its residence? (Owner, partially subsidized, or other; Housed by a family member for free; Rent-to-own, sub-lease, or 100-percent subsidized; Renter)
8,421	Are all household members ages 7 to 17 attending school this year? (No; No one ages 7 to 17; Yes)
8,391	Are all household members ages 7 to 12 attending school this year? (No; No one ages 7 to 12; Yes)
8,335	Are all household members ages 7 to 16 attending school this year? (No; No one ages 7 to 16; Yes)
8,334	Are all household members ages 7 to 14 attending school this year? (No; No one ages 7 to 14; Yes)
8,332	What is the current employment status of the male head/spouse? (Family farmer; Sharecropper, non-paid family worker, or agricultural day laborer; No male head/spouse; Does not work; Non-agricultural business owner (with or without salaried employees), unskilled employee, skilled or unskilled laborer, non-agricultural day laborer, domestic servant, apprentice, trainee, or other; Manager or administrator of level A, B, C, or D, manager, upper-level manager, mid-level manager, trainer, or skilled employee)
8,234	How many cellular telephones does the household have in good working order? (None; One; Two or more)
8,208	In their main line of work, how many household members are paid in kind, via business profits, or are not remunerated? (Three or more; Two; One; None)
8,028	Is the main line of work of the male head/spouse in the private sector, the public or para-statal sector, in agriculture, or in the informal sector? (Informal agricultural, or agro-industrial; Does not work; Informal non-agricultural; No female head/spouse; Formal non-agricultural private, public, or para-statal)

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

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
7,985	Are all household members ages 7 to 18 attending school this year? (No; No one ages 7 to 18; Yes)
7,979	What is the occupation or profession of the male head/spouse? (None, or not otherwise classified; Unskilled workers and laborers; Artisans and handcraft workers; No male head/spouse; Service workers, retail and wholesale salespeople, drivers and machine operators, or other; Skilled farmers and workers in agriculture and fishing; Politicians in the executive and legislative branches, public servants and administrators, managers and directors of businesses, intellectuals and scientists, professionals, clerks and technicians, or military and security)
7,837	What is the current employment status of the female head/spouse? (Non-paid family worker; Family farmer, or agricultural day laborer; Does not work; Unskilled laborer, non-agricultural day laborer, non-agricultural business owner (with or without salaried employees); Apprentice, sharecropper, domestic servant, intern, or other; No female head/spouse; Manager or administrator of level A, B, C, or D, manager, upper-level manager, mid-level manager, trainer, Skilled or unskilled employee, or skilled laborer)
7,577	Is the main line of work of the male head/spouse in the private sector, the public or para-statal sector, in agriculture, or in the informal sector? (Informal agricultural; No male head/spouse; Does not work; Agro-industrial; Informal non-agricultural; Formal non-agricultural private; Public or para-statal)
7,398	What is the highest year of study that the female head/spouse has completed? (There is no female head/spouse; None, pre-school, koranique, CP1, or CP2; CE1, CE2, or CM1; CM2, or BEPC level 6; BEPC levels 3, 4, or 5; Higher than BEPC level 3)
7,144	What type of sewerage arrangement does the household have? (On the ground; Street; Other; Gutter/ditch; Septic tank; Sewer)
6,986	What is the main source of energy for lighting? (Other; Petroleum, paraffin, or kerosene; Public grid, shared meter; Public grid, no meter; Public grid, individual meter)
6,913	In the past week, how many household members have worked at least one hour? (Five or more; Four; Three; Two; One; None)

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

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
6,850	Does the household have a radio, television, VCR/DVD player, or satellite dish in good working order? (None; Only radio and/or television (without VCR/DVD and without satellite dish); VCR/DVD and/or satellite dish (regardless of radio or television))
6,639	Is the male head/spouse a farmer, does he hunt, or does he have any cattle, poultry, or other livestock? (Yes; No male head/spouse; No)
6,494	Does the household have a television in good working order? (No; Yes)
6,296	How is the female head/spouse paid in her main line of work? (In kind; Not remunerated; Other; By the day or hour, or by the job; Does not work; Commission; Profits; No female head/spouse; Fixed salary)
6,248	What type of residence does the household live in? (Cabin, mud hut, or shack; Detached house; <i>Bande par particulier</i> ; Around a common court; Villa, apartment, or <i>bande par ste. immo.</i>)
6,135	What type of toilet arrangement does the household have? (None; Pit latrine, or flush)
6,128	Does the household have a VCR/DVD player in good working order? (No; Yes)
6,082	Is the female head/spouse a farmer, does she hunt, or does she have any cattle, poultry, or other livestock? (Yes; No; No female head/spouse)
5,999	Can the female head/spouse read and write in French, Arabic, or in a local language? (No; Yes; No female head/spouse)
5,912	What is the main material of the floors? (Earth/sand, or wood/planks; Cement; Tile, or other)
5,891	What is the main material of the exterior walls? (Earth or mud, or no walls; Bamboo or leaves, corrugated metal sheets, planks/wood, cement, tile/marble, or other)
5,663	How does the household dispose of its garbage? (Buried or burned, or thrown on ground; Other; Public collection point; Private collection point; Private curb-side service; Public curb-side service)
5,601	What is the total surface area in square meters of any agricultural lands that you own? (>0 to <1; 1 to <2; 2 to <3; 3 to <4; 4 to <6; 6 to <8; 8 to <11; 11 to <20; 20 or more; None)

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

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
4,664	Does the household have a stove in good working order? (No; Yes)
4,663	How is the male head/spouse paid in his main line of work? (Does not work, or not remunerated; In kind; No male head/spouse; Profits, or other; Fixed salary, or by the day or hour; By the job, or commission)
4,466	What is the religion of the female head/spouse? (Animist; No religion; Islam; Other religion; Other Christian; Evangelical; Roman Catholic; Methodist; No female head/spouse)
4,243	Where do household members bathe? (Outside; Outside shower, or other; Bathroom, water room, or inside shower)
4,174	Does the household have a refrigerator or freezer in good working order? (No; Yes)
4,051	Do you currently have any armchairs? (No; Yes)
4,035	What kind of contract does the female head/spouse have with her employer? (None at all; Does not work, CDD, temporary, or oral; No female head/spouse; CDI)
3,938	What is the highest year of study that the male head/spouse has completed? (There is no male head/spouse; None, pre-school, koranique, CP1, or CP2; CE1, CE2, or CM1; CM2, or BEPC level 6; BEPC levels 3, 4, or 5; Higher than BEPC level 3)
3,768	What is the ethnicity or nationality of the female head/spouse? (Southern Mandé, or Ghanian; Burkinian; Northern Mandé, or Malian; Other West African; No female head/spouse; Voltaique; Krou; Akan; Liberian, Guinean, other Africans, other Ivorian)
3,643	What is the marital status of the female head/spouse? (Married; Widow; Divorced; Separated; Single, never-married; No female head/spouse)
3,422	Are any household members, in their current employment, managers or administrators of level A, B, C, or D, managers (lower-, upper- or mid-level), trainers, skilled employees, or skilled laborers? (No; Yes)
3,359	Is the employment of the female head/spouse temporary or seasonal? (No; Seasonal; Does not work; Occasional; No female head/spouse)

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

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
3,300	How many household members, in their occupation or profession, are service workers, salespeople (retail or wholesale), artisans and handcraft workers, drivers and machine operators, or unskilled workers and laborers? (None; One; Two)
3,264	In the past seven days, has the female head/spouse worked for at least an hour? (Yes; No; No female head/spouse)
3,244	In their main line of work, are any household members paid a fixed salary? (No; Yes)
3,178	What is the main material of the roof? (Earth, or straw/grass; Wood/planks, corrugated metal sheets, reinforced concrete/cement, or other)
3,128	What kind of contract does the male head/spouse have with his employer? (None at all; No male head/spouse; Does not work, or temporary; CDD; Oral; CDI)
3,096	What is the structure of household headship? (Both male and female heads/spouses; Female head/spouse only; Male head/spouse only)
3,052	In their main line of work, are any household members paid by the hour, by the day, by the job, on commission, or a fixed salary? (No; Yes)
3,030	To keep your eating utensils sanitary, do you store them on a kitchen shelf, buffet, or table? (No; Yes)
2,913	Can the male head/spouse read and write in French, Arabic, or a local language? (No male head/spouse; No; Yes)
2,808	In their main line of work, are any household members in the formal sector (public/para-statal, private non-agricultural, or agroindustrial)? (No; Yes)
2,807	Are any household members, in their occupation or profession, politicians in the executive and legislative branches, public servants and administrators, and managers and directors of businesses, intellectuals and scientists, mid-level professionals, clerks, or technicians? (No; Yes)
2,767	To keep your eating utensils sanitary, do you store them on a kitchen shelf or buffet? (No; Yes)

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

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
2,700	Do you currently have any tables, chairs, or stools? (None; Chairs or stools, but no tables; Tables, with or without chairs and stools)
2,609	In their main line of work, how many household members are in the informal non-agricultural sector? (No; Yes)
2,420	Do any family members have a CDI, CDD, training, or oral employment contract? (No; Yes)
2,212	Do you currently have any tables? (No; Yes)
2,125	How many bicycles does the household have in good working order? (None; One; Two or more)
1,995	Does the household have a motorcycle or scooter in good working order? (No; Yes)
1,889	How many household members, in their current employment, are non-agricultural business owners (with or without salaried employees)? (None; One; Two)
1,779	What is the marital status of the male head/spouse? (Widower; Married; No male head/spouse; Divorced; Single, never-married; Separated)
1,562	What is the religion of the male head/spouse? (No male head/spouse; Islam; No religion; Animist; Roman Catholic; Other Christian; Other religion; Evangelical; Methodist)
1,155	How many rooms does the residence have? (One; Two; Three; Four; Five or more)
1,040	Does the household have a landline telephone in good working order? (No; Yes)
966	How many radios does the household have in good working order? (None; One; Two or more)
900	Do any household members attend a private school (institutional, religious, or secular)? (No; Yes)
859	Does the household have a satellite dish in good working order? (No; Yes)
783	What is the ethnicity or nationality of the male head/spouse? (Southern Mandé, or Ghanian; Voltaïque; Burkinian; Krou; No male head/spouse; Northern Mandé, Malian, Liberian, or other Ivorian; Other West African; Akan; Guinean, or other Africans)
647	How many household members have temporary or seasonal employment? (Two or more; One; None)
614	Do you currently have any stools? (Yes; No)

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

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
603	To keep your eating utensils sanitary, do you store them in a basin? (Yes; No)
513	Do you currently have any chairs? (No; Yes)
508	Can any household members read and write in French, Arabic, or in a local language? (No; Yes)
484	Is the employment of the male head/spouse temporary or seasonal? (Seasonal; No; No male head/spouse; Does not work; Occasional)
347	Are any household members of a GVC or a farmer's cooperative? (Yes; No)
193	How many meals does the household eat per day? (One; Two; Three)
184	Did your household take in people displaced by the crisis? (Yes; No)
169	Does the household have a plow, sprayer, fishing boat, canoe, handcart, or wheelbarrow in good working order? (No; Yes)
143	Are you currently a war refugee? (Yes; No)
64	Did you have to go into hiding because of the crisis, or did your household take in people displaced by the crisis? (Yes; No)
60	In the past seven days, has the male head/spouse worked for at least an hour? (Yes; No male head/spouse; No)
55	Does the household have a motorcycle or scooter in good working order? (No; Yes)
41	Were you a displaced by the war? (Yes; No)
22	Are you taking care of a gravely ill person or someone with a serious handicap? (Yes; No)
17	Do you currently have any stools, chairs, armchairs, or tables? (No; Yes)
14	Do you have a mosquito net that can be used for sleeping? (No; Yes)
2	Was your household displaced due to the crisis? (Yes; No)
2	Did you have to go into hiding because of the crisis? (Yes; No)

Source: 2008 ENV and the national poverty line

**Tables for
100% of the National Poverty Line
(and Tables Pertaining to All Eight 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	100.0
5-9	92.7
10-14	87.6
15-19	79.6
20-24	77.7
25-29	75.8
30-34	58.0
35-39	50.7
40-44	42.3
45-49	28.9
50-54	18.3
55-59	12.0
60-64	4.4
65-69	2.9
70-74	1.0
75-79	0.3
80-84	0.0
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	65	÷	65	=	100.0
5-9	878	÷	947	=	92.7
10-14	2,342	÷	2,674	=	87.6
15-19	3,887	÷	4,883	=	79.6
20-24	5,460	÷	7,031	=	77.7
25-29	5,510	÷	7,273	=	75.8
30-34	4,602	÷	7,938	=	58.0
35-39	4,272	÷	8,430	=	50.7
40-44	3,583	÷	8,475	=	42.3
45-49	3,015	÷	10,418	=	28.9
50-54	1,850	÷	10,097	=	18.3
55-59	1,044	÷	8,699	=	12.0
60-64	322	÷	7,267	=	4.4
65-69	154	÷	5,327	=	2.9
70-74	43	÷	4,139	=	1.0
75-79	9	÷	2,853	=	0.3
80-84	0	÷	1,634	=	0.0
85-89	0	÷	1,039	=	0.0
90-94	0	÷	578	=	0.0
95-100	0	÷	233	=	0.0

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

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

Score	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
0-4	+0.0	0.0	0.0	0.0
5-9	-4.3	3.0	3.1	3.3
10-14	+2.2	2.9	3.4	4.8
15-19	-1.8	2.6	3.0	3.8
20-24	+4.0	2.3	2.6	3.5
25-29	+3.6	2.3	2.7	3.6
30-34	-0.2	2.4	3.0	4.0
35-39	+0.6	2.4	2.8	3.7
40-44	+2.4	2.3	2.8	3.9
45-49	+1.9	1.8	2.1	3.0
50-54	-0.6	1.7	2.0	2.8
55-59	+0.9	1.4	1.7	2.3
60-64	-3.7	2.7	2.9	3.4
65-69	+0.3	0.9	1.0	1.2
70-74	-2.7	2.4	2.6	3.3
75-79	+0.3	0.0	0.0	0.0
80-84	-0.1	0.1	0.1	0.1
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 <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
1	-1.2	64.5	79.7	87.6
4	-0.6	34.0	40.5	56.1
8	+0.3	24.9	29.5	37.3
16	+0.3	17.5	20.8	25.2
32	+0.5	12.4	14.9	19.8
64	+0.5	8.6	10.5	13.6
128	+0.4	6.1	7.6	10.2
256	+0.6	4.5	5.3	6.8
512	+0.6	2.9	3.5	4.6
1,024	+0.6	2.1	2.5	3.3
2,048	+0.6	1.5	1.8	2.4
4,096	+0.6	1.1	1.3	1.7
8,192	+0.6	0.8	0.9	1.2
16,384	+0.6	0.6	0.7	0.9

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				Intl. 2011 PPP	
	100%	150%	200%	'Extreme'	\$1.25	\$2.00	\$2.50	\$8.00	\$1.90	\$3.10
Estimate minus true value	+0.6	+0.7	+0.9	+0.2	+1.1	+0.5	+0.6	+0.8	+0.1	+0.2
Precision of difference	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.5	0.5
α factor for precision	0.87	0.84	0.83	0.97	0.89	0.86	0.84	1.03	0.94	0.86

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

Differences and precision estimated from 1,000 bootstraps of $n = 16,384$.

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

Figure 10 (All poverty lines): Possible targeting outcomes

		<u>Targeting segment</u>	
		<u>Targeted</u>	<u>Non-targeted</u>
<u>True poverty status</u>	<u>Below poverty line</u>	<u>Inclusion</u> Below poverty line Correctly Targeted	<u>Undercoverage</u> Below poverty line Mistakenly Non-targeted
	<u>Above poverty line</u>	<u>Leakage</u> Above poverty line Mistakenly Targeted	<u>Exclusion</u> 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	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Total Accuracy</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.1	37.1	0.0	62.8	62.9	-99.7
≤9	1.0	36.2	0.0	62.8	63.8	-94.7
≤14	3.3	33.9	0.4	62.4	65.7	-81.3
≤19	7.3	29.9	1.3	61.6	68.9	-57.3
≤24	12.5	24.7	3.1	59.7	72.2	-24.5
≤29	17.8	19.4	5.1	57.7	75.5	+9.3
≤34	22.5	14.7	8.3	54.5	77.0	+43.5
≤39	26.8	10.4	12.4	50.4	77.2	+66.5
≤44	30.3	6.8	17.4	45.4	75.7	+53.2
≤49	33.4	3.8	24.8	38.1	71.4	+33.3
≤54	35.4	1.7	32.8	30.0	65.4	+11.7
≤59	36.5	0.7	40.5	22.4	58.8	-8.9
≤64	36.9	0.2	47.3	15.6	52.5	-27.2
≤69	37.1	0.1	52.4	10.4	47.5	-41.1
≤74	37.2	0.0	56.5	6.3	43.5	-52.1
≤79	37.2	0.0	59.4	3.5	40.6	-59.7
≤84	37.2	0.0	61.0	1.9	39.0	-64.1
≤89	37.2	0.0	62.0	0.8	38.0	-66.9
≤94	37.2	0.0	62.6	0.2	37.4	-68.5
≤100	37.2	0.0	62.8	0.0	37.2	-69.1

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 the 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	0.1	100.0	0.2	Only poor targeted
≤9	1.0	95.4	2.6	20.6:1
≤14	3.7	88.2	8.8	7.5:1
≤19	8.6	85.1	19.6	5.7:1
≤24	15.6	79.9	33.5	4.0:1
≤29	22.9	77.6	47.8	3.5:1
≤34	30.8	73.0	60.5	2.7:1
≤39	39.2	68.3	72.1	2.2:1
≤44	47.7	63.5	81.6	1.7:1
≤49	58.1	57.4	89.8	1.3:1
≤54	68.2	51.9	95.3	1.1:1
≤59	76.9	47.4	98.1	0.9:1
≤64	84.2	43.9	99.4	0.8:1
≤69	89.5	41.4	99.8	0.7:1
≤74	93.7	39.7	100.0	0.7:1
≤79	96.5	38.5	100.0	0.6:1
≤84	98.1	37.9	100.0	0.6:1
≤89	99.2	37.5	100.0	0.6:1
≤94	99.8	37.2	100.0	0.6:1
≤100	100.0	37.2	100.0	0.6:1

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	98.0
10-14	97.0
15-19	93.6
20-24	92.1
25-29	90.7
30-34	84.1
35-39	80.0
40-44	70.8
45-49	58.9
50-54	49.0
55-59	34.7
60-64	22.4
65-69	13.9
70-74	10.6
75-79	6.5
80-84	0.5
85-89	0.0
90-94	0.0
95-100	0.0

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

Score	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
0-4	+0.0	0.0	0.0	0.0
5-9	-0.4	1.6	1.8	2.3
10-14	+3.6	2.0	2.4	3.3
15-19	+0.2	1.6	1.9	2.5
20-24	-1.2	1.2	1.5	2.0
25-29	-1.3	1.3	1.6	2.1
30-34	-0.0	1.9	2.3	3.1
35-39	+1.5	2.0	2.4	3.2
40-44	+2.4	2.3	2.7	3.3
45-49	+1.3	2.2	2.6	3.6
50-54	+3.0	2.2	2.6	3.3
55-59	+0.5	2.2	2.6	3.3
60-64	-3.4	2.9	3.2	3.7
65-69	+0.7	1.9	2.4	3.2
70-74	+2.4	2.3	2.7	3.4
75-79	+5.1	0.8	0.9	1.2
80-84	+0.4	0.1	0.1	0.2
85-89	-0.6	0.6	0.7	0.9
90-94	+0.0	0.0	0.0	0.0
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 <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
1	-1.4	68.1	80.8	89.6
4	-0.3	33.4	39.8	49.9
8	+0.4	25.2	29.8	39.1
16	+0.6	16.2	20.2	27.9
32	+0.5	11.7	14.3	20.4
64	+0.6	8.2	9.7	12.7
128	+0.5	5.9	7.0	9.5
256	+0.8	4.5	5.2	6.7
512	+0.8	2.9	3.5	4.5
1,024	+0.8	2.1	2.5	3.2
2,048	+0.8	1.6	1.9	2.4
4,096	+0.8	1.1	1.3	1.7
8,192	+0.7	0.8	0.9	1.1
16,384	+0.7	0.5	0.6	0.8

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	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Total Accuracy</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.1	57.5	0.0	42.4	42.5	-99.8
≤9	1.0	56.6	0.0	42.4	43.4	-96.5
≤14	3.5	54.1	0.2	42.2	45.7	-87.5
≤19	8.1	49.5	0.5	41.9	50.0	-71.1
≤24	14.6	43.0	1.0	41.4	56.0	-47.6
≤29	21.3	36.3	1.6	40.8	62.1	-23.4
≤34	28.0	29.6	2.8	39.6	67.5	+2.0
≤39	34.7	22.9	4.5	37.8	72.5	+28.3
≤44	40.6	17.0	7.1	35.3	75.9	+53.3
≤49	46.8	10.8	11.3	31.1	77.9	+80.3
≤54	51.6	6.0	16.7	25.7	77.3	+71.1
≤59	54.6	3.0	22.3	20.0	74.6	+61.2
≤64	56.4	1.2	27.8	14.6	71.1	+51.8
≤69	57.2	0.4	32.3	10.1	67.3	+43.9
≤74	57.5	0.1	36.1	6.3	63.8	+37.3
≤79	57.6	0.0	38.9	3.5	61.0	+32.4
≤84	57.6	0.0	40.6	1.8	59.4	+29.6
≤89	57.6	0.0	41.6	0.8	58.4	+27.8
≤94	57.6	0.0	42.2	0.2	57.8	+26.8
≤100	57.6	0.0	42.4	0.0	57.6	+26.4

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 the 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	0.1	100.0	0.1	Only poor targeted
≤9	1.0	98.2	1.7	55.4:1
≤14	3.7	94.9	6.1	18.6:1
≤19	8.6	94.1	14.0	15.9:1
≤24	15.6	93.5	25.3	14.4:1
≤29	22.9	93.0	36.9	13.2:1
≤34	30.8	90.8	48.5	9.8:1
≤39	39.2	88.4	60.2	7.6:1
≤44	47.7	85.1	70.5	5.7:1
≤49	58.1	80.5	81.2	4.1:1
≤54	68.2	75.6	89.5	3.1:1
≤59	76.9	70.9	94.8	2.4:1
≤64	84.2	67.0	98.0	2.0:1
≤69	89.5	63.9	99.3	1.8:1
≤74	93.7	61.4	99.9	1.6:1
≤79	96.5	59.7	100.0	1.5:1
≤84	98.1	58.7	100.0	1.4:1
≤89	99.2	58.1	100.0	1.4:1
≤94	99.8	57.7	100.0	1.4:1
≤100	100.0	57.6	100.0	1.4:1

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	100.0
10-14	99.5
15-19	98.2
20-24	97.2
25-29	96.3
30-34	94.0
35-39	92.1
40-44	85.5
45-49	76.1
50-54	69.1
55-59	52.9
60-64	43.6
65-69	32.6
70-74	22.2
75-79	17.3
80-84	5.7
85-89	3.5
90-94	0.6
95-100	0.0

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

Score	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+1.4	1.0	1.2	1.6
15–19	+0.7	1.1	1.3	1.8
20–24	–0.2	0.8	0.9	1.2
25–29	–2.2	1.4	1.4	1.5
30–34	–1.5	1.2	1.3	1.5
35–39	–1.7	1.4	1.5	1.7
40–44	+1.6	1.8	2.0	2.8
45–49	+4.5	1.9	2.3	3.2
50–54	+3.1	2.0	2.4	3.2
55–59	–3.9	3.1	3.4	3.9
60–64	+1.1	2.7	3.2	4.1
65–69	+4.3	2.6	3.3	4.7
70–74	–0.2	3.3	4.0	4.8
75–79	+10.0	1.9	2.3	2.8
80–84	+4.7	0.9	1.1	1.4
85–89	+2.7	0.7	0.8	1.0
90–94	+0.6	0.0	0.0	0.0
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 <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
1	-1.5	62.8	76.5	85.9
4	+0.3	29.8	36.8	49.8
8	+0.2	21.1	25.5	34.5
16	+0.4	15.3	18.4	23.6
32	+0.6	11.1	13.3	18.4
64	+0.6	7.5	9.4	11.9
128	+0.8	5.3	6.3	8.7
256	+1.0	3.9	4.7	5.9
512	+1.0	2.7	3.2	4.1
1,024	+1.0	1.9	2.3	3.0
2,048	+0.9	1.4	1.6	2.1
4,096	+1.0	1.0	1.2	1.6
8,192	+1.0	0.7	0.8	1.1
16,384	+0.9	0.5	0.6	0.8

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	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Total Accuracy</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.1	70.4	0.0	29.5	29.6	-99.8
≤9	1.0	69.5	0.0	29.5	30.5	-97.1
≤14	3.6	66.8	0.1	29.5	33.1	-89.6
≤19	8.4	62.1	0.2	29.4	37.8	-75.9
≤24	15.2	55.2	0.4	29.2	44.4	-56.2
≤29	22.4	48.1	0.5	29.1	51.5	-35.8
≤34	29.9	40.5	0.9	28.6	58.6	-13.8
≤39	37.8	32.7	1.5	28.1	65.8	+9.3
≤44	45.0	25.5	2.7	26.8	71.8	+31.5
≤49	52.7	17.8	5.4	24.1	76.8	+57.3
≤54	59.5	11.0	8.8	20.7	80.2	+81.2
≤59	64.4	6.0	12.5	17.0	81.5	+82.3
≤64	67.7	2.8	16.5	13.0	80.7	+76.6
≤69	69.3	1.2	20.2	9.3	78.6	+71.3
≤74	70.2	0.3	23.5	6.0	76.2	+66.7
≤79	70.4	0.0	26.1	3.4	73.9	+63.0
≤84	70.5	0.0	27.7	1.8	72.3	+60.7
≤89	70.5	0.0	28.7	0.8	71.3	+59.3
≤94	70.5	0.0	29.3	0.2	70.7	+58.4
≤100	70.5	0.0	29.5	0.0	70.5	+58.1

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 the 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	0.1	100.0	0.1	Only poor targeted
≤9	1.0	100.0	1.4	Only poor targeted
≤14	3.7	98.5	5.2	65.2:1
≤19	8.6	98.2	11.9	54.3:1
≤24	15.6	97.7	21.6	42.9:1
≤29	22.9	98.0	31.8	47.8:1
≤34	30.8	97.2	42.5	34.1:1
≤39	39.2	96.3	53.6	25.8:1
≤44	47.7	94.2	63.8	16.4:1
≤49	58.1	90.7	74.8	9.7:1
≤54	68.2	87.1	84.4	6.8:1
≤59	76.9	83.8	91.4	5.2:1
≤64	84.2	80.4	96.0	4.1:1
≤69	89.5	77.4	98.4	3.4:1
≤74	93.7	74.9	99.6	3.0:1
≤79	96.5	73.0	99.9	2.7:1
≤84	98.1	71.8	100.0	2.5:1
≤89	99.2	71.0	100.0	2.5:1
≤94	99.8	70.6	100.0	2.4:1
≤100	100.0	70.5	100.0	2.4:1

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	100.0
5–9	68.4
10–14	53.1
15–19	49.7
20–24	42.0
25–29	37.5
30–34	26.3
35–39	20.9
40–44	16.7
45–49	10.1
50–54	3.7
55–59	2.0
60–64	1.0
65–69	0.5
70–74	0.1
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 from 1,000 bootstraps of $n = 16,384$ with confidence intervals by score range, scorecard applied to the validation sample

Score	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
0–4	+88.5	14.4	16.7	20.3
5–9	–0.4	6.3	7.4	9.5
10–14	–12.3	8.1	8.5	9.1
15–19	+1.7	3.0	3.6	4.8
20–24	+1.8	2.5	3.1	3.9
25–29	+1.9	2.5	2.9	4.0
30–34	+2.7	2.0	2.4	3.2
35–39	+0.8	1.9	2.2	2.9
40–44	–0.4	1.7	2.1	2.7
45–49	–0.1	1.3	1.6	2.0
50–54	–0.9	0.9	1.0	1.4
55–59	+0.2	0.6	0.7	1.0
60–64	+0.2	0.4	0.5	0.6
65–69	–0.3	0.5	0.6	0.8
70–74	+0.1	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
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 <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
1	-0.4	60.6	66.5	71.5
4	-0.5	30.3	36.4	45.2
8	-0.1	21.3	24.7	33.0
16	-0.0	15.1	17.7	22.8
32	+0.3	10.4	12.5	16.4
64	+0.3	7.4	8.7	11.7
128	+0.2	5.1	6.1	7.9
256	+0.2	3.7	4.5	5.8
512	+0.2	2.7	3.3	4.2
1,024	+0.3	1.9	2.2	2.9
2,048	+0.3	1.3	1.6	2.1
4,096	+0.2	0.9	1.1	1.5
8,192	+0.2	0.7	0.8	1.1
16,384	+0.2	0.5	0.6	0.7

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	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Total Accuracy</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	17.2	0.1	82.6	82.6	-99.6
≤9	0.6	16.6	0.4	82.2	82.8	-90.7
≤14	2.3	14.9	1.4	81.3	83.6	-65.4
≤19	4.7	12.5	3.8	78.8	83.6	-22.9
≤24	7.6	9.6	7.9	74.8	82.4	+34.6
≤29	10.2	7.0	12.6	70.0	80.2	+26.6
≤34	12.2	5.0	18.5	64.1	76.3	-7.8
≤39	13.9	3.3	25.2	57.5	71.4	-46.5
≤44	15.4	1.8	32.2	50.5	65.8	-87.3
≤49	16.4	0.8	41.6	41.1	57.5	-141.7
≤54	16.9	0.3	51.2	31.5	48.4	-197.6
≤59	17.1	0.1	59.7	23.0	40.1	-247.1
≤64	17.2	0.0	66.9	15.8	32.9	-289.1
≤69	17.2	0.0	72.2	10.5	27.7	-319.8
≤74	17.2	0.0	76.3	6.3	23.5	-343.9
≤79	17.2	0.0	79.2	3.5	20.7	-360.5
≤84	17.2	0.0	80.8	1.9	19.0	-370.0
≤89	17.2	0.0	81.9	0.8	18.0	-376.0
≤94	17.2	0.0	82.4	0.2	17.4	-379.4
≤100	17.2	0.0	82.7	0.0	17.2	-380.7

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 the 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	0.1	15.7	0.1	0.2:1
≤9	1.0	57.7	3.4	1.4:1
≤14	3.7	62.1	13.3	1.6:1
≤19	8.6	55.0	27.4	1.2:1
≤24	15.6	48.8	44.3	1.0:1
≤29	22.9	44.5	59.2	0.8:1
≤34	30.8	39.5	70.8	0.7:1
≤39	39.2	35.5	81.1	0.6:1
≤44	47.7	32.2	89.4	0.5:1
≤49	58.1	28.3	95.5	0.4:1
≤54	68.2	24.8	98.4	0.3:1
≤59	76.9	22.2	99.4	0.3:1
≤64	84.2	20.4	99.8	0.3:1
≤69	89.5	19.2	100.0	0.2:1
≤74	93.7	18.4	100.0	0.2:1
≤79	96.5	17.8	100.0	0.2:1
≤84	98.1	17.5	100.0	0.2:1
≤89	99.2	17.3	100.0	0.2:1
≤94	99.8	17.2	100.0	0.2:1
≤100	100.0	17.2	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	100.0
5-9	81.7
10-14	71.5
15-19	66.1
20-24	58.3
25-29	56.5
30-34	40.1
35-39	33.2
40-44	27.1
45-49	18.1
50-54	8.2
55-59	5.0
60-64	2.2
65-69	1.2
70-74	0.1
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 from 1,000 bootstraps of $n = 16,384$ with confidence intervals by score range, scorecard applied to the validation sample

Score	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
0-4	+18.9	20.3	23.5	30.2
5-9	-0.0	5.1	6.0	8.0
10-14	-8.6	5.9	6.2	6.9
15-19	-0.3	3.0	3.5	4.5
20-24	+2.5	2.6	3.0	4.2
25-29	+5.6	2.6	2.9	4.0
30-34	+0.2	2.6	3.0	4.0
35-39	+2.7	2.2	2.7	3.3
40-44	+0.1	2.1	2.5	3.3
45-49	+2.1	1.6	1.8	2.4
50-54	+0.8	1.0	1.2	1.6
55-59	+1.6	0.7	0.9	1.1
60-64	+0.3	0.7	0.8	1.1
65-69	+0.2	0.6	0.7	0.8
70-74	+0.0	0.1	0.1	0.1
75-79	+0.0	0.0	0.0	0.0
80-84	-0.1	0.1	0.1	0.1
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 <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
1	-0.9	64.7	70.1	79.8
4	+0.2	32.2	38.9	51.6
8	+0.6	22.8	27.3	36.4
16	+0.9	15.5	18.3	25.4
32	+1.1	11.5	13.2	17.8
64	+1.1	7.9	9.1	11.6
128	+1.0	5.7	6.9	9.3
256	+1.0	4.0	4.8	6.5
512	+1.0	2.9	3.4	4.7
1,024	+1.1	2.0	2.4	3.3
2,048	+1.1	1.4	1.7	2.3
4,096	+1.1	1.0	1.2	1.7
8,192	+1.1	0.7	0.9	1.2
16,384	+1.1	0.5	0.6	0.8

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	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Total Accuracy</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.1	25.6	0.0	74.3	74.4	-99.5
≤9	0.8	24.9	0.2	74.1	74.9	-93.0
≤14	2.9	22.8	0.8	73.6	76.5	-74.3
≤19	6.3	19.4	2.3	72.0	78.3	-42.2
≤24	10.2	15.4	5.4	69.0	79.2	+0.6
≤29	14.0	11.7	8.9	65.4	79.4	+43.5
≤34	17.3	8.4	13.5	60.8	78.1	+47.3
≤39	20.1	5.6	19.2	55.2	75.3	+25.4
≤44	22.4	3.2	25.3	49.1	71.5	+1.5
≤49	24.2	1.5	34.0	40.4	64.6	-32.3
≤54	25.1	0.6	43.2	31.2	56.3	-68.1
≤59	25.4	0.2	51.5	22.8	48.3	-100.6
≤64	25.6	0.1	58.6	15.7	41.3	-128.3
≤69	25.7	0.0	63.9	10.5	36.1	-148.8
≤74	25.7	0.0	68.0	6.3	32.0	-164.9
≤79	25.7	0.0	70.8	3.5	29.1	-176.0
≤84	25.7	0.0	72.5	1.9	27.5	-182.3
≤89	25.7	0.0	73.5	0.8	26.5	-186.4
≤94	25.7	0.0	74.1	0.2	25.9	-188.6
≤100	25.7	0.0	74.3	0.0	25.7	-189.5

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 the 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	0.1	80.6	0.2	4.1:1
≤9	1.0	78.5	3.1	3.6:1
≤14	3.7	79.2	11.4	3.8:1
≤19	8.6	73.1	24.4	2.7:1
≤24	15.6	65.6	39.9	1.9:1
≤29	22.9	61.1	54.4	1.6:1
≤34	30.8	56.1	67.4	1.3:1
≤39	39.2	51.2	78.3	1.0:1
≤44	47.7	47.0	87.4	0.9:1
≤49	58.1	41.6	94.2	0.7:1
≤54	68.2	36.8	97.7	0.6:1
≤59	76.9	33.1	99.1	0.5:1
≤64	84.2	30.4	99.7	0.4:1
≤69	89.5	28.7	100.0	0.4:1
≤74	93.7	27.4	100.0	0.4:1
≤79	96.5	26.6	100.0	0.4:1
≤84	98.1	26.2	100.0	0.4:1
≤89	99.2	25.9	100.0	0.3:1
≤94	99.8	25.7	100.0	0.3:1
≤100	100.0	25.7	100.0	0.3:1

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	100.0
5-9	96.7
10-14	93.9
15-19	89.0
20-24	87.1
25-29	85.6
30-34	72.9
35-39	68.4
40-44	59.4
45-49	44.8
50-54	33.7
55-59	22.3
60-64	11.8
65-69	8.1
70-74	4.3
75-79	2.5
80-84	0.0
85-89	0.0
90-94	0.0
95-100	0.0

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

Score	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
0-4	+0.0	0.0	0.0	0.0
5-9	-1.0	1.6	2.0	2.5
10-14	+3.1	2.4	2.9	3.7
15-19	-1.2	1.8	2.2	2.9
20-24	-1.9	1.7	1.9	2.5
25-29	-1.4	1.7	2.0	2.7
30-34	+0.4	2.3	2.8	3.6
35-39	+0.9	2.3	2.8	3.4
40-44	+4.9	2.4	3.0	4.0
45-49	+1.2	2.1	2.6	3.4
50-54	+1.8	2.0	2.4	3.2
55-59	+2.8	1.8	2.1	3.0
60-64	-5.1	3.7	3.8	4.5
65-69	+2.9	1.2	1.5	2.0
70-74	-2.3	2.3	2.6	3.3
75-79	+1.9	0.5	0.7	0.9
80-84	-0.1	0.1	0.1	0.2
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 (\$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 <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
1	-2.1	67.4	75.3	89.5
4	-0.5	33.8	40.9	51.1
8	-0.1	24.6	28.5	41.1
16	+0.2	17.5	20.7	27.4
32	+0.6	12.2	14.7	19.6
64	+0.5	8.3	9.7	13.6
128	+0.4	6.0	7.3	9.8
256	+0.6	4.6	5.4	7.4
512	+0.6	3.1	3.7	5.1
1,024	+0.6	2.2	2.6	3.4
2,048	+0.6	1.5	1.9	2.6
4,096	+0.6	1.1	1.3	1.7
8,192	+0.5	0.8	0.9	1.1
16,384	+0.5	0.5	0.7	0.9

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	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Total Accuracy</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.1	48.3	0.0	51.7	51.7	-99.7
≤9	1.0	47.3	0.0	51.7	52.6	-95.9
≤14	3.4	44.9	0.3	51.4	54.8	-85.3
≤19	7.8	40.5	0.7	50.9	58.8	-66.1
≤24	14.0	34.3	1.6	50.1	64.0	-38.8
≤29	20.3	28.0	2.6	49.1	69.4	-10.6
≤34	26.2	22.2	4.6	47.0	73.2	+17.9
≤39	31.9	16.4	7.3	44.4	76.3	+47.3
≤44	36.7	11.6	11.0	40.7	77.4	+74.7
≤49	41.5	6.8	16.7	35.0	76.5	+65.5
≤54	44.9	3.5	23.4	28.3	73.2	+51.6
≤59	46.7	1.6	30.2	21.4	68.1	+37.4
≤64	47.8	0.5	36.4	15.3	63.0	+24.6
≤69	48.1	0.2	41.4	10.3	58.4	+14.3
≤74	48.3	0.0	45.4	6.3	54.6	+6.1
≤79	48.3	0.0	48.2	3.5	51.8	+0.2
≤84	48.3	0.0	49.8	1.9	50.2	-3.1
≤89	48.3	0.0	50.9	0.8	49.1	-5.3
≤94	48.3	0.0	51.4	0.2	48.6	-6.5
≤100	48.3	0.0	51.7	0.0	48.3	-7.0

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 the 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	0.1	100.0	0.1	Only poor targeted
≤9	1.0	97.0	2.0	32.6:1
≤14	3.7	92.9	7.1	13.0:1
≤19	8.6	91.3	16.2	10.5:1
≤24	15.6	89.6	28.9	8.6:1
≤29	22.9	88.8	42.0	7.9:1
≤34	30.8	84.9	54.2	5.6:1
≤39	39.2	81.3	66.1	4.4:1
≤44	47.7	76.9	76.0	3.3:1
≤49	58.1	71.4	85.8	2.5:1
≤54	68.2	65.8	92.8	1.9:1
≤59	76.9	60.7	96.6	1.5:1
≤64	84.2	56.7	98.9	1.3:1
≤69	89.5	53.7	99.6	1.2:1
≤74	93.7	51.6	99.9	1.1:1
≤79	96.5	50.1	100.0	1.0:1
≤84	98.1	49.2	100.0	1.0:1
≤89	99.2	48.7	100.0	0.9:1
≤94	99.8	48.4	100.0	0.9:1
≤100	100.0	48.3	100.0	0.9:1

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	98.0
10-14	97.2
15-19	94.9
20-24	93.6
25-29	92.0
30-34	86.6
35-39	81.6
40-44	74.1
45-49	61.8
50-54	53.7
55-59	37.2
60-64	25.1
65-69	16.7
70-74	12.2
75-79	6.5
80-84	2.1
85-89	0.9
90-94	0.0
95-100	0.0

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

Score	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
0-4	+0.0	0.0	0.0	0.0
5-9	-0.4	1.6	1.8	2.3
10-14	+2.2	1.8	2.0	2.6
15-19	+0.6	1.4	1.8	2.4
20-24	-0.9	1.2	1.4	1.9
25-29	-1.9	1.5	1.6	1.8
30-34	+0.5	1.7	2.1	2.9
35-39	-0.3	1.9	2.3	3.0
40-44	+2.6	2.2	2.7	3.5
45-49	+1.0	2.2	2.6	3.5
50-54	+3.0	2.2	2.6	3.3
55-59	-1.5	2.3	2.8	3.6
60-64	-3.4	3.0	3.2	3.7
65-69	+3.2	1.9	2.3	3.3
70-74	+2.8	2.4	2.7	3.5
75-79	+3.7	1.3	1.5	2.0
80-84	+2.0	0.1	0.1	0.2
85-89	+0.3	0.6	0.7	0.9
90-94	+0.0	0.0	0.0	0.0
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 <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
1	-1.7	68.5	78.2	88.8
4	-0.3	32.9	39.3	49.0
8	-0.1	24.8	28.6	37.7
16	+0.3	16.6	20.6	27.3
32	+0.3	11.8	14.6	19.8
64	+0.4	8.0	9.9	13.4
128	+0.4	5.8	7.0	9.5
256	+0.6	4.3	5.1	6.7
512	+0.6	2.9	3.4	4.5
1,024	+0.6	2.0	2.5	3.2
2,048	+0.6	1.5	1.8	2.4
4,096	+0.6	1.1	1.2	1.7
8,192	+0.6	0.7	0.9	1.1
16,384	+0.6	0.5	0.6	0.8

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	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Total Accuracy</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.1	59.9	0.0	40.0	40.1	-99.8
≤9	1.0	59.0	0.0	40.0	41.0	-96.7
≤14	3.5	56.5	0.2	39.8	43.4	-88.0
≤19	8.2	51.8	0.4	39.6	47.7	-72.1
≤24	14.8	45.2	0.8	39.2	54.0	-49.3
≤29	21.6	38.4	1.3	38.7	60.3	-25.9
≤34	28.4	31.5	2.4	37.6	66.1	-1.2
≤39	35.4	24.6	3.8	36.2	71.6	+24.5
≤44	41.6	18.4	6.1	33.9	75.4	+48.8
≤49	48.1	11.9	10.0	30.0	78.1	+77.1
≤54	53.3	6.7	14.9	25.1	78.4	+75.2
≤59	56.6	3.4	20.3	19.7	76.4	+66.2
≤64	58.7	1.3	25.5	14.5	73.2	+57.5
≤69	59.5	0.5	30.0	10.0	69.5	+50.0
≤74	59.9	0.1	33.8	6.2	66.1	+43.7
≤79	60.0	0.0	36.5	3.5	63.4	+39.1
≤84	60.0	0.0	38.2	1.8	61.8	+36.4
≤89	60.0	0.0	39.2	0.8	60.8	+34.7
≤94	60.0	0.0	39.8	0.2	60.2	+33.7
≤100	60.0	0.0	40.0	0.0	60.0	+33.3

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 the 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	0.1	100.0	0.1	Only poor targeted
≤9	1.0	98.2	1.7	55.4:1
≤14	3.7	95.7	5.9	22.3:1
≤19	8.6	95.2	13.6	19.8:1
≤24	15.6	94.8	24.7	18.3:1
≤29	22.9	94.4	36.0	16.9:1
≤34	30.8	92.3	47.4	12.1:1
≤39	39.2	90.3	59.1	9.3:1
≤44	47.7	87.1	69.3	6.8:1
≤49	58.1	82.8	80.2	4.8:1
≤54	68.2	78.2	88.9	3.6:1
≤59	76.9	73.6	94.4	2.8:1
≤64	84.2	69.7	97.8	2.3:1
≤69	89.5	66.5	99.2	2.0:1
≤74	93.7	63.9	99.8	1.8:1
≤79	96.5	62.1	100.0	1.6:1
≤84	98.1	61.1	100.0	1.6:1
≤89	99.2	60.5	100.0	1.5:1
≤94	99.8	60.1	100.0	1.5:1
≤100	100.0	60.0	100.0	1.5:1

Tables for
the \$8.00/day 2005 PPP Poverty Line

Figure 4 (\$8.00/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	100.0
5-9	100.0
10-14	100.0
15-19	100.0
20-24	99.9
25-29	99.9
30-34	99.9
35-39	99.9
40-44	99.6
45-49	98.7
50-54	96.9
55-59	95.3
60-64	91.9
65-69	87.2
70-74	83.3
75-79	73.7
80-84	56.2
85-89	37.7
90-94	17.1
95-100	11.8

Figure 7 (\$8.00/day line): Average differences between estimated and true poverty likelihoods for households from 1,000 bootstraps of $n = 16,384$ with confidence intervals by score range, scorecard applied to the validation sample

Score	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
0-4	+0.0	0.0	0.0	0.0
5-9	+0.0	0.0	0.0	0.0
10-14	+0.0	0.0	0.0	0.0
15-19	+0.0	0.0	0.0	0.0
20-24	-0.1	0.0	0.0	0.0
25-29	-0.1	0.1	0.1	0.1
30-34	-0.1	0.0	0.0	0.0
35-39	+0.1	0.2	0.2	0.2
40-44	+0.6	0.6	0.7	0.8
45-49	+1.7	0.8	0.9	1.2
50-54	-0.5	0.7	0.8	1.2
55-59	-0.5	1.0	1.1	1.5
60-64	-1.1	1.4	1.7	2.1
65-69	+5.0	2.3	2.8	3.5
70-74	-1.7	2.7	3.3	4.2
75-79	+8.2	4.3	5.2	6.6
80-84	+5.9	6.0	7.1	9.2
85-89	+8.6	6.2	7.6	9.9
90-94	+8.8	4.4	5.3	6.8
95-100	+9.6	2.3	2.8	3.7

Figure 8 (\$8.00/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 <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
1	-0.5	16.9	50.0	80.1
4	+0.6	17.8	22.5	37.4
8	+0.5	12.6	16.9	25.0
16	+0.7	9.3	11.9	15.8
32	+0.6	6.1	7.5	10.8
64	+0.9	4.7	5.7	7.7
128	+0.9	3.5	4.0	5.4
256	+0.8	2.4	2.8	3.9
512	+0.8	1.7	2.0	2.8
1,024	+0.8	1.2	1.4	1.9
2,048	+0.8	0.9	1.1	1.5
4,096	+0.8	0.6	0.8	1.0
8,192	+0.8	0.5	0.5	0.7
16,384	+0.8	0.3	0.4	0.5

Figure 11 (\$8.00/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	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Total Accuracy</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.1	94.0	0.0	5.9	6.0	-99.9
≤9	1.0	93.1	0.0	5.9	6.9	-97.8
≤14	3.7	90.4	0.0	5.9	9.6	-92.2
≤19	8.6	85.5	0.0	5.9	14.5	-81.8
≤24	15.6	78.5	0.0	5.9	21.5	-66.8
≤29	22.9	71.2	0.0	5.9	28.8	-51.4
≤34	30.8	63.3	0.0	5.9	36.7	-34.5
≤39	39.2	54.9	0.0	5.9	45.1	-16.6
≤44	47.6	46.5	0.1	5.8	53.5	+1.3
≤49	57.8	36.3	0.3	5.6	63.4	+23.2
≤54	67.7	26.4	0.6	5.3	73.0	+44.4
≤59	76.0	18.1	0.9	5.0	80.9	+62.5
≤64	82.8	11.3	1.4	4.5	87.3	+77.5
≤69	87.3	6.8	2.2	3.7	91.0	+87.9
≤74	90.8	3.3	2.8	3.1	93.9	+96.1
≤79	92.8	1.3	3.8	2.1	94.9	+96.0
≤84	93.6	0.5	4.5	1.4	95.0	+95.2
≤89	94.0	0.1	5.2	0.7	94.7	+94.5
≤94	94.1	0.0	5.7	0.2	94.3	+94.0
≤100	94.1	0.0	5.9	0.0	94.1	+93.7

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

Figure 12 (\$8.00/day line): Share of all households who are targeted (that is, score at or below the 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	0.1	100.0	0.1	Only poor targeted
≤9	1.0	100.0	1.1	Only poor targeted
≤14	3.7	100.0	3.9	Only poor targeted
≤19	8.6	100.0	9.1	Only poor targeted
≤24	15.6	100.0	16.6	Only poor targeted
≤29	22.9	100.0	24.3	Only poor targeted
≤34	30.8	100.0	32.7	Only poor targeted
≤39	39.2	100.0	41.7	2,333.3:1
≤44	47.7	99.8	50.6	625.6:1
≤49	58.1	99.4	61.4	172.1:1
≤54	68.2	99.2	71.9	117.3:1
≤59	76.9	98.8	80.7	80.2:1
≤64	84.2	98.4	88.0	60.1:1
≤69	89.5	97.5	92.8	39.3:1
≤74	93.7	97.0	96.5	32.2:1
≤79	96.5	96.1	98.6	24.7:1
≤84	98.1	95.4	99.5	20.6:1
≤89	99.2	94.8	99.9	18.1:1
≤94	99.8	94.3	100.0	16.5:1
≤100	100.0	94.1	100.0	15.9:1

Tables for
the \$1.90/day 2011 PPP Poverty Line

Figure 4 (\$1.90/day 2011 PPP 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	77.6
10-14	66.4
15-19	60.8
20-24	51.5
25-29	47.0
30-34	33.0
35-39	27.8
40-44	21.4
45-49	14.8
50-54	6.4
55-59	3.5
60-64	1.1
65-69	0.7
70-74	0.1
75-79	0.0
80-84	0.0
85-89	0.0
90-94	0.0
95-100	0.0

Figure 7 (\$1.90/day 2011 PPP line): Average differences between estimated and true poverty likelihoods for households from 1,000 bootstraps of $n = 16,384$ with confidence intervals by score range, scorecard applied to the validation sample

Score	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
0–4	+18.9	20.3	23.5	30.2
5–9	–0.9	5.5	6.6	8.2
10–14	–6.4	5.0	5.4	6.5
15–19	–2.8	3.0	3.6	4.5
20–24	+0.2	2.6	3.0	3.9
25–29	+3.5	2.5	3.1	4.1
30–34	+0.8	2.4	2.8	3.7
35–39	+0.3	2.2	2.6	3.3
40–44	–0.5	1.9	2.2	3.2
45–49	+0.9	1.5	1.8	2.3
50–54	–0.1	1.0	1.2	1.6
55–59	+0.9	0.7	0.8	1.0
60–64	–0.3	0.5	0.6	0.8
65–69	+0.1	0.4	0.4	0.6
70–74	+0.1	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
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 (\$1.90/day 2011 PPP 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 <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
1	-1.8	59.6	68.4	80.0
4	-0.7	32.1	37.9	48.4
8	-0.4	22.6	26.9	35.0
16	-0.2	15.6	18.1	24.9
32	+0.2	11.1	13.2	17.2
64	+0.2	7.8	9.3	11.3
128	+0.1	5.5	6.5	8.8
256	+0.1	3.9	4.5	6.0
512	+0.1	2.8	3.3	4.3
1,024	+0.2	2.1	2.4	3.1
2,048	+0.2	1.4	1.7	2.1
4,096	+0.1	1.0	1.2	1.6
8,192	+0.1	0.7	0.9	1.1
16,384	+0.1	0.5	0.6	0.8

Figure 11 (\$1.90/day 2011 PPP line): Shares of households by cut-off score and targeting classification, along with “Total Accuracy” and BPAC, scorecard applied to the validation sample

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Total Accuracy</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.1	22.6	0.0	77.4	77.4	-99.5
≤9	0.8	21.9	0.3	77.1	77.9	-92.2
≤14	2.7	19.9	1.0	76.4	79.1	-71.7
≤19	5.9	16.7	2.7	74.7	80.6	-36.1
≤24	9.6	13.0	6.0	71.4	81.0	+11.4
≤29	12.8	9.8	10.1	67.3	80.1	+55.3
≤34	15.5	7.1	15.3	62.0	77.5	+32.1
≤39	18.0	4.6	21.3	56.1	74.1	+6.0
≤44	19.9	2.7	27.8	49.6	69.5	-22.9
≤49	21.4	1.2	36.7	40.7	62.1	-62.3
≤54	22.2	0.4	46.1	31.3	53.5	-103.7
≤59	22.4	0.2	54.5	22.9	45.3	-141.0
≤64	22.6	0.0	61.6	15.8	38.3	-172.6
≤69	22.6	0.0	66.9	10.5	33.1	-195.9
≤74	22.6	0.0	71.1	6.3	28.9	-214.2
≤79	22.6	0.0	73.9	3.5	26.1	-226.9
≤84	22.6	0.0	75.5	1.9	24.5	-234.1
≤89	22.6	0.0	76.6	0.8	23.4	-238.7
≤94	22.6	0.0	77.2	0.2	22.8	-241.3
≤100	22.6	0.0	77.4	0.0	22.6	-242.3

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

Figure 12 (\$1.90/day 2011 PPP line): Share of all households who are targeted (that is, score at or below the 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	0.1	80.6	0.2	4.1:1
≤9	1.0	74.8	3.3	3.0:1
≤14	3.7	73.3	11.9	2.7:1
≤19	8.6	68.6	26.0	2.2:1
≤24	15.6	61.4	42.4	1.6:1
≤29	22.9	55.9	56.5	1.3:1
≤34	30.8	50.2	68.4	1.0:1
≤39	39.2	45.8	79.5	0.8:1
≤44	47.7	41.8	88.2	0.7:1
≤49	58.1	36.9	94.8	0.6:1
≤54	68.2	32.5	98.0	0.5:1
≤59	76.9	29.2	99.3	0.4:1
≤64	84.2	26.8	99.8	0.4:1
≤69	89.5	25.3	100.0	0.3:1
≤74	93.7	24.1	100.0	0.3:1
≤79	96.5	23.4	100.0	0.3:1
≤84	98.1	23.0	100.0	0.3:1
≤89	99.2	22.8	100.0	0.3:1
≤94	99.8	22.7	100.0	0.3:1
≤100	100.0	22.6	100.0	0.3:1

Tables for
the \$3.10/day 2011 PPP Poverty Line

Figure 4 (\$3.10/day 2011 PPP 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	95.8
10-14	91.3
15-19	85.1
20-24	84.9
25-29	83.5
30-34	68.5
35-39	64.2
40-44	56.1
45-49	40.0
50-54	29.5
55-59	19.2
60-64	10.5
65-69	7.3
70-74	4.2
75-79	2.5
80-84	0.0
85-89	0.0
90-94	0.0
95-100	0.0

Figure 7 (\$3.10/day 2011 PPP line): Average differences between estimated and true poverty likelihoods for households from 1,000 bootstraps of $n = 16,384$ with confidence intervals by score range, scorecard applied to the validation sample

Score	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	–1.9	1.7	2.0	2.5
10–14	+3.5	2.8	3.3	4.5
15–19	–3.1	2.5	2.7	3.3
20–24	–0.6	1.8	2.1	2.8
25–29	–1.3	1.8	2.1	2.7
30–34	–0.7	2.4	2.8	3.8
35–39	–0.8	2.3	2.8	3.5
40–44	+3.3	2.4	3.0	4.1
45–49	+0.1	2.1	2.5	3.4
50–54	+0.5	2.0	2.4	3.4
55–59	+1.5	1.7	2.1	2.8
60–64	–1.4	2.0	2.3	3.1
65–69	+3.0	1.1	1.4	1.9
70–74	+0.4	2.1	2.4	3.3
75–79	+1.8	0.5	0.7	0.9
80–84	–0.1	0.1	0.1	0.1
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 (\$3.10/day 2011 PPP 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 <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval (\pm percentage points)		
		90-percent	95-percent	99-percent
1	-2.2	69.5	74.6	88.8
4	-0.9	33.4	39.1	51.9
8	-0.3	24.3	29.0	39.1
16	-0.0	17.5	19.9	28.0
32	+0.1	11.9	15.1	18.8
64	+0.1	8.4	9.9	14.1
128	+0.1	6.2	7.2	9.6
256	+0.3	4.5	5.3	7.3
512	+0.3	3.1	3.7	4.9
1,024	+0.3	2.2	2.6	3.4
2,048	+0.3	1.6	1.8	2.4
4,096	+0.3	1.1	1.3	1.7
8,192	+0.3	0.8	0.9	1.1
16,384	+0.2	0.5	0.7	0.9

Figure 11 (\$3.10/day 2011 PPP line): Shares of households by cut-off score and targeting classification, along with “Total Accuracy” and BPAC, scorecard applied to the validation sample

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Total Accuracy</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.1	45.6	0.0	54.3	54.4	-99.7
≤9	1.0	44.7	0.0	54.3	55.3	-95.6
≤14	3.4	42.3	0.3	54.0	57.3	-84.6
≤19	7.7	38.0	0.9	53.4	61.1	-64.4
≤24	13.6	32.1	2.0	52.3	66.0	-36.0
≤29	19.8	25.9	3.1	51.2	71.0	-6.6
≤34	25.3	20.3	5.5	48.9	74.2	+23.0
≤39	30.9	14.8	8.4	45.9	76.8	+53.5
≤44	35.4	10.2	12.3	42.0	77.5	+73.1
≤49	39.8	5.9	18.4	35.9	75.7	+59.8
≤54	42.8	2.9	25.4	28.9	71.7	+44.4
≤59	44.5	1.2	32.4	21.9	66.4	+29.0
≤64	45.3	0.4	38.9	15.4	60.7	+14.8
≤69	45.6	0.1	44.0	10.4	55.9	+3.8
≤74	45.7	0.0	48.0	6.3	52.0	-5.1
≤79	45.7	0.0	50.8	3.5	49.2	-11.3
≤84	45.7	0.0	52.5	1.9	47.5	-14.9
≤89	45.7	0.0	53.5	0.8	46.5	-17.2
≤94	45.7	0.0	54.1	0.2	45.9	-18.4
≤100	45.7	0.0	54.3	0.0	45.7	-18.9

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

Figure 12 (\$3.10/day 2011 PPP line): Share of all households who are targeted (that is, score at or below the 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	0.1	100.0	0.1	Only poor targeted
≤9	1.0	97.0	2.1	32.6:1
≤14	3.7	91.0	7.3	10.1:1
≤19	8.6	89.7	16.8	8.7:1
≤24	15.6	87.3	29.8	6.9:1
≤29	22.9	86.5	43.3	6.4:1
≤34	30.8	82.3	55.5	4.6:1
≤39	39.2	78.6	67.5	3.7:1
≤44	47.7	74.3	77.6	2.9:1
≤49	58.1	68.4	87.0	2.2:1
≤54	68.2	62.8	93.8	1.7:1
≤59	76.9	57.8	97.4	1.4:1
≤64	84.2	53.8	99.2	1.2:1
≤69	89.5	50.9	99.8	1.0:1
≤74	93.7	48.7	99.9	1.0:1
≤79	96.5	47.3	100.0	0.9:1
≤84	98.1	46.5	100.0	0.9:1
≤89	99.2	46.0	100.0	0.9:1
≤94	99.8	45.8	100.0	0.8:1
≤100	100.0	45.7	100.0	0.8:1