A Simple Poverty Scorecard for Bangladesh

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This document and related tools are at `microfinance.com/#Bangladesh`.

Abstract

This study uses Bangladesh's 2010 Household Income and Expenditure Survey to construct an easy-to-use scorecard that estimates the likelihood that a household has expenditure below a given poverty line. The scorecard uses ten simple indicators that field workers can collect in about ten minutes, and poverty scores can be computed by hand in the field. The scorecard's bias and precision are reported for a range of poverty lines. The simple poverty scorecard is a practical way for pro-poor programs in Bangladesh to measure poverty rates, to track changes in poverty rates over time, and to target services.

Version note

This paper updates Chen and Schreiner (2009), using data from 2010 instead of 2005. Estimates from the two scorecards are compatible because they use the same definition of *poverty*, so users of the old scorecard can (and should) switch to the new one here.

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Entity	Name	ID	Date (DD/MM/YY)	
Participant:			Date joined:	
Field agent:			Date scored:	
Service point:			# HH members:	

Indicator	Response	Points	Score
1. How many household members are 12-years-old or younger?	A. Three or more	0	
	B. Two	10	
	C. One	16	
	D. None	29	
2. Do all household members ages 6-to-12 currently attend a school/educational institution?	A. No	0	
	B. No one 6-to-12	3	
	C. Yes	6	
3. In the past year, did any household member ever do work for which he/she was paid on a daily basis?	A. Yes	0	
	B. No	8	
4. How many rooms does your household occupy (excluding rooms used for business)?	A. One	0	
	B. Two	3	
	C. Three or more	5	
5. What is the main construction material of the walls of the main room?	A. Hemp/hay/bamboo, or other	0	
	B. Mud brick, or C.I. sheet/wood	2	
	C. Brick/cement	9	
6. Does the household own any televisions?	A. No	0	
	B. Yes	7	
7. How many fans does the household own?	A. None	0	
	B. One	4	
	C. Two or more	7	
8. How many mobile phones does the household own?	A. None	0	
	B. One	8	
	C. Two or more	15	
9. Does the household own any bicycles, motorcycle/scooters, or motor cars etc.?	A. No	0	
	B. Yes	4	
10. Does the household own (or rent/sharecrop/mortgage in or out) 51 or more decimals of cultivable agricultural land (excluding uncultivable land and dwelling-house/homestead land)?	A. No	0	
	B. Yes	7	

Microfinance Risk Management, L.L.C., `microfinance.com` **Score:**

Back-page Worksheet:
Household Members, Education, and Employment

At the start, read to the respondent: *Please give me the names and ages of all household members. A* household *is a dwelling unit where one or more people live and eat together. They may or may not be related by blood or marriage.* Household members *include permanent family members as well as lodgers or employees who normally live and eat in the household as well as people temporarily absent. People who usually live and eat somewhere else but who are visiting the household temporarily at the time of the interview are not considered to be* household members.

Record each household member's name and age. Mark the total number of household members in the scorecard header next to "# HH members". Then mark Indicator 1 with the number of members who are 12-years-old or younger. For 6- to 12-year-olds, ask about school attendance, and mark Indicator 2 accordingly. For all household members 5-years-old or older, ask whether they ever did any work in the past year for which they were paid on a daily basis. Use the responses to mark Indicator 3.

Name	Age	If <name> is 6- to 12-years-old, does he or she currently attend a school/educational institution?			In the past year, did <name> ever do work for which he/she was paid on a daily basis?	
1.		Not 6-to-12	No	Yes	No	Yes
2.		Not 6-to-12	No	Yes	No	Yes
3.		Not 6-to-12	No	Yes	No	Yes
4.		Not 6-to-12	No	Yes	No	Yes
5.		Not 6-to-12	No	Yes	No	Yes
6.		Not 6-to-12	No	Yes	No	Yes
7.		Not 6-to-12	No	Yes	No	Yes
8.		Not 6-to-12	No	Yes	No	Yes
9.		Not 6-to-12	No	Yes	No	Yes
10.		Not 6-to-12	No	Yes	No	Yes
11.		Not 6-to-12	No	Yes	No	Yes
12.		Not 6-to-12	No	Yes	No	Yes
13.		Not 6-to-12	No	Yes	No	Yes
14.		Not 6-to-12	No	Yes	No	Yes
15.		Not 6-to-12	No	Yes	No	Yes

Look-up table for converting scores to poverty likelihoods

	Poverty likelihood (%)								
	Natl.	National Upper			USAID	Intl. 2005 PPP			
Score	Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
0–4	76.2	87.3	98.4	100.0	65.8	97.9	98.8	100.0	100.0
5–9	70.6	84.6	97.7	99.5	65.6	89.3	98.2	98.7	99.7
10–14	63.6	82.1	97.6	99.5	57.2	88.8	98.2	98.7	99.7
15–19	46.4	68.0	96.2	99.5	42.5	81.6	96.9	98.6	99.7
20–24	37.1	62.7	96.1	99.5	32.7	78.0	96.3	98.4	99.7
25–29	26.6	50.4	88.7	97.9	22.9	65.8	91.6	95.3	98.7
30–34	19.1	40.9	84.3	96.0	16.9	57.0	87.9	93.5	98.2
35–39	15.0	36.0	80.8	93.6	13.8	50.3	83.6	90.7	96.9
40–44	12.7	26.7	76.1	91.9	11.1	40.8	79.6	87.4	94.9
45–49	6.6	19.6	65.8	86.6	5.4	33.5	68.8	79.6	91.5
50–54	3.9	14.7	55.0	81.3	4.5	24.2	60.3	74.2	87.9
55–59	1.5	7.1	42.6	75.6	1.8	14.5	50.4	65.2	84.3
60–64	0.9	5.3	34.8	64.9	1.0	10.9	40.4	54.6	73.2
65–69	0.4	4.4	28.6	52.5	0.1	8.7	32.2	44.5	63.3
70–74	0.2	2.3	24.6	51.0	0.0	5.6	31.5	42.9	60.4
75–79	0.0	1.2	21.4	40.3	0.0	4.3	25.8	34.0	50.7
80–84	0.0	0.5	17.0	32.0	0.0	2.7	19.7	26.7	40.9
85–89	0.0	0.0	8.3	24.9	0.0	0.0	10.7	14.6	33.3
90–94	0.0	0.0	3.9	9.9	0.0	0.0	5.1	6.6	12.3
95–100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

A Simple Poverty Scorecard for Bangladesh

1. Introduction

This paper presents a simple poverty scorecard that pro-poor programs in Bangladesh can use to estimate the likelihood that a household has expenditure below a given poverty line, to measure groups' poverty rates at a point in time, to track changes in groups' poverty rates over time, and to target services to households.

The new poverty scorecard here uses 2010 data; it replaces the scorecard in Chen and Schreiner (2009) that uses 2005 data. For now on, only the new 2010 scorecard should be used. For a given poverty line, estimates from both the old and new scorecards are compatible because they are based on the same definition of *poverty*. This means that existing users of the old scorecard do not have to start over from scratch; they can estimate changes in poverty rates over time with a baseline from the old 2005 scorecard and a follow-up from the new 2010 scorecard.

The direct approach to poverty measurement via expenditure surveys is difficult and costly. As a case in point, Bangladesh's 2010 Household Income and Expenditure Survey (HIES) runs 40 pages. Enumerators visited each household every other day for two weeks to record daily consumption and to ask other once-off questions. In all, the HIES collected more than 400 expenditure items.

In comparison, the indirect approach via poverty scoring is simple, quick, and inexpensive. It uses ten verifiable indicators (such as "What is the main construction material of the walls of the main room?" and "How many fans does the household own?") to get a score that is highly correlated with poverty status as measured by the exhaustive HIES survey.

The poverty scorecard differs from "proxy means tests" (Coady, Grosh, and Hoddinott, 2004) in that it is transparent, it is freely available, 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.

Poverty scoring can be used to measure the share of a program's participants who are below a given poverty line, for example, the Millennium Development Goals' $1.25/day line at 2005 purchase-power parity (PPP). USAID microenterprise partners can use scoring with the $1.25/day line to report how many of their participants are "very poor".[1] Scoring can also be used to measure net movement across a poverty line

[1] USAID defines a household as "very poor" if its daily per-capita expenditure is below the highest of the $1.25/day 2005 PPP line (BDT59.32 in Bangladesh in 2010, Figure 1) or the USAID "extreme" line that divides people in households below Bangladesh's upper national poverty line into two equal-size groups (BDT52.64).

over time. In all these cases, the poverty scorecard provides an expenditure-based, objective tool with known accuracy. While expenditure surveys are costly even for governments, some local pro-poor organizations may be able to implement an inexpensive scorecard 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 poverty scoring on their own and apply it to inform their decisions, then they must first trust that it works. Transparency and simplicity build trust. Getting "buy-in" matters; proxy means tests and regressions on the "determinants of poverty" have been around for three decades, but they are rarely used to inform decisions by local, pro-poor organizations. This is not because they do not work, but because they are presented (when they are presented at all) as tables of regression coefficients incomprehensible to non-specialists (with cryptic indicator names such as "`LGHHSZ_2`" and with points with negative values and many decimal places). Thanks to the predictive-modeling phenomenon known as the "flat maximum", simple scoring approaches can be about as accurate as complex ones (Schreiner, 2012; Caire and Schreiner, 2012).

Beyond its simplicity and transparency, the poverty 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 these 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 scorecards.

The scorecard is based on data from the 2010 HIES from the Bangladesh Bureau of Statistics (BBS). 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 Bangladesh

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.

Poverty scoring 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 expenditure below a given poverty line.

Second, poverty scoring 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, poverty scoring can estimate changes in the poverty rate for a group of households (or for two independent samples of households that are both 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).

Poverty scoring 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 expenditure data and Bangladesh's $1.25/day 2005 PPP poverty line. Scores from this one scorecard are calibrated to poverty likelihoods for nine poverty lines.

The scorecard is constructed and calibrated using half of the data from the 2010 HIES. 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. Furthermore, accuracy for estimating changes in poverty rates for the population over time is tested using the validation sample from the 2010 HIES and all the data from the 2000 HIES and the 2005 HIES.

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 2010.[2]

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 must assume that the future relationships between indicators and poverty in all possible groups of households will be

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

the same as in the construction data. Of course, this assumption—inevitable in predictive modeling—holds only partly.

When applied to the 2010 validation sample with 1,000 bootstraps of $n = 16{,}384$, the average difference between scorecard estimates of groups' poverty rates and the true rates at a point in time with the upper national line is +0.2 percentage points. The average absolute difference across all nine lines is 0.4 percentage points. These differences are due to sampling variation rather than bias; the average difference would be zero if the whole 2010 HIES were to be repeatedly redrawn 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 ±2.3 percentage points or less.

To check the accuracy and precision of estimates of changes in poverty rates over time, the new 2010 scorecard[3] is applied to the 2010 validation sample as a baseline and then again to data from the full 2000 HIES or the full 2005 HIES as follow-up estimates. The average absolute difference in 1,000 bootstraps with $n = 16{,}384$ across eight poverty lines[4] is 5.2 percentage points for 2000–2010 and 1.8

[3] The 2000 and 2005 HIES did not ask "How many mobile phones does the household own?" To enable estimating change over time, this indicator was removed from the scorecard, and points and poverty likelihoods were derived anew.

[4] The USAID "extreme" line is not considered because it is not constant in real terms.

percentage points for 2005–2010. The average relative absolute error was about 60 percent for 2000–2010 and about 30 percent for 2005–2010.

In general, estimates of change over time are more accurate for:

- Shorter periods
- Lower poverty lines
- Greater true changes in poverty

All estimates of change correctly indicate a decrease in poverty, and 12 of the 16 are statistically different from zero with 90-percent confidence and $n = 4{,}096$.

Section 2 below describes data and poverty lines. Sections 3 and 4 describe scorecard construction and offer guidelines for use in practice. Sections 5 and 6 detail the estimation of households' poverty likelihoods and of 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 similar exercises for Bangladesh. The last section is a summary.

2. Data and poverty lines

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

2.1 Data

The scorecard is based on data from the 12,240 households in the 2010 HIES. This is Bangladesh's most recent national expenditure survey.

For the purposes of poverty scoring, the households in the 2010 HIES 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

In addition, the entire 2000 HIES and the entire 2005 HIES are used to validate estimates of change over time.

2.2 Poverty rates

A *poverty rate* is the share of units in households in which total household expenditure (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 has 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 expenditure 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 has four members, two of whom are program participants.

Poverty rates are either at the household-level or person-level. 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 households with participants. In the example here, this is $\frac{1 \cdot 1 + 1 \cdot 0}{1 + 1} = \frac{1}{2} = 0.5 = 50$ percent. In the "$1 \cdot 1$" term in the numerator, the first "1" is the first household's weight, and the second "1" is the first household's poverty status (poor). In the "$1 \cdot 0$" term in the numerator, the "1" is the second household's weight, and the "0" is the second household's poverty status (non-poor). The "$1 + 1$" in the denominator is the sum of the weights of the two households. Each household has a weight of one (1) because the unit of analysis is the household.

Alternatively, a person-level rate is relevant if a program defines all people in households that benefit from its services as *participants*. In the example here, the person-level rate is the household-size-weighted average 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 "$3 \cdot 1$" 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 "$4 \cdot 0$" term in the numerator, the "4" is

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

As a final example—one that pertains to what is likely the most common situation in practice—a program counts as *participants* only those household members with whom it deals with directly. For the example here, this means that some—but not all—household members are counted. The person-level rate is now the participant-weighted average of the poverty statuses of households with participants, or $\frac{1 \cdot 1 + 2 \cdot 0}{1 + 2} = \frac{1}{3} = 0.33 = 33$ percent. The first "1" in the "$1 \cdot 1$" in the numerator is the first household's weight because it has one participant, and the second "1" is its poverty status (poor). In the "$2 \cdot 0$" term in the numerator, the "2" is the second household's weight because it has two participants, and the zero is its poverty status (non-poor). The "$1 + 2$" in the denominator is the sum of the weights of the two households. Each household's weight is its number of participants because the unit of analysis is the participant.

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

Figure 1 reports poverty rates and poverty lines for Bangladesh for both households and people in 2000, 2005, and 2010 and for the construction and validation samples in 2010. Figure 2 is similar, covering Bangladesh overall and each of its 16 poverty-line regions.[5] 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 discussed above—household-level poverty likelihoods can be straightforwardly converted into poverty rates for other units of analysis. This is also why the poverty scorecard is constructed, calibrated, and validated with household weights.

2.3 Poverty lines

Bangladesh has a "lower" national poverty line and an "upper" national poverty line. Both are based on the cost-of-basic-needs method (Ahmed, 2004; Ravallion, 1998). Their derivation starts with a "food line" that is the cost of 2,122 Calories from an 11-item basket of rice, wheat, pulses, milk, oil, meat, fish, potatoes, other vegetables, sugar, and fruits. Prices for the 16 poverty-line regions come from the HIES. Originally derived for the 2005 HIES, the food line was retrofitted to previous HIES surveys using food-price deflators and likewise updated for the 2010 HIES (BBS, 2011).

[5] During sampling for the 2010 HIES, Rangpur division was still part of Rajshahi.

For a given HIES round, the lower national poverty line is defined as the food line, plus the median expenditure on non-food items by households whose per-capita *total* expenditure is close to the food line (BBS, 2011). In 2010, the lower national line was BDT42.90 per person per day, giving a household-level poverty rate of 15.4 percent and a person-level poverty rate of 17.6 percent (Figure 1).

The upper line differs from the lower line in that the non-food part is the median expenditure on non-food items by households whose per-capita *food* (not *total*) expenditure is close to the food line. In 2010, this was BDT52.64 per person per day, giving poverty rates of 28.5 percent (households) and 31.5 percent (people).

Poverty rates in Bangladesh decreased from 2000 to 2010. The person-level rate for the lower line was halved, going from 34.3 percent to 17.6 percent. The rate for the upper line fell about 17 percentage points, from 48.9 percent to 31.5 percent.

Because local, pro-poor programs in Bangladesh may want to use different or various poverty lines, this paper calibrates scores from its single scorecard to poverty likelihoods for nine lines:

- Lower national
- 100% of upper national
- 150% of upper national
- 200% of upper national
- USAID "extreme"
- $1.25/day 2005 PPP
- $1.75/day 2005 PPP
- $2.00/day 2005 PPP
- $2.50/day 2005 PPP

The USAID "extreme" line is defined as the median per-capita expenditure of people (not households) in a given poverty-line region who are below the upper national line (United States Congress, 2004).

The scorecard here is constructed using the $1.25/day 2005 PPP line. It is derived from:

- 2005 PPP exchange rate of BDT25.49 per $1.00 (World Bank, 2008)
- Consumer Price Index for Bangladesh, averaged across months when the HIES was in the field:
  - 2000: 122.32
  - 2005: 158.30
  - 2010: 294.72
- Average upper national lines (Figure 1):
  - 2000: BDT22.51
  - 2005: BDT28.33
  - 2010: BDT52.64
- Upper national lines for each of 16 poverty-line regions (Figure 2)

In average prices for the months when the 2010 HIES was in the field, the $1.25/day 2005 PPP line for Bangladesh as a whole is (Sillers, 2006):

$$(2005\ \text{PPP exchange rate}) \cdot \$1.25 \cdot \left(\frac{\text{CPI}_{2010}}{\text{CPI}_{2005}}\right) = \left(\frac{\text{BDT}25.49}{\$1.00}\right) \cdot \$1.25 \cdot \left(\frac{294.72}{158.30}\right) = \text{BDT}59.32.$$

This line applies to Bangladesh as a whole. At the household level, it is adjusted for cost-of-living differences across poverty-line regions by multiplying it by the given region's upper line and then dividing it by Bangladesh's overall upper line.

The other 2005 PPP lines are multiples of the $1.25/day lines.

The definition of *poverty status*—that is, the definition of the measure of expenditure and the definitions of the lower national line, the upper national line, and the $1.25/day 2005 PPP line—is the same (after adjusting for price changes over time) in the 2010 HIES as in the 2000 HIES and the 2005 HIES (BBS, 2011). This means that estimates from the new scorecard (based on data from the 2010 HIES) are compatible with those from the previous scorecard (based on data from the 2005 HIES, see Chen and Schreiner, 2009). This compatibility means that existing users of the old 2005 scorecard can switch to the new 2010 scorecard and still measure changes in poverty rates over time with a baseline from the old scorecard and a follow-up from the new scorecard.

USAID microenterprise partners who use the new 2010 scorecard should report poverty rates to USAID based on the $1.25/day 2005 PPP line. This is because USAID defines "very poor" as those households whose expenditure is below the highest of two lines:

- $1.25/day 2005 PPP (BDT59.32, Figure 1)
- The USAID "extreme" line (BDT43.04).

3. Scorecard construction

For Bangladesh, about 120 candidate indicators are initially prepared in the areas of:

- Family composition (such as number of household members)
- Education (such as school attendance)
- Housing (such as number of rooms)
- Ownership of durable assets (such as televisions, fans, or bicycles)
- Employment (such as whether a household member is paid on a daily basis)
- Agriculture (such as use or ownership of cultivable land)

Figure 3 lists the candidate indicators, ordered by the entropy-based "uncertainty coefficient" (Goodman and Kruskal, 1979) that measures how well a given indicator predicts poverty on its own.

The scorecard also aims to measure *changes* in poverty through time. This means that, when selecting indicators and holding other considerations constant, preference is given to more sensitive indicators. For example, the ownership of a television 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 $1.25/day 2005 PPP 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 expenditure distribution, 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 best 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 statistical[6] and non-statistical criteria. The non-statistical criteria can improve robustness through time and helps ensure that indicators are simple, sensible, and acceptable to users.

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

The single poverty scorecard here applies to all of Bangladesh. Evidence from Indonesia (World Bank, 2012), India and Mexico (Schreiner, 2006a and 2005a), Sri Lanka (Narayan and Yoshida, 2005), Jamaica (Grosh and Baker, 1995), and Bangladesh (Sharif, 2009) suggests 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 it 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 and use it properly. Of course, accuracy matters, but it is balanced against 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, Bangladesh'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. It can be used with a simple spreadsheet database (Microfinance Risk Management, L.L.C., 2013) that records identifying information, dates, and indicator values and then computes and stores scores and poverty likelihoods.

A field worker using Bangladesh'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, school attendance, and receipt of a daily wage
- Record household size and the responses to the first, second, and third indicators based on the back-page worksheet
- Read each of the remaining seven questions one-by-one from the scorecard, drawing a circle around the relevant response options and their points, and writing the point value in the far right-hand column
- Add up the points to get the 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).[7] 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 is 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 poverty scorecard.[8]

For the example of Nigeria, Onwujekwe, Hanson, and Fox-Rushby (2006) find 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) find that gross underreporting of assets does not affect targeting. For the first stage of targeting in a conditional cash-transfer program in Mexico, Martinelli and

[7] If a program does not want field workers to know the points associated with indicators, 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 (2011) 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 agents and respondents. Even if points are hidden, field workers and respondents still know—due to common sense—which response options are associated with greater poverty.

[8] These guidelines here are the only ones to be imparted to field workers. All other issues of interpretation are to be left to the judgment of the individual field workers and respondents, as this seems to be what the BBS did when it fielded the 2010 HIES.

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 agents who make a home visit. This is the suggested procedure if a local, pro-poor organization in Bangladesh is using the poverty 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 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 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.

Frequency of application can be:

- As a once-off project (precluding measuring change)
- Every two years (or at any other 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
- With the same set of participants

An example set of choices are illustrated by BRAC and ASA, two Bangladeshi microfinance titans who currently apply the old 2005 poverty scorecard. Their design is that 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. ASA's and BRAC's sampling plans cover 25,000–50,000 participants each.

5. Estimates of household poverty likelihoods

The sum of scorecard points for a household is called the *score*. For Bangladesh, 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 increases the likelihood of being above a given poverty line, but it does not double the likelihood.

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 upper national line, scores of 30–34 have a poverty likelihood of 40.9 percent, and scores of 35–39 have a poverty likelihood of 36.0 percent (Figure 4).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 30–34 are associated with a poverty likelihood of 40.9 percent for the upper national line but of 57.0 percent for the $1.25/day 2005 PPP line.[9]

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 are below a given poverty line.

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

For the example of the upper national line (Figure 5), there are 7,617 (normalized) households in the calibration sub-sample with a score of 30–34. Of these, 3,112 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 30–34 is then 40.9 percent, because 3,112 ÷ 7,617 = 40.9 percent.

To illustrate with the upper national line and a score of 35–39, there are 8,568 (normalized) households in the calibration sample, of whom 3,080 (normalized) are below the line (Figure 5). The poverty likelihood for this score is then 3,080 ÷ 8,568 = 36.0 percent.

The same method is used to calibrate scores with estimated poverty likelihoods for the other eight poverty lines.[10]

Figure 6 shows, for all scores, the likelihood that a given household's expenditure falls in a range demarcated by two adjacent poverty lines.

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

For example, the daily per-capita expenditure of a household with a score of 30–34 falls in the following ranges with probability:

- 16.9 percent below the USAID "extreme" line
- 2.1 percent between the USAID "extreme" line and the lower national line
- 21.8 percent between the lower natl. line and 100% of the upper natl. line
- 16.1 percent between 100% of the upper natl. line and $1.25/day
- 27.3 percent between $1.25/day and 150% of the upper national line
- 3.6 percent between 150% of the upper national line and $1.75/day
- 5.6 percent between $1.75/day and $2.00/day
- 2.5 percent between $2.00/day and 200% of the upper national line
- 2.2 percent between 200% of the upper national line and $2.50/day
- 1.8 percent above $2.50/day

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

Although the points in the Bangladesh poverty scorecard are transformed coefficients from a Logit regression, (untransformed) scores are not converted to poverty likelihoods via the Logit formula of 2.718281828^{score} x $(1+ 2.718281828^{score})^{-1}$. This is because the Logit formula is esoteric and difficult to compute by hand. Non-specialists find it more intuitive to define the poverty likelihood as the share of households with a given score in the calibration sample who are below a poverty line. Going from scores to poverty likelihoods in this way requires no arithmetic at all, just a look-up table. This approach to calibration can also improve accuracy, especially with large samples.

5.2 Accuracy of estimates of households' poverty likelihoods

As long as the relationships between indicators and poverty do not change over time, and as long as the scorecard is applied to households that are representative of the same population from which the scorecard was originally constructed, then this calibration process produces unbiased estimates of poverty likelihoods. *Unbiased* means that in repeated samples from the same population, the average estimate matches the true value. The scorecard also produces unbiased estimates of poverty rates at a point in time and unbiased estimates of changes in poverty rates between two points in time.[11]

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

Of course, the relationships between indicators and poverty do change to some unknown extent over time and also across sub-groups in Bangladesh's population. Thus, the scorecard will generally be biased when applied after December 2010 (the last month of fieldwork for the 2010 HIES) or when applied with sub-groups that are not nationally representative.

How accurate are estimates of households' poverty likelihoods, given the assumption of constant relationships between indicators and poverty over time and the assumption of a sample that is representative of Bangladesh as a whole? To find out, the scorecard is applied to 1,000 bootstrap samples of size $n = 16{,}384$ from the 2010 validation sample. Bootstrapping entails:

- Score each household in the 2010 validation sample
- Draw a new bootstrap sample *with replacement* from the 2010 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 expenditure below a poverty line
- For each score, record the difference between the estimated poverty likelihood (Figure 4) and the true poverty likelihood in the bootstrap sample
- Repeat the previous three steps 1,000 times
- For each score, report the average difference between estimated and true poverty likelihoods across the 1,000 bootstrap samples
- For each score, report the two-sided intervals containing the central 900, 950, and 990 differences between estimated and true poverty likelihoods

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

For the upper national line, the average poverty likelihood across bootstrap samples for scores of 30–34 in the 2010 validation sample is too high by 2.1 percentage points. For scores of 35–39, the estimate is too low by 1.1 percentage points.[12]

The 90-percent confidence interval for the differences for scores of 30–34 is ±2.3 percentage points (upper national line, Figure 7). This means that in 900 of 1,000 bootstraps, the difference between the estimate and the true value is between –0.2 and +4.4 percentage points (because +2.1 – 2.3 = –0.2, and +2.1 + 2.3 = +4.4). In 950 of 1,000 bootstraps (95 percent), the difference is +2.1 ± 2.7 percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is +2.1 ± 3.8 percentage points.

For a few scores, Figure 7 shows medium-to-large differences between estimated poverty likelihoods and true values. This is because the 2010 validation sample is a single sample that—thanks to sampling variation—differs in distribution from the construction/calibration sub-samples and from Bangladesh's population. For targeting, however, what matters is less the difference in all score ranges and more the difference in score ranges just above and below the targeting cut-off. This mitigates the effects of bias and sampling variation on targeting (Friedman, 1997). Section 8 below looks at targeting accuracy in detail.

[12] 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.

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 HIES fieldwork in December 2010. That is, it may fit the data from the 2010 HIES so closely that it captures not only some timeless patterns but also some random patterns that, due to sampling variation, show up only in the 2010 HIES but not in the overall population of Bangladesh. 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 it 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 later sections). 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 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 Jan. 1, 2013 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 62.7, 40.9, and 26.7 percent (upper national line, Figure 4). The group's estimated poverty rate is the households' average poverty likelihood of $(62.7 + 40.9 + 26.7) \div 3 =$ 43.4 percent.

Be careful; the group's poverty rate is *not* the poverty likelihood associated with the average score. Here, the average score is 30, which corresponds to a poverty likelihood of 40.9 percent. This differs from the 43.4 percent found as the average of the three individual poverty likelihoods associated with each of the three scores. Unlike poverty likelihoods, scores are ordinal symbols, like letters in the alphabet or colors in the spectrum. Because scores are not cardinal numbers, they cannot be added up or averaged across households. Only three operations are valid for scores: conversion to poverty likelihoods, distributional analysis (Schreiner, 2012), 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 Bangladesh scorecard applied to 1,000 bootstraps of n = 16,384 from the 2010 validation sample, the absolute difference between the estimated poverty rate at a point in time and the true rate is 0.9 percentage points or less (Figure 9, summarizing Figure 8 across poverty lines). The average absolute difference across the nine poverty lines is 0.4 percentage points. At least part of these differences is due to sampling variation in the division of the 2010 HIES 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 Bangladesh scorecard and the upper national line, bias is +0.2 percentage points, so the unbiased estimate in the three-household example above is 43.4 – (+0.2) = 43.2 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 Bangladesh scorecard and the upper national line is 43.4 percent. Then estimates in 90 percent of such samples would be expected to fall in the range of 43.4 – (+0.2) – 0.5 = 42.7 percent to 43.4 – (+0.2) + 0.5 = 43.7 percent, with the most likely true value being the unbiased estimate in the middle of this range (43.4 – (+0.2) = 43.2

percent). This is because the original (biased) estimate is 43.4 percent, bias is +0.2 percentage points, and the 90-percent confidence interval for the upper national line is ±0.5 percentage points (Figure 9).

6.2 Formula for standard errors for estimates of poverty rates

How precise are the point-in-time estimates? Because the 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 scorecards (Schreiner, 2008a), 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 of $\sqrt{\frac{N - n}{N - 1}}$,

N is the population size, and

n is the sample size.

For example, Bangladesh's 2010 HIES estimates a household-level poverty rate for the upper national line of $\hat{p} = 28.5$ percent (Figure 1) by direct measurement. If this estimate came from a sample of $n = 16{,}384$ households from a population N of 33,028,014 (the number of households in Bangladesh in 2010), then the finite population correction ϕ is $\sqrt{\frac{33{,}028{,}014 - 16{,}384}{33{,}028{,}014 - 1}} = 0.9998$, 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

$$\pm z \cdot \sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}} = \pm 1.64 \cdot \sqrt{\frac{0.285 \cdot (1 - 0.285)}{16{,}384}} \cdot 1 = \pm 0.578 \text{ percentage points.}$$

Poverty scorecards, however, do not measure poverty directly, so this formula is not applicable. To derive a formula for the Bangladesh scorecard, consider Figure 8, which reports empirical confidence intervals $\pm c$ for the differences for the scorecard applied to 1,000 bootstrap samples of various sizes from the 2010 validation sample. For example, with $n = 16{,}384$ and the upper national line, the 90-percent confidence interval is ± 0.485 percentage points.[13]

Thus, the 90-percent confidence interval with $n = 16{,}384$ is ± 0.485 percentage points for the Bangladesh poverty scorecard and ± 0.578 percentage points for direct measurement. The ratio of the two intervals is $0.485 \div 0.578 = 0.84$.

[13] Due to rounding, Figure 8 displays 0.5, not 0.485.

Now consider the same case, but with $n = 8{,}192$. The confidence interval under direct measurement is $\pm 1.64 \cdot \sqrt{\frac{0.285 \cdot (1 - 0.285)}{8{,}192}} \cdot 1 = \pm 0.818$ percentage points. The empirical confidence interval with the Bangladesh poverty scorecard and the upper national line (Figure 8) is ± 0.720 percentage points. Thus for $n = 8{,}192$, the ratio of the two intervals is $0.720 \div 0.818 = 0.88$.

This ratio of 0.88 for $n = 8{,}192$ is close to the ratio of 0.84 for $n = 16{,}384$. Across all sample sizes of 256 or more in Figure 8, the average ratio turns out to be 0.86, implying that confidence intervals for indirect estimates of poverty rates via the Bangladesh scorecard and the upper national poverty line are—for a given sample size—about 14 percent narrower than confidence intervals for direct estimates via the 2010 HIES. This 0.86 appears in Figure 9 as the "α factor" because if $\alpha = 0.86$, then the formula for confidence intervals c for the Bangladesh poverty scorecard is $\pm c = \pm z \cdot \alpha \cdot \sigma$. That is, the formula for the standard error σ for point-in-time estimates of poverty rates via scoring is $\alpha \cdot \sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}}$.

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 eight of the nine poverty lines in Figure 9.

The formula relating confidence intervals with standard errors for poverty scoring can be rearranged to give a formula for determining sample size before measurement. If $\widetilde{p}$ is the expected poverty rate before measurement, then the formula

for sample size n from a population of size N that is based on the desired confidence level that corresponds to z and the desired confidence interval $\pm c$ is

$n = N \cdot \left(\frac{z^2 \cdot \alpha^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p})}{z^2 \cdot \alpha^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p}) + c^2 \cdot (N - 1)} \right)$. If the population N is "large" relative to the sample size n, then the finite population correction factor ϕ can be taken as one (1), and the formula becomes $n = \left(\frac{\alpha \cdot z}{c} \right)^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p})$.

To illustrate how to use this, suppose the population N is 33,028,014 (the number of households in Bangladesh while the 2010 HIES was in the field), suppose $c = 0.03890$, $z = 1.64$ (90-percent confidence), and the relevant poverty line is the upper national line so that the most sensible expected poverty rate $\widetilde{p}$ is Bangladesh's overall poverty rate for that line in 2010 (28.5 percent at the household level, Figure 1). The α factor is 0.86 (Figure 9). Then the sample-size formula gives

$$n = 33{,}028{,}014 \cdot \left(\frac{1.64^2 \cdot 0.86^2 \cdot 0.285 \cdot (1 - 0.285)}{1.64^2 \cdot 0.86^2 \cdot 0.285 \cdot (1 - 0.285) + 0.03890^2 \cdot (33{,}028{,}014 - 1)} \right) = 268,$$

which is not far from the sample size of 256 observed for these parameters in Figure 8 for the upper national line. Taking the finite population correction factor ϕ as one (1) gives the same answer, as $n = \left(\frac{0.86 \cdot 1.64}{0.03890} \right)^2 \cdot 0.285 \cdot (1 - 0.285) = 268$.[14]

[14] 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 Bangladesh should report using the \$1.25/day 2005 PPP line. Given the α factor of 0.86 for this line (Figure 9), an expected before-measurement household-level poverty rate of 28.5 percent (the all-Bangladesh

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

In practice after the end of fieldwork for the HIES in December 2010, a program would select a poverty line (say, the upper national line), note its participants' population size (say, $N = 10{,}000$ participants), select a desired confidence level (say, 90 percent, or $z = 1.64$), select a desired confidence interval (say, ±2.0 percentage points, or $c = \pm 0.02$), make an assumption about $\widetilde{p}$ (perhaps based on a previous measurement such as the household-level poverty rate for the upper national line for Bangladesh overall of 28.5 percent in the 2010 HIES in Figure 1), look up α (here, 0.86, Figure 9), assume that the scorecard will still work in the future and for non-nationally representative sub-groups,[15] and then compute the required sample size. In this illustration, $n = 10{,}000 \cdot \left(\frac{1.64^2 \cdot 0.86^2 \cdot 0.285 \cdot (1 - 0.285)}{1.64^2 \cdot 0.86^2 \cdot 0.285 \cdot (1 - 0.285) + 0.02^2 \cdot (10{,}000 - 1)} \right) = 921.$

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rate for 2010, Figure 1), and a confidence level of 90 percent, then $n = 300$ implies a confidence interval of $\pm\, 0.86 \cdot 1.64 \cdot \sqrt{\frac{0.285 \cdot (1 - 0.285)}{300}} = \pm 3.7$ percentage points.

[15] This paper reports accuracy for the scorecard applied to the 2010 validation sample, but it cannot test accuracy for later years or for other groups. Performance after December 2010 will resemble that in the 2010 HIES 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.

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: poverty scoring 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, poverty scoring 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 somewhere beyond poverty scoring.

7.2 Calculating estimated changes in poverty rates over time

Consider the illustration begun in the previous section. On Jan. 1, 2013, an organization samples three households who score 20, 30, and 40 and so have poverty

likelihoods of 62.7, 40.9, and 26.7 percent (upper national line, Figure 4). Adjusting for the known bias of +0.2 percentage points (Figure 9), the group's baseline estimated poverty rate is the households' average poverty likelihood of [(62.7 + 40.9 + 26.7) ÷ 3] – (+0.2) = 43.2 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 follow-up as was scored at baseline

By way of illustration, suppose that two years later on Jan. 1, 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 now 25, 35, and 45 (poverty likelihoods of 50.4, 36.0, and 19.6 percent, upper national line, Figure 4). Adjusting for the known bias, the average poverty likelihood at follow-up is [(50.4 + 36.0 + 19.6) ÷ 3] – (+0.2) = 35.1 percent, an improvement of 43.2 – 35.1 = 8.1 percentage points.[16]

Thus, about one in 12 participants in this hypothetical example crossed the poverty line in 2013/5.[17] Among those who started below the line, about one in five (8.1 ÷ 43.2 = 18.8 percent) on net ended up above the line.[18]

[16] Of course, such a huge reduction in poverty in two years is highly unlikely, but this is just an example to show how poverty scoring can be used to estimate change.
[17] This is a net figure; some people start above the line and end below it, and vice versa.
[18] Poverty scoring does not reveal the reasons for this change.

7.3 Accuracy for estimated change in two independent samples

Given the new poverty scorecard for Bangladesh built with the construction/calibration sample from the 2010 HIES, an estimate of the change in the poverty rate over time from two independent samples is the difference between a baseline estimate for the 2010 validation sample and a follow-up estimate from either the full 2000 HIES or the full 2005 HIES. Other than looking backwards in time instead of forwards, this set-up mimics how poverty scoring would be used in practice to estimate change. In particular, it is both *out-of-sample* (the baseline and follow-up estimates come from data that is not used to construct the scorecard) and *out-of-time* (the follow-up data is from a different year than the data used to construct the scorecard). Of course, the test can only use data from the past, so while it is the best-available guide to future accuracy, it is inevitably imperfect.

Figure 10 shows the average differences—across 1,000 bootstraps of $n = 16{,}384$—between the scorecard's estimated change in household-level poverty rates and the true change. For the example of the upper national poverty line and the 10 years between a baseline of 2010 and a follow-up of 2000, the true change in the poverty rate is –18.1 percentage points (Figure 1). The scorecard's estimate of change is –18.4 percentage points, so its bias is –0.3 percentage points (Figure 10). Seen relative to the absolute value of the true change, the absolute error is about $0.3 \div 18.1 = 2$ percent.

This example is unsually accurate. Across all eight poverty lines for 2000–2010 in Figure 10,[19] the average true change is –11.4 percentage points, and the average estimated change is –7.4 percentage points. The relative error, averaged poverty-line-by-poverty-line, is about 60 percent. The scorecard correctly estimates that poverty decreased for all lines, and five of thee eight estimates are statistically different from zero, given 90-percent confidence and $n = 4{,}096$. These five estimates correspond to five of the six lowest poverty lines ($1.25/day 2005 PPP, lower national, and 100%, 150%, and 200% of upper national).

For three reasons, it seems plausible that accuracy would be higher for lower lines. First, true changes are larger for these lines, and larger true changes are easier to detect than smaller ones. Second, the scorecard was constructed based on a low line ($1.25/day). Third, indicators and response options were selected to be relevant and sensitive for households at the poorer end of the distribution. This tends to make poverty likelihoods that correspond to lower scores more accurate than poverty likelihoods for upper scores. It also means that poverty likelihoods are more sensitive (they vary more) for a given increase in the poverty score for households who are in lower score ranges at baseline.

Estimates for the shorter period of 2005 to 2010 are more accurate. In particular, the average true change across the eight poverty lines is –5.9 percentage points, and the

[19] There are no estimates of change for the USAID "extreme" line because it is a relative line whose real value is not constant over time.

average estimated change is –7.0 percentage points. The average absolute bias is 1.8 percentage points, and the average line-by-line relative error is about 30 percent. Seven of the eight estimates are statistically different from zero (90-percent confidence and n = 4,096), and the exception is the highest line ($2.50/day).

All in all, the scorecard's estimates of change are more accurate for:

- Shorter periods (probably because the relationships between indicators and poverty change less than in longer periods)
- Lower poverty lines (probably because the scorecard is constructed with a low line and because indicators and responses are tuned for sensitivity to poorer households)
- Greater true changes in poverty (because larger changes are more likely to lead to changes in responses to scorecard indicators)

Are scoring's estimates of change accurate enough? There is no objective standard for answering this question, and it depends on the specific context and goals of the analysis. Perhaps the weakest benchmark is whether the sign is right. In the tests here, scoring always correctly estimates a decrease in poverty rates, and two-thirds of the estimates are statistically different from zero (90-percent confidence and n = 4,096).

Beyond that low hurdle, the relative error is another signal of likely usefulness. Across the two periods here, the average relative error for the lowest four lines is about 30 percent. For the highest four lines, the average relative error is about 90 percent for 2000–2010 and about 30 percent for 2005–2010.

Most formally, accuracy can be gauged via the standard statistical concepts of bias (discussed above) and precision. Given n = 16,384, 90-percent confidence intervals for estimates of change over time are ±0.8 percentage points or less (Figure 10). More

generally, the α factor indicates that standard errors for the scorecard are about 20- to 40-percent wider than for direct measurement.

There can be no general, once-and-for-all answer as to whether poverty scoring is accurate enough to be useful for measuring change over time. The tests for Bangladesh here offer both hope and disappointment, as some estimates seem usefully accurate, but some do not.

The ultimate question is whether scoring is better than alternatives. A central strength of poverty scoring is that its accuracy for measuring change is known, allowing programs to make informed choices. This is not possible for most alternatives.

7.4 General formula for standard errors for estimates of change in two independent 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 c with the standard error σ of a poverty scorecard's estimate of the change in poverty rates over time:

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

Here, z, c, $\hat{p}$ and N are defined as above, n is the sample size at both baseline and follow-up,[20] and α is the average (across a range of bootstrapped sample sizes) of the ratio of the observed confidence interval from a poverty scorecard and the theoretical confidence interval under direct measurement.

As before, the formula for standard errors can be rearranged to give a formula for sample sizes before indirect measurement via a poverty scorecard, where $\tilde{p}$ is based on previous measurements and is assumed equal at both baseline and follow-up: $n = 2 \cdot N \cdot \left(\frac{z^2 \cdot \alpha^2 \cdot \tilde{p} \cdot (1 - \tilde{p})}{z^2 \cdot \alpha^2 \cdot \tilde{p} \cdot (1 - \tilde{p}) + c^2 \cdot (N - 1)} \right)$. If ϕ can be taken as one, then the formula becomes $n = 2 \cdot \left(\frac{\alpha \cdot z}{c} \right)^2 \cdot \tilde{p} \cdot (1 - \tilde{p})$.

To illustrate the use of this formula to determine sample size for estimating changes in poverty rates across two independent samples, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is ± 2 percentage points ($\pm c = \pm 0.02$), the poverty line is the upper national line, $\alpha = 1.24$ (the α for the upper national line for 2005–2010 in Figure 10), $\hat{p} = 0.372$ (the household-level poverty rate in 2005 for the upper national line in Figure 1), and the population N is large enough relative to the expected sample size n that the finite population correction factor ϕ can be taken as one. Then the baseline sample size is

[20] This means that, for a given precision and with direct measurement, 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.

$n = 2 \cdot \left(\frac{1.24 \cdot 1.64}{0.02} \right)^2 \cdot 0.372 \cdot (1 - 0.372) \cdot 1 = 4{,}831$, and the follow-up sample size is also 4,831.

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 poverty scorecard to estimate change for a single group of households, all of whom are scored at two points in time, is:[21]

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

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

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

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

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

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

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

Given this, a sample-size formula for a group of households to whom the Bangladesh scorecard is applied twice (once after December 2010 and then again later) is $n = 2 \cdot \left(\frac{\alpha \cdot z}{c}\right)^2 \cdot \left\{-0.02 + 0.016 \cdot y + 0.47 \cdot \left[p_{\text{pre-baseline}} \cdot \left(1 - p_{\text{pre-baseline}}\right)\right]\right\} \cdot \sqrt{\frac{N - n}{n - 1}}$.

In Peru (the only source of a data-based estimate, Schreiner, 2009), 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 upper 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 factor ϕ can be taken as one. The pre-baseline poverty rate p_{2010} is taken as 28.5 percent (Figure 1), and α is assumed to be 1.30. Then the baseline sample size is $n = 2 \cdot \left(\frac{1.30 \cdot 1.64}{0.02}\right)^2 \cdot \left\{-0.02 + 0.016 \cdot 3 + 0.47 \cdot \left[0.285 \cdot (1 - 0.285)\right]\right\} \cdot 1 = 2{,}814$. The same group of 2,814 households is scored at follow-up as well.

8. Targeting

When an organization uses poverty scoring 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 expenditure below a poverty line). Poverty status is a fact that is defined by whether expenditure 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 11 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 12 shows the distribution of households by targeting outcome for Bangladesh. For an example cut-off of 30–34, outcomes for the upper national line in the 2010 validation sample are:

- Inclusion: 18.6 percent are below the line and correctly targeted
- Undercoverage: 9.9 percent are below the line and mistakenly not targeted
- Leakage: 13.1 percent are above the line and mistakenly targeted
- Exclusion: 58.4 percent are above the line and correctly not targeted

Increasing the cut-off to 35–39 improves inclusion and undercoverage but worsens leakage and exclusion:

- Inclusion: 21.6 percent are below the line and correctly targeted
- Undercoverage: 6.9 percent are below the line and mistakenly not targeted
- Leakage: 18.7 percent are above the line and mistakenly targeted
- Exclusion: 52.9 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 12 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 or exclusion versus errors of undercoverage and leakage. It is healthy to go through a process of thinking explicitly and intentionally about how possible targeting outcomes are valued.

A common choice of benefits and costs is "Total Accuracy" (IRIS Center, 2005; Grootaert and Braithwaite, 1998). With "Total Accuracy", total net benefit is the number of households correctly included or correctly excluded:

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

Figure 12 shows "Total Accuracy" for all cut-offs for the Bangladesh scorecard. For the upper national line in the 2010 validation sample, total net benefit is greatest (78.7) for a cut-off of 29 or less, with almost four in five households in Bangladesh 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 x Households correctly included) + (1 x Households correctly excluded).[22]

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 13 ("% targeted who are poor") shows, for the Bangladesh scorecard applied to the 2010 validation sample, the expected poverty rate among households who score at or below a given cut-off. For the example of the upper national line, targeting households who score 34 or less would target 31.7 percent of all households (second column) and produce a poverty rate among those targeted of 58.5 percent (third column).

Figure 13 also reports two other measures of targeting accuracy. The first is a version of coverage ("% of poor who are targeted"). For the example of the upper national line with the 2010 validation sample and a cut-off of 34 or less, 65.2 percent of all poor households are covered.

The final targeting measure in Figure 13 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For the upper national line with the 2010 validation sample and a cut-off of 34 or less, covering 1.4 poor households means leaking to 1 non-poor household.

[22] Figure 12 also reports "BPAC", discussed in the next section.

9. The context of poverty scorecards in Bangladesh

This section discusses twelve existing scorecards for Bangladesh in terms of their goals, methods, definitions of *poverty*, data, indicators, cost, bias, and precision. In general, the advantages of the new poverty scorecard here are its:

- Use of data from the latest nationally representative expenditure survey
- Accuracy for targeting that is similar to that of alternatives
- Reporting of bias and precision from out-of-sample and out-of-time tests, including formulas for standard errors
- Feasibility for local, pro-poor programs, due to its simplicity and transparency

9.1 Grameen Bank

The Grameen Bank—probably the world's best-known microfinance organization (Dowla and Barua, 2006; Rutherford, 2006)—uses a poverty scorecard of its own design to measure its members' poverty over time.[23] The 13 indicators are:[24]

- Characteristics of the residence:
  - Is the roof made of tin, or is the residence worth more than 25,000 Taka?
  - Does the family use a sanitary latrine?
  - Does drinking water come from a tube well, or has it been purified by boiling, pitcher filters, alum, bleach, or tablets?
- Do all children six-years-old or older go to school or have finished primary school?

[23] Founded by Mohammad Yunus (winner of the 2006 Nobel Peace Prize), Grameen Bank in March 2013 had about 8.4 million members (almost all rural women), $1.0 billion in loans outstanding, and $1.6 billion in deposit balances (`grameen-info.org/index.php?option=com_content&task=view&id=453&Itemid=527`, retrieved 14 March 2013). Grameen—along with the two other Bangladeshi microfinance titans BRAC (Smillie, 2009) and ASA (Rutherford, 2009)—inspired much of the worldwide microfinance movement.

[24] `grameen-info.org/index.php?option=com_content&task=view&id=23&Itemid=126`, retrieved 14 March 2013.

- Ownership of assets:
    - — Do all family members sleep off the floor on cots or beds?
    - — Do all family members have adequate clothing for daily use?
    - — Do all family members have warm clothes for winter?
    - — Do all family members have mosquito nets?
- Status as a microfinance participant:
    - — Does the Grameen member pay a weekly installment of at least 200 Taka?
    - — Does the Grameen member have an average annual savings balance of at least 5,000 Taka?
- Does the family have diversified sources of income?
- Does the family eat three square meals per day throughout the year?
- If someone falls ill, can the family immediately seek (and pay for) medical care?

The Grameen Bank considers a household to have exited poverty if it answers "Yes" to all 13 indicators. Loan officers apply this scorecard annually.

The Grameen Bank's poverty scorecard is based on its in-house expertise and experience, and as such it is well-accepted by its staff. Two indicators, however, are unverifiable ("Does the family eat three square meals throughout the year?" and "If someone falls ill, can the family immediately seek (and pay for) medical care?"). Two other indicators are relevant only for microfinance participants ("Weekly installment is at least 200 taka" and "Average savings of at least 5,000 taka").

Unlike the scorecard in this paper, the Grameen Bank's scorecard is not tied to an expenditure-based poverty line. While the Grameen Bank's definition of poverty is as defensible as any other, it is not the one typically used in poverty analysis and policy discussions. Also, from the point of view of an expenditure-based poverty line, the Grameen Bank's scorecard is too stringent; many households with per-capita expenditure above, say, the upper national line, will nevertheless answer "No" to some of the 13 indicators.

In terms of targeting, the Grameen Bank's official policy is to admit new members only from households who own less than 50 decimals of cultivable land or who have total assets worth less than 100 decimals (a hectare) of medium-quality land in the area. While this rule is not always followed (Matin, 1998, and Morduch, 1998), it is not possible—except perhaps for extremely low poverty lines—for this one-indicator scorecard to target more accurately than the scorecard here and its 10 indicators, one of which is the possession/use of 50 decimals of cultivable land.

9.2 Gwatkin *et al.*

Gwatkin *et al.* (2007) construct a poverty scorecard for Bangladesh with an approach that they use in 56 countries with Demographic and Health Surveys (Rutstein and Johnson, 2004). They use Principal Components Analysis to make an asset index from simple, low-cost indicators available for the 10,500 households in Bangladesh's 2004 DHS. The PCA index is like the poverty scorecard here except that, because the DHS does not collect data on expenditure, it is based on a different conception of poverty, its accuracy vis-à-vis an expenditure-based poverty is unknown, and it can only be assumed to be a proxy for long-term wealth/economic status.[25] Well-known

[25] Nevertheless, the indicators are similar and the "flat maximum" is important, so carefully built PCA indexes and expenditure-based poverty scorecards 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 expenditure-based scorecards include Filmer and Scott

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

The 20 indicators in Gwatkin *et al.* are similar to those in the new scorecard here in terms of their simplicity, low cost, and verifiability:

- Characteristics of the residence:
  - — Presence of electricity
  - — Type of floor
  - — Type of walls
  - — Type of roof
  - — Source of drinking water
  - — Type of fuel for cooking
  - — Type of toilet arrangement
- Whether the household owns land
- Whether the household has a domestic worker not related to the head
- Ownership of consumer durables:
  - — Radio
  - — Television
  - — Telephone
  - — Bicycle
  - — Motorcycle or scooter
  - — *Almirah* (wardrobe)
  - — Table
  - — Chair or bench
  - — Watch or clock
  - — Cot or bed
  - — Sewing machine

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

- Segmenting households by quintiles 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

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

The first goal is akin to targeting, and the last two goals deal with monitoring, so the uses of the PCA index are similar to those of the poverty scorecard here.

Still, the Gwatkin *et al.* index is more difficult and costly than the poverty scorecard. In particular, computing a poverty score requires adding up 10 integers, some of which are usually zero. In contrast, finding a household's asset index requires adding up 84 numbers, each with five decimal places and half with negative signs.

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

In essence, Gwatkin *et al.*—like all PCA indexes—define poverty in terms of the indicators and points in the index itself. Thus, the index is not a proxy standing in for something else (such as expenditure) but rather a direct measure of a non-expenditure-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 expenditure-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 expenditure
- 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/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.

9.3 Barua and Sulaiman

Like this paper, Barua and Sulaiman (2006) seek a practical, low-cost, accurate way to assess poverty, in this case for the participants in an ultra-poor program run by BRAC.[26] Like Gwatkin *et al.*, Barua and Sulaiman build a PCA asset index.

They survey 1,339 households in a sample of villages where BRAC runs its ultra-poor program. Sampled households fall in three groups: participants in BRAC's ultra-poor program, non-ultra-poor participants in BRAC's village associations, and other households in the village who are not BRAC participants.

[26] As the world's largest non-government organization, BRAC provides a wide range of services, including microfinance, education, and health (`brac.net/sites/default/files/BRAC%20Fact%20Sheet_23Sept10.pdf`, retrieved 15 March 2013). BRAC's village organizations in Bangladesh have about 6 million members (`www.brac.net/content/stay-informed-brac-glance`, retrieved 15 March 2013). BRAC has expanded out of Bangladesh into Afghanistan, Haiti, Liberia, Pakistan, Philippines, Sierra Leone, South Sudan, Sri Lanka, Tanzania, and Uganda.

BRAC defines the *ultra-poor* as those who answer "Yes" to all three questions in what amounts to an ultra-poverty scorecard:

- Does the household own less than 30 decimals of land?
- Does the household have a female head or a disabled male head?
- Does the household depend on seasonal wage work?

Barua and Sulaiman construct the index with the "CGAP PAT"[27] approach (Henry *et al.*, 2003). They first select 20–25 indicators from a longer list of candidates based on their correlation in their data with expenditure on clothing and footwear. PCA is then used to extract the first two principle components[28] for 14 final indicators:

- Per-capita expenditure on clothing and footwear
- Education of the household head
- Condition of the residence (4 = Very good, . . ., 1 = Very bad)
- Asset ownership:
  - — Cultivable land
  - — One set of good clothes
  - — Shoes/sandals
  - — Value of furniture
  - — Value of operational items
- Food consumption:
  - — Sufficiency of food intake over the past year
  - — Seasonality of food intake
  - — Number of days eggs were eaten in the past week
  - — Number of days only rice was eaten in the past week
- Self-assessment of vulnerability:
  - — Financial status (3 = Surplus, . . ., 1 = Deficit)
  - — Ability to cope with crisis (3 = Can cope easily, . . ., 1 = Can never cope)

[27] This approach was supported by the Consultative Group to Assist the Poor as a Poverty Assessment Tool for microfinance (although it is not microfinance-specific).
[28] Most other PCA indexes use only the first principal component.

Vis-à-vis the poverty scorecard, BRAC's index has some disadvantages:

- It is not presented in a ready-to-use form
- Ordinal/categorical-valued indicators (condition of the residence, assessment of vulnerability) are treated as if they were cardinal/continuous-valued
- Some indicators are subjective (condition of residence, sufficiency of food intake, assessment of vulnerability)
- Some indicators are not verifiable (sufficiency and seasonality of food intake, consumption of eggs and rice, per-capita expenditure on clothing and footwear)
- Monetary indicators are difficult to answer and so may be inaccurate (value of furniture, operational items, and expenditure on clothing and footwear)

After constructing the index, Barua and Sulaiman apply it to the same data that was used to build it. They find that participants in the ultra-poor program have lower scores—that is, they are poorer—than members of BRAC's village associations who are not also participants in the ultra-poor program. The least-poor households are those who do not participate in BRAC programs at all.

Like all asset indexes (and like the scorecard here), Barua and Sulaiman's index can rank households and works in diverse contexts. Its small sample, however, is not nationally representative, and its definition of *poverty*—based on the index's own indicators and points—is less-transparent and less widely used than is a definition based on expenditure and poverty lines. Most important, the index's specific indicators are difficult to collect. Even if the index's indicators are collected accurately, they probably do not rank households much better—thanks to the "flat maximum"—than simpler indicators. In practice, BRAC now uses the Bangladesh simple poverty scorecard as well as similar simple poverty scorecards for Tanzania and Uganda.

9.4 Pitchforth *et al.*

Pitchforth *et al.* (2007) simplify the asset-index approach of Gwatkin *et al.* (2000) in several ways that mirror the goals of this paper. They design their index to:

- Spur up-take by local organizations because it is quick, low-cost, and practical
- Allow scores to be computed on the spot by hand
- Obtain reliable answers

In particular, Pitchforth *et al.* seek a tool to measure women's socio-economic status upon admission to a hospital for emergency obstetric care. They report that—in a test in Bangladesh—application of the index as part of a 30-question in-take form was so swift and straightforward that it did not interfere with treatment.[29]

Pitchforth *et al.* begin by noting (p. 311) that existing tools—such as the PCA index of Gwatkin *et al.* (2000)—are "unsuitable for use in this context as they are too lengthy or need to be administered at the household or community level." They then look at how responses to the indicators in Gwatkin *et al.* (2000) vary across quintiles of scores from the PCA index. They find, for example, that television ownership is rare among households in the lowest three quintiles, implying that that indicator only helps to distinguish among households in the upper two quintiles. They hand-pick four straightforward indicators that show variation across all quintiles:

- Literacy
- Educational attainment
- Type of toilet arrangement
- Type of roof

[29] While the index is indeed very quick and simple, surely even a one- or two-minute delay can sometimes make a difference in an obstetric emergency.

Points for responses to each indicator are not derived from PCA. Instead, Pitchforth *et al.* look at how responses vary by quintile for scores from Gwatkin *et al.*'s (2000) PCA index and then give points to each response based on a simple, eye-balled scale such as 0/0.5/1 or 0/0.2/0.4/0.6/0.8. Low points are assigned to responses linked with low quintiles of scores from the PCA index. These point values are then multiplied for 4 (for literacy, the indicator with the widest range between the first and fifth quintiles), 3 for the second-widest range (type of roof), 2 for the third-widest (toilet arrangement), and finally 1 for educational attainment. When the resulting points are added up, they give a total score that ranges from zero (most-poor as defined by the index) to ten (least-poor).[30]

While indicators are selected without explicitly optimizing some statistical measure of accuracy, the four chosen indicators make intuitive sense, and they frequently appear in poverty scorecards that do explicitly optimize some quantitative criterion. Pitchforth *et al.* thus resembles this paper in its careful use of judgment to pick indicators that are both powerful and feasible. Likewise, Pitchforth *et al.* report that they find only small differences in correlations—vis-à-vis rankings by the Gwatkin *et al.* (2000) index—between their hand-picked points, "unit weights" (0/1, 0/1/2, etc.), and points derived from factor analysis (a method similar to PCA). This is no surprise, as the "flat maximum" literature shows that simple, intuitive point systems can be

[30] Unlike the scorecard here, some points are not positive integers, but they would be if multiplied by 10, in which case scores would range from 0 to 100.

almost as accurate as sophisticated, optimized ones (Mark, Thomas, and Decarli, 1996; Bloch and Moses, 1988; Wainer, 1978; Einhorn and Hogarth, 1975; Tukey, 1948).[31]

Pitchforth *et al.* also report that, for a cut-off set at the median score of Gwatkin *et al.*'s (2000) PCA index, 633 of their 638 patients are classified the same by their simple index as by the full PCA index. This suggests that extremely simple scorecards can be usefully accurate, and that the complexity of the Gwatkin *et al.* index offers little additional accuracy but may discourage adoption.

Pitchforth *et al.* find that poorer women in Bangladesh are less likely to seek emergency obstetric care in a hospital, even though they probably need it more than less-poor women. Just as important, they show that PCA indexes can be greatly simplified and still retain almost all of their power. Pitchforth *et al.* suggest that the speed and simplicity of their index could save lives by quickly qualifying poor patients for reduced fees or subsidies that would allow them to be admitted without having to pay the full price up-front, a situation which would also encourage greater use of emergency hospital care in the first place.

[31] Dawes and Corrigan (1974) go so far as to say, "The whole trick is to decide what variables to look at and then know how to add."

9.5 Zeller *et al.*

Like Barua and Sulaiman, Zeller *et al.* (2006b) follow the approach of Henry *et al.* (2003)[32] to construct PCA-based scorecards[33] Uganda, Peru, Kazakhstan, and Bangladesh. Their goals are to:

- Predict households' poverty status and to monitor the poverty rates of groups of households with easy-to-collect indicators
- Compare predictive power in-sample versus out-of-sample[34]
- Report precision as confidence intervals
- Compare the accuracy of a PCA index with that of scorecards that directly estimate expenditure or expenditure-based poverty likelihoods

Zeller *et al.* use their own nationally representative[35] survey of 800 households in Bangladesh, fielded from March 15 to April 17, 2004 (Zeller, Alcaraz V., and Johanssen, 2004). The poverty line is $1.08/day 1993 PPP, giving a household-level poverty rate in their data of 31.4 percent. Two-thirds of the data is used for construction, and one-third is set aside for out-of-sample validation.

[32] Before the advent of the poverty-scorecard approach, this PCA-based "CGAP PAT" was the most widely used poverty-assessment tool in microfinance.
[33] These are called *scorecards* rather than *asset indexes* because they include a wide range of types of indicators beyond simply assets.
[34] An *in-sample* test uses the same data to construct a tool as well as to validate its accuracy. An *out-of-sample* test divides data in two parts, one for construction and another for validation. In practice, scorecards are used out-of-sample, so out-of-sample tests are more relevant. Also, in-sample tests tend to overstate accuracy.
[35] The 800 households come from 20 villages in 10 *upazilas/thanas* in five of what in 2004 were six divisions. Of the 800 households, 320 were not selected at random.

Zeller *et al.* also construct poverty scorecards with four regression methods:

- Least-squaresto estimate the logarithm of per-capita expenditure
- Quantile to estimate the 43th percentile of per-capita expenditure
- Probit to estimate the likelihood that expenditure is below a poverty line
- Least-squares to estimate the likelihood that expenditure is below a poverty line

The four regression approaches are also tested in Zeller, Alcaraz V., and Johannsen (2004) and IRIS Center (2011).

The 10 indicators in the Zeller *et al.* PCA-based scorecard for Bangladesh are:

- Number of household members who are literate
- Characteristics of the residence:
  - — Area in square feet
  - — Legal socket connection to public electrical grid
  - — Type of toilet arrangement
- Ownership of consumer durables:
  - — Black-and-white television
  - — Number of poultry
  - — Number of saris
  - — Logarithm of the value of *kantha*, a digging tool used for farming
- Financial status
  - — Ownership of a checking account
  - — Ratio of remittances received to remittances sent

According to Zeller *et al.* (p. 12), "the 10 indicators are fairly easy to measure in household surveys." But four indicators seem difficult: estimating square footage, counting poultry, estimating the value of *kantha*, and estimating remittances sent and received. Furthermore, the scorecard is not presented in a ready-to-use format.

To compare accuracy for the PCA scorecard versus the four regression approaches requires a benchmark to define whether a given household is poor. The most-common definition is whether a household has expenditure below a poverty line. Zeller *et al.*, however, use two definitions of *poverty*. For the PCA scorecard, their

definition is whether a household's PCA score is below the average PCA score of the 20 households centered on the 31.4th percentile of their construction sample. For the four regression approaches, Zeller *et al.*'s definition is whether measured expenditure from their survey is below the $1.08/day 1993 PPP poverty line.

Using two benchmarks invalidates Zeller *et al.*'s accuracy comparisons. It does not make sense to compare how an PCA-based scorecard predicts one definition of *poverty* (scoring below a given percentile in the ranking of households by the PCA scorecard itself) against how a non-PCA scorecard predicts another definition of *poverty* (having expenditure below a poverty line). Even though both definitions give poverty rates of 34.1 percent, the specific households defined as poor differ.

Thus, even if a PCA-based scorecard predicts poverty rates as accurately as an expenditure-based scorecard, or even if a PCA scorecard targets the poor (by its definition) as well as an expenditure-based scorecard targets the poor (by a different definition), it says nothing about the two compare either of the two definitions.

Nevertheless, Zeller *et al.* (pp. 20–21) conclude that "our results demonstrate that [PCA-based scorecards] can be calibrated to predict absolute poverty status with relatively high accuracy." Even if their comparisons could be taken at face value, it is not clear by what standard accuracy is "relatively high". In out-of-sample tests for Bangladesh, Zeller *et al.* (p. 15) report that "PCA is one of the most inferior methods", being next-to-last in terms of poverty-rate bias and third in terms of targeting. For Uganda, the PCA scorecard has the lowest targeting accuracy and the most-biased

estimated poverty rates. For Peru, the PCA scorecard does better, coming in second of five for both estimated poverty rates and targeting. Finally, the Kazakhstan PCA scorecard has the worst bias and the second-best targeting accuracy.[36]

9.6 Wodon

Wodon (1997) shows how to use ROC curves—equivalent to the "c" statistic used here—to assess indicators' targeting power.[37] ROC curves have long been common in predictive modelling.

To illustrate, Wodon uses Logit (as in this paper) to build a set of poverty scorecards based on expenditure in the 1991/2 HIES, measuring targeting strength via ROC curves (equivalent to graphs of "% of poor who are targeted" versus "% of all households who are targeted" in Figure 13). He compares scorecards that include only:

- Housing indicators
- Indicators whose values are determined before poverty status is measured and so are not themselves caused by current poverty (as in the "determinants of poverty" exercises common in World Bank country-level poverty assessments)
- Single indicators

[36] Results for Kazakhstan are to be taken with a grain of salt, as only 37 of 800 households surveyed are poor (Zeller and Alcaraz V., 2005). Given that the validation sample has about 13 poor households, sampling variation and overfitting should lead to imprecise estimates of out-of-sample accuracy and large in-sample/out-of-sample differences, and this is, in fact, what is observed (Zeller *et al.*, p. 15).

[37] Baulch (2003) covers the same ground as Wodon, and sometimes echoes him closely.

The five indicators in the "housing" scorecards are simple, inexpensive, and verifiable:

- Type of wall
- Type of roof
- Number and size of bedrooms
- Type of toilet arrangement
- Source of drinking water

The 13 indicators in the "determinants of poverty" scorecards are:

- Demographics:
  - Number of babies (and its square)
  - Number of children (and its square)
  - Number of adults (and its square)
  - Age of the male head/spouse (and its square)
  - Age of the female head/spouse (and its square)
  - Family structure
- Highest educational level attained by:
  - Male head/spouse
  - Female head/spouse
  - Any other family member
- Main occupation of the household head
- Amount of land owned
- Religion
- Geographic location

In Wodon's in-sample tests, the "determinants-of-poverty" scorecards have higher "c" than the "housing" scorecards. Wodon never combines the two sets of indicators in a single scorecard, although that would improve the ROC curve.

Wodon's indicators are practical, but—consistent with the paper's technical purpose—points or ready-to-use scorecards are not presented. Even though Wodon believes that governments and local, pro-poor organizations could use ROC curves to identify individual indicators for targeting (p. 2090), he doubts that multiple indicators

could be used together in a scorecard, saying (p. 2087) "it is unlikely that we would have the necessary information to use the 'determinants-of-poverty' model in practice. Even if we did, the implementation of a policy under such a complex set of indicators might be too difficult." Nevertheless, many organizations around the world are using simple poverty scorecards similar to the one here, including BRAC and ASA in Bangladesh. All of these include indicators similar to those in Wodon's scorecards, as well as several other types of indicators.

9.7 Haslett and Jones

Haslett and Jones (2004) use the "poverty mapping" approach of Elbers, Lanjouw, and Lanjouw (2003) to estimate poverty rates at the level of Bangladesh's 507 *upazilas/thanas*.[38] Their purpose is to provide detailed information on poverty "to aid the planning of social-intervention programmes" (p. v).

They first construct a single poverty scorecard for Bangladesh as a whole using robust regression to estimate the logarithm of expenditure with data from the 2000 HIES, considering only indicators found also in Bangladesh's 2001 population census. The resulting poverty scorecard is then applied to the five-percent sample of the census data to estimate poverty rates for the lower and upper national lines at the

[38] Haslett and Jones also experiment with poverty maps for Bangladesh's 5,637 unions/wards, as well as maps based not on expenditure and poverty lines but rather on caloric intake or child malnutrition (height-for-age and weight-for-age). They find, however, that these estimates with their data are too imprecise to be useful.

upazila/*thana* level. Such estimates would not be possible with only the 2000 HIES due to its smaller sample size. Finally, Haslett and Jones make "poverty maps" that quickly show how estimated poverty rates vary across areas in a way that makes sense to non-specialists.

Poverty mapping in Haslett and Jones has much in common with the poverty scoring here in that they both:

- Build scorecards with nationally representative survey data and then apply them to other data on groups that may not be nationally representative
- Use simple, verifiable indicators that are quick and inexpensive to collect
- Provide unbiased estimates when their assumptions hold
- Estimate poverty rates for groups
- Report bias and standard errors
- Reduce overfitting by selecting indicators with statistical and non-statistical criteria
- Seek to be useful in practice and so aim to be transparent to non-specialists

Strengths of poverty mapping include that it:

- Has formally established theoretical properties
- Can be applied straightforwardly to measures of well-being (such as the poverty gap or food security) that go beyond head-count poverty rates
- Requires less data for construction and calibration
- Includes community-level indicators, increasing accuracy and precision
- Uses only indicators that are collected by a census

Strengths of poverty scoring include that it:

- Is simpler in terms of both construction and application
- Tests accuracy empirically
- Associates poverty likelihoods with scores non-parametrically
- Surfaces estimates of poverty likelihoods for individual households
- Reports simple formulas for standard errors

The basic difference between the two approaches is that poverty mapping seeks to help governments target pro-poor policies, while poverty scoring seeks to help local

pro-poor organizations to manage their social performance.[39] On a technical level, Haslett and Jones estimate expenditure directly, whereas the poverty scorecard here estimates poverty likelihoods.

Haslett and Jones' 19 indicators for Bangladesh are:

- Demographics:
  - Household size (and its square, and its interaction with rurality)
  - Proportion of household members who are:
    - Four-years-old or younger
    - Female (interacted with rurality)
- Education:
  - Whether the household head completed primary school (and interacted with rurality)
  - Proportion of household members who are literate
- Employment:
  - Whether the main source of income is construction or transportation
  - Proportion of household members who are:
    - Employees, family helpers, or other
    - Self-employed (and interacted with rurality)
- Characteristics of the residence:
  - Type (and its interaction with rurality)
  - Presence of electricity
  - Type of toilet arrangement
  - Source of drinking water
- Ownership of real estate:
  - House (and interacted with the type of residence)
  - Agricultural land
- Location:
  - Urban/rural
  - Division

[39] Another apparent difference is that the developers of poverty mapping (Elbers, Lanjouw, and Lanjouw, 2003; Demombynes *et al.*, 2004) say that it is too inaccurate to be used for targeting at the household level, while Schreiner (2008b) supports household-level targeting as a legitimate, potentially useful application of poverty scoring. In Elbers *et al.* (2007), the developers of poverty mapping seem to have taken a small step away from their original position.

- Census means at the level of the *upazila/thana*:
    - — Household size
    - — Dependency ratio
    - — Share of households with agriculture as the main source of income

The complexity brought about by the use of *upazila/thana* census-based cluster means, logarithms, squares, and interaction terms means that the scorecard cannot be used for on-the-spot targeting of individual households.

Because the census does not measure expenditure, Haslett and Jones cannot test accuracy out-of-sample. They do report standard errors for estimated poverty rates, averaged across *upazilas/thanas*. For the upper national line, the 90-percent confidence interval for their scorecard's estimate of the poverty rate is ±6.8 percentage points.

9.8 Kam *et al.*

Like Haslett and Jones, Kam *et al.* (2004) use the five-percent sample of Bangladesh's January 2001 population census to make poverty maps at the level of *upazilas/thanas*. They build their scorecard not with expenditure from the 2000 HIES but rather with income from a nationally representative 2000/1 survey by the International Rice Research Institute that covered 1,888 households in 62 villages.

Kam *et al.* use two poverty lines based on the cost of 2,112 calories (or 1,800 calories) and 58 grams of protein derived from the consumption by rural households in the 2000 HIES, adding 40 percent for non-food purchases. Their scorecard is derived from least-squares regression on income with nine indicators:

- Education:
  - — Average years of schooling among working household members
  - — Number of adults who attended college
- Employment:
  - — Number of agricultural workers
  - — Number of non-agricultural workers
  - — Whether the household has a business
- Characteristics of the residence:
  - — Presence of electricity
  - — Quality of house
- Ownership of agricultural land
- Whether the household is Muslim

In addition, there are four more indicators that combine two of the indicators above. In general, the indicators in Kam *et al.* are simple, inexpensive, and verifiable.

Overall, Kam *et al.* is less useful than Haslett and Jones. For example, a central strength of poverty mapping is the reporting of standard errors, but Kam *et al.* do not do this. Also, Kam *et al.* use a smaller survey and income instead of expenditure.

9.9 Cortez *et al.*

Cortez *et al.* (2005, p. iii) build a poverty scorecard meant to be "a more objective, transparent, and equally applicable targeting scheme to deliver subsidies to the poor." They use least-squares regression on the logarithm of expenditure from the

2000 HIES. Their initial scorecard has about 40 indicators selected for the statistical significance of their estimated coefficients. To get a more practical tool, Cortez *et al.* winnow the indicators down to 14:

- Number of household members
- Education:
  - Number of members 16-years-old or older who never attended school
  - Highest educational attainment by any household member
- Characteristics of the residence:
  - Presence of electricity
  - Type of wall
  - Type of roof
  - Source of drinking water
  - Type of toilet arrangement
- Ownership of consumer durables:
  - Fans
  - Televisions
  - Dining-room furniture
  - Drawing-room furniture
  - Freezer
  - Telephone (landline or mobile)

As here, all these indicators are simple, inexpensive, and verifiable. In general, Cortez *et al.* emphasize practicality, presenting a ready-to-use scorecard (as here) and providing advice and examples for how to use it for targeting.

In addition to these similarities, there are also differences in that Cortez *et al.*:

- Do not report bias nor precision
- Use 14 indicators (versus 10), two of which are continuous (versus none)
- Have points with one decimal place that are also sometimes negative
- Expect enumerators to multiply responses by their points before adding up the score

Using the 2000 HIES,[40] Schreiner (2006b) reconstructs Cortez *et al.* to compare its accuracy and precision versus his simple poverty scorecard based on the 2000 HIES.

Using ROC curves (as in Wodon), Schreiner (2006b) shows that his 2000-based poverty scorecard is better at targeting. For example, targeting the lowest-scoring 30 percent of households out-of-sample with the $1.08/day 1993 PPP poverty line, the scorecard in Cortez *et al.* targets 51.4 percent of the poor and 14.4 percent of the non-poor. The 2000 poverty scorecard does better, targeting 55.3 percent of the poor and 10.4 percent of the non-poor.

To test the bias and precision of estimates of groups' poverty rates at a point in time, 1,000 bootstraps of $n = 16{,}384$ are drawn out-of-sample, again for the $1.08/day 1993 PPP line. For Cortez *et al.*, the average difference between the estimate and the true value is +2.3 percentage points with a standard error of 1.2 percentage points. For the 2000 simple poverty scorecard, the mean difference is +0.5 percentage points with a standard error of 0.9 percentage points. Thus, the grandmother of the simple poverty scorecard here is both more accurate (less bias) and more precise (smaller standard errors) than Cortez *et al.*

Finally, Cortez *et al.* overstate targeting accuracy, saying that "field-testing of [our scorecard] suggests that it can identify the poor with a 94-percent degree of accuracy" (p. iv). Instead of testing accuracy using the 2000 HIES, Cortez *et al.* apply

[40] Cortez *et al.* (p. 73) lists "Has no private toilet" an indicator, but this is not in the 2000 HIES. Based on the reported mean, the indicator must be "Does the household use a temporary *kacha* latrine or open fields?"

their scorecard to 220 households who, in a previous USAID survey that had measured expenditure, were all *food-poor*, that is, with daily per-capita expenditure less than the cost of 1,800 Calories. Given that the lower national line for the 2000 HIES is BDT18.82 per person per day and that this is the cost of 2,122 Calories, the "food line" used by Cortez *et al.* is BDT18.82 x (1800 ÷ 2,122) = BDT15.96, leading to a poverty rate in the 2000 HIES of 22.1 percent at the household level and 23.2 percent at the person level.

In their test, Cortez *et al.* classify households as "poor" if their scorecard-estimated daily per-capita expenditure is less than BDT26.25 (not BDT15.96). Applied to the 2000 HIES, this line gives a person-level poverty rate of 60 percent (not 23.2 percent).[41] Cortez *et al.* report that 94 percent of people in their households—all with measured expenditure less than BDT15.96—have scorecard-estimated expenditure less than BDT26.25. This overstates accuracy for the line of BDT26.25. This weakens Cortez *et al.*'s conclusion (p. 74) that "the ability of the model to correctly identify such a high percentage of the poor implies that it can be replicated with a high degree of confidence to deliver specific social services targeted to the poor."

[41] Cortez *et al.* do not report whether their test is at the person-level or household-level. The discussion here assumes it is at the person-level.

9.10 Zeller, Alcaraz V., and Johannsen

Zeller, Alcaraz V., and Johannsen ("ZAJ", 2004) seek to build a tool for use by USAID microenterprise partners so that they can report their participants' poverty rates to USAID. Given the same data as in Zeller *et al.* (2006b), they use least-squares regression to predict the logarithm of per-capita expenditure.

ZAJ select indicators from a pool of about 700 candidates by an automated forward stepwise routine that maximizes R^2. The poverty line is \$1.08/day 1993 PPP (BDT23.10/person/day in March 2004 prices), corresponding to a poverty rate in their sample of 36 percent, presumably at the household level.

ZAJ build a series of nine scorecards, progressively restricting the pool of candidate indicators to be simpler, less difficult, and more verifiable. For each scorecard, they test 8, 13, and 18 indicators. For this paper, the most relevant variant is Model 7, as it considers only indicators rated as "easily verifiable" by the survey firm.

The 13-indicator version of ZAJ's Model 7 uses:

- Household demographics:
    - — Household size (and its square)
    - — Age of the household head
- Whether the household head is a domestic worker
- Characteristics of the residence:
    - — Whether the house structure is "good"
    - — Whether there is an improved toilet
- Ownership of agricultural assets:
    - — Whether 51 or more decimals of land are owned, including homestead
    - — Value of milk cows owned

- Ownership of consumer durables:
    - — Value of radios, televisions, VCRs, and CD players
    - — Number of saris
    - — Number of mosquito nets
    - — Presence of blankets
- Geographic division
- Whether the household declares that it is not able to save

Compared with indicators in the scorecard here, those in ZAJ are greater in number, more difficult to collect, and less verifiable. In particular, it is not clear what is a "good" house, nor how to verify whether a household is able to save. Also, it may be difficult for households to put an accurate monetary value on their milk cows, radios, televisions, VCRs, and CD players.

While ZAJ resembles this paper in that it seeks to estimate poverty rates for groups of households, it also differs in several ways. First, ZAJ do not discuss targeting nor estimating changes in poverty rates. Second, ZAJ do not report their scorecards' points. Third, ZAJ's estimates of poverty rates at a point in time are biased.[42] Fourth, ZAJ's automated selection of indicators increases the risk of overfitting. Coupled with their in-sample tests, their measures of accuracy may be overstated. Fifth, ZAJ do not report standard errors. Sixth, ZAJ—instead of using poverty likelihoods—classify a given household as either 100-percent-below or 100-percent-above a poverty line, even though some households with estimated expenditure on one side of a given line will have true expenditure on the other side. Seventh and finally, ZAJ's survey is smaller and older, and 40 percent of its households were not selected randomly. Taken together,

[42] This is due to the non-linear conversion of estimated expenditure into poverty status.

these differences preclude a meaningful comparison of accuracy between ZAJ's scorecard and the one here.

9.11 IRIS Center

Like ZAJ, IRIS Center (2011) was commissioned to build a poverty scorecard (called a "Poverty Assessment Tool", or PAT) for use by USAID's microenterprise partners in Bangladesh to use for reporting the share of their participants who are "very poor". The IRIS PAT uses the same data as ZAJ and Zeller *et al.* (2006b). In essence, IRIS updates ZAJ to use more practical indicators and to replace 1993 PPP lines with 2005 PPP lines. Thus the IRIS PAT shares most of the strengths and weaknesses of ZAJ.

The PAT supports five 2005 PPP poverty lines:

- $0.75/day (poverty rate not reported)
- $1.00/day (poverty rate not reported)
- $1.25/day (household-level poverty rate of 49.1 percent)
- $2.00/day (poverty rate not reported)
- $2.50/day (poverty rate not reported)

In general, the PAT is like the poverty scorecard here, except that it:

- Uses older data (2004 rather than 2010)
- Has a more indicators (18 rather than 10)
- Estimates expenditure (rather than poverty likelihoods)
- Tests in-sample rather than out-of-sample, thus overstating accuracy
- Does not report standard errors

After comparing several statistical approaches,[43] IRIS settles on least-squares regression that, based on the values of indicators for a given household, estimates the logarithm of per-capita household expenditure. A household is counted as *poor* if this estimate is less than a given poverty line.

The PAT's 18 indicators are simple and verifiable:

- Demographics:
  - — Household size (and its square)
  - — Age of the head of the household (and its square)
  - — Whether the head of the household is male
- Education:
  - — Share of members (excluding the head) with no education or only Class 1
  - — Share of members (excluding the head) who did not complete primary school
- Characteristics of the residence:
  - — Number of rooms
  - — Type of lock on the main entrance
  - — Whether the kitchen is separate
  - — Type of cooking fuel
  - — Type of toilet arrangement
- Asset ownership:
  - — Number of saris
  - — Number of blankets and quilts
  - — Number of radios
  - — Black-and-white television
  - — Number of cattle and buffalo
  - — Number of milk cows and heifers
- Location of the residence:
  - — Urban/rural
  - — Division

[43] Thanks to the "flat max", all methods have similar "Total Accuracy".

IRIS reports accuracy in terms of:

- Bias of estimated poverty rates at a point in time[44]
- Targeting (inclusion, undercoverage, leakage, and exclusion)
- The Balanced Poverty Accuracy Criterion, USAID's standard for certifying PATs

IRIS Center (2005) proposed BPAC. It considers accuracy in terms of inclusion and in terms of the absolute difference between undercoverage and leakage (that is, bias). The formula is $\text{BPAC} = 100 \cdot \left(\frac{\text{Inclusion} - \mid \text{Undercoverage} - \text{Leakage} \mid}{\text{Inclusion} + \text{Undercoverage}} \right)$.

Because bias is the difference between undercoverage and leakage, and because the normalization term $\frac{100}{\text{Inclusion} + \text{Undercoverage}}$ is not useful except when comparing scorecards across populations with different poverty rates, the formula boils down to $\text{BPAC} = \text{Inclusion} - \mid \text{Bias} \mid$.

Expressing BPAC as $\text{Inclusion} - \mid \text{Bias} \mid$ helps to show why BPAC is not useful for comparing the PAT with the poverty scorecard here. Regardless of whether undercoverage differs from leakage and given the assumptions discussed earlier in this paper, the poverty scorecard—unlike the PAT for Bangladesh—produces unbiased estimates of poverty rates. While BPAC can be used to compare alternative scorecards under the PAT's expenditure-estimation approach, it does not make sense to apply it to the poverty scorecard's poverty-likelihood approach. This is because, when estimating poverty rates, the scorecard does not use a cut-off to classify households as either 100-

[44] IRIS (2005) calls bias the "Poverty Incidence Error" (PIE). In their expenditure-estimation approach, it is the absolute difference between undercoverage and leakage.

percent poor or 100-percent non-poor. Instead, households have an estimated poverty likelihood somewhere in the range of 0 to 100 percent. If a user of a poverty scorecard sets a targeting cut-off, then that cut-off matters only for targeting, and it does not affect the estimation of poverty rates at all.

In any case, both the PAT and the poverty scorecard give unbiased estimates of poverty rates (after subtracting off known bias), so any distinction between their accuracy must relate to targeting or to the precision of their estimates of poverty rates. A comparison along these dimensions, however, is not possible, as IRIS uses an older, smaller survey and does not report standard errors. And while the PAT's targeting accuracy is reported and although the BPAC formula considers targeting accuracy, IRIS says that the PAT should not be used for targeting.[45]

IRIS also doubts that the PAT can be useful for measuring change, noting that "it is unclear that the tools will be able to identify real changes in poverty over time due to their inherent measurement errors. Unless the changes in the poverty rate are exceptionally large and the tools exceptionally accurate, the changes identified are likely to be contained within the margin of error."[46]

That is, IRIS expects that the confidence interval for estimates of change—for some unstated confidence level and sample size—will usually include zero. In Bangladesh for the new scorecard here, the out-of-sample estimates of change between

[45] `http://www.povertytools.org/faq/faq.html#11`, retrieved 19 February 2009.
[46] `http://www.povertytools.org/faq/faq2.html`, retrieved 7 December 2012.

the validation sample for the 2010 HIES and the full samples for the 2000 HIES and 2005 HIES are statistically different from zero with $n = 4{,}096$ and 90-percent confidence in 12 of 16 cases.

Targeting and estimating changes over time are possible uses that are supported for the poverty scorecard. This paper reports targeting accuracy as well as formula for standard errors for measures of change over time so that users can decide for themselves whether accuracy is adequate for their purposes.

9.12 Sharif

Like this paper but unlike IRIS and Wodon, Sharif (2009) believes poverty scorecards can be useful for targeting households. She proposes a scorecard[47] as the heart of a national system to identify extremely poor households for government and non-government social programs. Simulations (p. 30) suggest that "delivering as little as a third of the current safety-net budget via a [scoring-based] targeting system results in a 7.5-[percent] drop in the poverty rate and a 22-percent drop in the poverty gap."

[47] Sharif calls the poverty scorecard a "proxy means test formula".

In statistics and in spirit, Sharif and this paper are similar in that they both:

- Focus on transparency and simplicity to reduce the risk of improper/failed implementation, tailoring design to mitigate challenges to adoption[48]
- Apply a single scorecard to all regions of Bangladesh
- Present the scorecard's indicators and points in a ready-to-use form
- Report measures of targeting accuracy
- Round estimated regression coefficients to get integer scorecard points
- Keep the scorecard to one page
- Use simple, low-cost, verifiable indicators, selected with many of the same non-statistical criteria to accommodate constraints on feasibility[49]
- Offer only multiple-choice response options

The two scorecards also differ in some respects. In particular, Sharif's scorecard:

- Has more indicators (21 versus 10) and more point values (63 versus 21)
- Includes a couple of difficult indicators (household members per room, and presence of remittances from abroad)
- Has some negative points (rather than always zero or positive), and has scores that are more difficult to add up (ranging from about 600 to 900, rather than 0 to 100)
- Comes from the 2005 HIES (rather than the 2010 HIES)[50]
- Focuses only on targeting (rather than both targeting and estimating poverty rates)
- Estimates expenditure directly (rather than the likelihood that expenditure is less than a poverty line)
- Measures targeting accuracy with a less-strict out-of-sample test

[48] Sharif (p. 3) notes that "having the institutional set-up to implement the targeting system is just as important as having a robust formula."
[49] Sharif says (p. 6) that among current targeted government programs, "a number of indicators used to select beneficiaries are difficult—if not impossible—to verify", such as whether household members eat at least two full meals per day.
[50] Sharif (2011) presents a scorecard based on the 2010 HIES.

Sharif regresses the following 21 indicators on the logarithm of per-capita household monthly expenditure:

- Household demographics:
  - Number of household members of all ages
  - Number of household members 14-years-old or younger
  - Age of the household head
  - Whether the head has no spouse due to being widowed or separated
- Education:
  - Years of education of the household head
  - Years of education of the spouse of the household head
- Employment:
  - Whether any household members work as labourers
  - Whether the household receives remittances from abroad
- Characteristics of the residence:
  - Location (division)
  - Electrical connection
  - Number of household members per room
  - Type of wall
  - Type of roof
  - Type of toilet arrangement
- Ownership of assets:
  - House
  - Fan
  - Television
  - Bicycle
  - Tube well
  - Cattle
  - Land

Which of the two poverty scorecards target better? A perfect apples-to-apples comparison is not possible because the scorecard here is constructed:

- With 2010 data but—for comparability with Sharif—is applied to 2005 data
- At the household level but—again for comparability—is applied at the person level

Both of these factors place the scorecard here at a disadvantage. Furthermore, the scorecard here is applied fully out-of-sample (no 2005 data is used in scorecard construction) and out-of-time. In contrast, Sharif selects indicators with the full 2005 HIES and then—taking the indicators as given—estimates points based on a random sample of half of households in each HIES primary sampling unit (PSU). The resulting scorecard is then applied to the other half of households in each PSU. It turns out that accuracy in-sample and out-of-sample are very similar. This is unusual; in most cases, out-of-sample accuracy is noticably lower, and there is nothing about Sharif's scorecard to suggest that it might be unusually immune to overfitting. It may be due to balancing the construction and validation samples at the level of PSUs.

In any case, the scorecard here targets almost as well as Sharif's. For example, when targeting households whose scorecard-predicted expenditure is less than the 30th percentile of actual measured expenditure, inclusion for Sharif—as defined in this paper at the level of people—is 17.2 percent, and exclusion is 62.6 percent. For the scorecard here, the cut-off that gives inclusion of 17.2 percent has exclusion of 60.5 percent. Thus, Sharif is slightly less likely to mistakenly target the non-poor.

Targeting at the 20th percentile is similar. With inclusion at 8.5 percent for both scorecards, Sharif has slightly better exclusion (74.4 percent versus 73.4 percent).

As a final comparison, Sharif finds that 54 percent of people in households whose actual expenditure is in the lowest decile also have scorecard-estimated expenditure that

is less than the 20th percentile of actual expenditure. The scorecard in this paper again fares a little worse, including 52 percent of people in the lowest decile.

Given the disadvantages faced by the scorecard here (it is tested fully out-of-sample and 5 years out-of-time), it is reasonable to expect that it would catch up to Sharif in an apples-to-apples comparison. And the small differences observed in this imperfect comparison may not be statistically significant at conventional levels. In sum, the two scorecards probably target about equally well.

Given its simplicity, how could the scorecard here do as well as Sharif's? Logit and the non-statistical approach here seek indicators, response options, and points that distinguish among households near the poverty line (here, $1.25/day 2005 PPP). In contrast, Sharif's least-squares approach spreads power more evenly across all households. Furthermore, it is susceptible to distortion by outliers, usually those far from being poor. In general, the "flat maximum" in predictive modelling means that adding more indicators has sharply diminishing returns.

10. Conclusion

This paper presents a simple poverty scorecard for Bangladesh that can be used to estimate the likelihood that a household has expenditure below a given poverty line, to estimate the poverty rate of a group of households at a point in time, and to estimate changes in the poverty rate of a group of households between two points in time. The scorecard can also be used for targeting.

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

The scorecard is constructed with data from Bangladesh's 2010 HIES. It replaces an earlier scorecard based on the 2005 HIES (Chen and Schreiner, 2009). Existing users should switch from the old 2005 scorecard to the new 2010 scorecard. Estimates from the two scorecards are compatible, so existing users can—if desired—estimate changes with a baseline from the old scorecard and a follow-up from the new scorecard.

The new scorecard is constructed with half of the 2010 HIES data, calibrated to nine poverty lines, and tested on the other half of the 2010 data. The validation of estimates of changes in poverty rates over time also uses the full 2000 HIES and the full 2005 HIES.

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 2010 validation sample, the absolute difference between estimates versus true poverty rates for groups of households at a point in time is 0.9 percentage points or less and averages—across the nine poverty lines—about 0.4 percentage points. Unbiased estimates may be had by subtracting this known bias from the original estimates. For $n = 16{,}384$ and 90-percent confidence, the precision of these differences is ± 0.6 percentage points or better.

For estimates of changes in poverty rates over time, the average absolute difference across eight poverty lines is 5.2 percentage points for 2000–2010 and 1.8 percentage points for 2005–2010. The relative error for these lines averages about 60 percent for 2000–2010 and 30 percent for 2005–2010. For all lines in both time periods, the scorecard correctly estimates a decrease in poverty, and 12 of the 16 estimates are statistically different from zero with 90-percent confidence and $n = 4{,}096$. Scoring's estimates of change are more accurate for shorter time periods, for lower poverty lines, and for larger true changes.

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 values and mission.

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 poverty scorecard is kept simple, using ten indicators that are simple, 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 adoption by helping managers understand and trust scoring and by allowing non-specialists to generate scores quickly in the field.

In summary, the simple poverty scorecard is a practical, objective way for pro-poor programs in Bangladesh to estimate expenditure-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

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1. How many household members are 12-years-old or younger?
   A. Three or more
   B. Two
   C. One
   D. None

According to p. 1 of the *Questionnaire*, age should be recorded in full years.

According to p. 173 of the *Final Report*, a *household* is "the smallest unit of social institution. Almost all socio-economic activities are performed around this unit. It can be defined as a dwelling unit where one or more persons live and eat together under a common cooking arrangement. Matrimonial or blood or both relations exist among most of the persons who reside in the dwelling."

According to p. 174 of the *Final Report*, *household members* "include permanent family members as well as boarders and lodgers, servants, and other employees who often live in the household and take food together. It also includes people temporarily away from the household. Persons whose usual place of residence is elsewhere but who are found staying with the household at the time of enumeration are not deemed as *members of the household*. Guests visiting a household temporarily or people who normally reside and takes food outside is not considered as *members of the household*."

According to p. 172 of the *Final Report*, a *family member* is "a person who depends on the family. A family member can be a head of household, spouse, unmarried sons and daughters, married sons who are direct dependants, parents, unmarried sisters, or divorced or separated daughters or sisters. Servants, labourers, and lodgers who have no other usual place of residence but who live and eat together within the household with or without payments are not considered as *family members*."

Please note that while the concept of *family member* excludes servants, labourers, and lodgers who usually live and eat with the household, the concept of *household member* includes these cases.

2. Do all household members ages 6-to-12 currently attend a school/educational institution?
    A. No
    B. No one 6-to-12
    C. Yes

Please see the definition of *household* and *household member* presented above for the first indicator.

According to p. 1 of the *Questionnaire*, age should be recorded in full years.

According to p. 171 of the *Final Report*, a person is considered to be *attending a school/education institution* if they are attending on a full- or part-time basis.

According to p. 172 of the *Final Report*, an *educational institution* is "any primary school, kindergarten school, high school, college, university, *madrasa* (religious institution), technical/vocational school, etc."

The original item in the questionnaire (p. 4) is worded as follows: "What type of school/institution did you last attend/are you currently attending?". The response options are listed as: "1 Government; 2 Private (Govt. grants); 3 Private (Not govt. grants); 4 NGO run institution; 5 Madrasa (Govt. affiliated); and 6 Madrasa (Kowmi)".

3. In the past year, did any household member ever do work for which he/she was paid on a daily basis?
    A. Yes
    B. No

Please see the definition of *household* and *household member* presented above for the first indicator.

According to p. 12 of the *Manual*, this question asks about any type of work for which payment is made on a daily basis, whether in-cash or in-kind.

4. How many rooms does your household occupy (excluding rooms used for business)?
    A. One
    B. Two
    C. Three or more

According to p. 16 of the *Manual*, this includes any type of rooms used for any kind of household work, such as living rooms, storerooms, reading rooms, etc.

5. What is the main construction material of the walls of the main room?
    A. Hemp/hay/bamboo, or other
    B. Mud brick, or C.I. sheet/wood
    C. Brick/cement

According to p. 16 of the *Manual*, if the walls of the main room are constructed of more one kind of material, then count the one which is found in the largest quantity.

6. Does the household own any televisions?
    A. No
    B. Yes

There are no additional guidelines for this indicator.

7. How many fans does the household own?
    A. None
    B. One
    C. Two or more

There are no additional guidelines for this indicator.

8. How many mobile phones does the household own?
    A. None
    B. One
    C. Two or more

There are no additional guidelines for this indicator.

9. Does the household own any bicycles, motorcycle/scooters, or motor cars etc.?
    A. No
    B. Yes

There are no additional guidelines for this indicator.

10. Does the household own (or rent/sharecrop/mortgage in or out) 51 or more decimals of cultivable agricultural land (excluding uncultivable land and dwelling-house/homestead land)?
    A. No
    B. Yes

According to pp. 175–176 of the *Final Report*, *cultivable land* is "land under temporary agricultural crops such as paddy, jute, *rabi* crop, *kharif* crop, etc. It also includes fallow land.

"*Leased-in land* is land taken from other household or institution for the purpose of habitation, farming, fishery, etc. in [exchange for] a fixed rent, on a sharecropping basis, on a mortgage basis, or in any other arrangement.

"*Leased-out land* is land leased out to any person or institutional in [exchange for] a fixed rent, on a sharecropping basis, on a mortgage basis, or in any other arrangement. . . .

"*Owned land* is any land legally owned in the name of a family member."

Please note that the *Questionnaire* uses the terms *rented-in* and *rented-out*, but the *Final Report* uses the terms *leased-in* and *leased-out*.

According to p. 16 of the *Manual*, *dwelling-house/homestead land* means land on which a residence stands, as well as *uthan* (yards) and surrounding areas around the house. *Uncultivable land* means ponds, roads, graveyards, hedges etc.

According to p. 16 of the *Manual*, *cultivable agricultural land rented/share-cropped/mortgaged in* means land taken as rented, mortgaged, or rented from others, as well as land owned by others but used for sharecropping by the household. Conversely, *cultivable agricultural land rented/share-cropped/mortgaged out* means land given as rented, mortgaged, or rented to others, as well as land owned by the household that is given to others for sharecropping.

Figure 1: Poverty lines and poverty rates for all of Bangladesh by survey year, sub-sample, poverty line, and household-level/person-level

Survey year	Line or rate	Person or HH level	# HHs surveyed	% with per-capita daily household expenditure below a poverty line								
				Natl.	National Upper			USAID	Intl. 2005 PPP			
				Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
All Bangladesh												
2000	Line		7,440	18.82	22.51	33.77	45.03	16.99	24.62	34.47	39.39	49.24
	Rate	Household		32.2	46.6	75.4	87.4	22.4	54.3	76.3	82.9	90.1
	Rate	Person		34.3	48.9	77.0	88.3	24.4	56.5	77.9	84.0	90.9
2005	Line		10,080	23.62	28.33	42.49	56.66	22.48	31.86	44.61	50.98	63.73
	Rate	Household		23.1	37.2	69.6	83.5	17.9	47.5	73.9	79.1	87.5
	Rate	Person		25.1	40.0	71.5	84.8	20.0	50.1	74.6	80.7	88.6
2010	Line		12,240	42.90	52.64	78.95	105.27	43.04	59.32	83.05	94.91	118.64
	Rate	Household		15.4	28.5	63.3	80.2	13.8	39.0	66.9	75.1	85.0
	Rate	Person		17.6	31.5	66.1	82.2	15.8	42.2	69.4	77.4	86.6
Construction/calibration: Selecting indicators and points, and associating scores with likelihoods												
2010	Rate	Household	6,131	15.4	28.6	63.0	80.1	13.8	39.0	66.6	74.9	84.9
Validation: Measuring accuracy of 2010 scorecard												
2010	Rate	Household	6,109	15.4	28.5	63.6	80.4	13.8	39.0	67.2	75.4	85.0
Change in poverty rates vis-á-vis 2010 in validation samples												
2000	Rate	Household		–16.8	–18.1	–11.8	–7.0	—	–15.4	–9.2	–7.5	–5.1
2005	Rate	Household		–7.7	–8.8	–6.0	–3.1	—	–8.6	–6.7	–3.7	–2.4
2010	Rate	Household		–0.1	+0.1	–0.5	–0.3	+0.0	+0.0	–0.6	–0.5	–0.1

Source: Bangladesh's 2000, 2005, and 2010 Household Income and Expenditure Survey

Poverty lines are in units of BDT per person per day. Poverty rates are percentages.

Change in poverty rates vis-á-vis 2010 in validation samples are in units of percentage points.

Change in poverty rates over time for the USAID "extreme" line is not reported because it is a relative line.

Figure 2 (Bangladesh): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	7,440	18.82	22.51	33.77	45.03	16.99	24.62	34.47	39.39	49.24
	Rate (HHs)		32.2	46.6	75.4	87.4	22.4	54.4	76.3	82.9	90.1
	Rate (people)		34.3	48.9	77.0	88.4	24.4	56.5	77.9	84.0	90.9
2005	Line	10,080	23.62	28.33	42.49	56.66	22.48	31.86	44.61	50.98	63.73
	Rate (HHs)		23.1	37.2	69.6	83.5	17.9	47.5	72.9	79.1	87.5
	Rate (people)		25.1	40.0	71.5	84.8	20.0	50.1	74.6	80.7	88.6
2010	Line	12,240	42.90	52.64	78.95	105.27	43.04	59.32	83.05	94.91	118.64
	Rate (HHs)		15.4	28.5	63.3	80.2	13.8	39.0	66.9	75.1	85.0
	Rate (people)		17.6	31.5	66.1	82.2	15.8	42.2	69.4	77.4	86.6

Figure 2 (Barisal Rural): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	520	19.08	23.47	35.20	46.93	17.55	25.66	35.93	41.06	51.32
	Rate (HHs)		31.4	50.4	80.4	91.0	23.6	59.6	81.5	86.7	93.1
	Rate (people)		36.0	55.1	84.2	92.7	27.5	64.9	85.4	88.9	94.5
2005	Line	560	24.76	30.45	45.68	60.90	20.91	34.25	47.95	54.80	68.50
	Rate (HHs)		34.5	50.0	77.7	89.8	24.5	59.6	82.5	86.6	92.0
	Rate (people)		37.2	54.1	80.2	91.7	27.0	63.1	85.1	88.9	93.6
2010	Line	680	42.21	48.83	73.25	97.66	38.03	55.03	77.05	88.05	110.07
	Rate (HHs)		23.7	34.6	67.2	85.0	16.7	44.0	71.3	78.7	89.3
	Rate (people)		27.3	39.2	71.9	88.6	19.5	49.2	76.0	82.5	91.8

Figure 2 (Barisal Urban): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	200	21.14	25.12	37.67	50.23	18.81	27.46	38.45	43.94	54.93
	Rate (HHs)		20.0	31.5	62.0	72.5	15.3	40.0	63.0	67.0	79.5
	Rate (people)		21.7	32.0	62.5	74.1	16.1	40.4	63.2	67.1	81.7
2005	Line	260	26.31	31.26	46.89	62.51	24.82	35.16	49.22	56.25	70.31
	Rate (HHs)		25.0	37.7	61.5	76.2	19.4	45.0	63.5	71.9	80.0
	Rate (people)		26.4	40.4	63.8	78.6	19.7	47.9	65.4	75.0	82.2
2010	Line	300	46.67	64.53	96.80	129.06	45.32	72.73	101.82	116.36	145.45
	Rate (HHs)		19.7	34.0	58.3	78.7	16.2	42.0	63.0	72.0	84.0
	Rate (people)		24.2	39.9	64.7	83.3	20.1	48.1	69.6	77.3	87.7

Figure 2 (Chitttagong Rural): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	860	20.35	24.10	36.15	48.20	18.79	26.36	36.90	42.17	52.71
	Rate (HHs)		26.9	41.6	72.9	87.4	19.8	49.7	74.8	82.3	91.5
	Rate (people)		30.2	46.2	75.6	89.3	23.1	53.9	77.2	83.9	92.6
2005	Line	1,160	24.74	29.30	43.95	58.60	24.59	32.96	46.14	52.73	65.91
	Rate (HHs)		15.4	31.3	72.8	88.4	14.7	44.4	76.1	84.2	92.4
	Rate (people)		18.7	36.0	77.3	91.1	18.0	49.0	80.6	87.5	94.4
2010	Line	1,420	46.16	55.47	83.20	110.94	45.32	62.51	87.52	100.02	125.03
	Rate (HHs)		13.2	26.4	64.0	82.9	12.6	36.9	67.6	76.7	87.5
	Rate (people)		16.2	31.0	69.6	86.3	15.5	42.3	73.3	81.3	90.0

Figure 2 (Chitttagong Urban): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	160	21.16	27.21	40.82	54.43	18.93	29.76	41.66	47.61	59.52
	Rate (HHs)		23.1	38.1	58.8	78.8	17.8	45.0	60.6	73.1	83.1
	Rate (people)		25.6	40.4	60.1	80.7	20.1	47.2	61.8	74.3	85.6
2005	Line	460	24.63	31.67	47.51	63.34	25.62	35.62	49.87	56.99	71.24
	Rate (HHs)		11.3	27.4	58.3	75.0	13.4	36.5	61.1	69.4	81.7
	Rate (people)		12.8	29.8	60.4	78.2	14.9	38.8	64.1	72.5	84.2
2010	Line	540	49.16	60.01	90.02	120.03	49.49	67.64	94.69	108.22	135.27
	Rate (HHs)		9.1	19.1	50.0	67.4	9.4	28.7	53.2	60.4	74.8
	Rate (people)		10.8	22.1	54.3	71.3	11.1	32.3	57.4	64.2	78.3

Figure 2 (Chitttagong SMA): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	320	21.03	32.18	48.26	64.35	25.22	35.19	49.26	56.30	70.37
	Rate (HHs)		9.1	39.1	70.9	84.1	18.3	46.6	71.9	78.1	86.9
	Rate (people)		11.5	46.1	77.2	87.4	23.2	53.9	77.8	82.5	89.6
2005	Line	180	25.17	38.50	57.76	77.01	32.17	43.31	60.63	69.29	86.61
	Rate (HHs)		3.9	23.9	57.2	73.3	11.3	36.7	61.1	66.1	77.2
	Rate (people)		5.3	26.6	59.5	74.4	13.1	39.3	63.1	68.2	77.6
2010	Line	240	48.63	61.68	92.53	123.37	54.56	69.52	97.33	111.23	139.04
	Rate (HHs)		0.4	4.6	27.1	47.9	2.7	10.8	31.3	38.8	55.4
	Rate (people)		0.5	6.6	30.9	51.4	3.4	12.7	34.9	41.7	57.7

Figure 2 (Dhaka Rural): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	1,380	18.50	21.39	32.09	42.78	15.44	23.39	32.75	37.43	46.79
	Rate (HHs)		40.6	52.8	80.9	90.9	25.6	60.2	81.7	87.8	92.5
	Rate (people)		43.7	55.9	82.9	92.0	28.0	62.9	83.5	89.4	93.4
2005	Line	1,720	23.95	27.68	41.53	55.37	22.03	31.14	43.59	49.82	62.28
	Rate (HHs)		23.3	36.0	67.3	82.9	17.1	45.9	70.8	77.9	87.2
	Rate (people)		26.1	39.0	68.9	84.1	19.5	48.7	72.3	79.2	88.2
2010	Line	2,100	41.96	49.21	73.82	98.43	39.74	55.46	77.65	88.74	110.93
	Rate (HHs)		20.4	35.1	70.1	86.3	16.7	45.7	73.6	81.9	90.2
	Rate (people)		23.5	38.8	73.0	88.2	19.4	49.4	75.9	84.2	91.6

Figure 2 (Dhaka Urban): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	200	20.53	24.39	36.58	48.78	18.02	26.67	37.34	42.67	53.34
	Rate (HHs)		24.0	33.0	56.0	73.5	15.8	37.0	56.0	66.5	79.5
	Rate (people)		26.3	34.2	56.4	74.2	17.4	38.4	56.4	66.6	81.6
2005	Line	740	24.63	29.25	43.88	58.50	22.62	32.90	46.06	52.64	65.80
	Rate (HHs)		17.2	28.5	53.4	69.5	13.3	36.1	56.1	63.8	75.5
	Rate (people)		18.9	29.9	53.7	69.8	14.8	37.7	56.5	63.8	75.8
2010	Line	900	43.20	58.95	88.43	117.91	47.09	66.44	93.02	106.31	132.88
	Rate (HHs)		10.4	27.4	55.9	73.7	14.1	35.6	60.1	67.8	81.0
	Rate (people)		11.3	29.8	59.0	76.1	15.0	38.7	63.0	70.7	82.8

Figure 2 (Dhaka SMA): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	700	22.28	28.13	42.19	56.25	22.34	30.76	43.06	49.21	61.51
	Rate (HHs)		11.6	24.1	45.0	64.4	11.8	28.6	45.9	55.7	71.0
	Rate (people)		13.0	26.5	47.7	66.3	13.2	30.8	48.6	57.8	72.9
2005	Line	480	26.50	33.45	50.18	66.91	27.46	37.63	52.68	60.20	75.25
	Rate (HHs)		5.8	15.2	46.0	61.7	7.2	21.7	50.0	55.2	69.2
	Rate (people)		7.0	17.5	47.4	63.1	8.7	23.9	51.2	57.0	70.8
2010	Line	540	46.21	67.00	100.49	133.99	58.02	75.51	105.71	120.81	151.01
	Rate (HHs)		1.7	14.4	48.0	67.2	6.6	23.3	51.7	62.6	73.2
	Rate (people)		2.1	15.3	49.4	68.0	7.7	25.0	52.7	63.1	74.5

Figure 2 (Khulna Rural): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	580	16.80	19.14	28.71	38.28	15.20	20.93	29.30	33.48	41.85
	Rate (HHs)		32.6	45.9	79.5	92.4	23.2	54.3	80.2	87.2	94.3
	Rate (people)		34.0	46.4	79.2	93.4	23.2	54.1	79.7	87.6	95.0
2005	Line	880	21.43	24.42	36.62	48.83	19.12	27.46	38.44	43.94	54.92
	Rate (HHs)		30.6	43.9	75.7	88.2	21.2	54.6	79.2	85.2	92.1
	Rate (people)		32.7	46.4	76.9	89.5	23.2	56.5	79.9	86.4	93.0
2010	Line	1,100	39.18	47.18	70.77	94.36	39.22	53.17	74.44	85.08	106.34
	Rate (HHs)		14.2	28.6	67.8	83.2	14.4	40.2	71.7	79.5	88.1
	Rate (people)		15.2	31.0	69.8	85.3	15.4	42.7	74.0	81.6	89.5

Figure 2 (Khulna Urban): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	160	18.44	22.70	34.05	45.40	17.62	24.82	34.75	39.72	49.65
	Rate (HHs)		20.0	31.9	59.4	66.3	16.6	41.3	59.4	63.8	71.3
	Rate (people)		19.8	32.0	59.4	65.6	16.0	40.2	59.4	63.0	70.0
2005	Line	440	22.04	27.13	40.70	54.27	20.96	30.52	42.72	48.83	61.03
	Rate (HHs)		17.5	31.1	59.1	73.2	15.1	40.0	62.1	68.4	77.1
	Rate (people)		19.2	32.9	59.2	73.0	16.3	41.8	62.3	68.5	77.3
2010	Line	540	41.49	55.24	82.86	110.49	43.47	62.26	87.16	99.62	124.52
	Rate (HHs)		10.7	28.2	56.3	70.6	13.6	36.1	59.8	65.9	76.3
	Rate (people)		13.2	32.1	59.6	73.6	16.1	40.5	62.8	68.7	78.7

Figure 2 (Khulna SMA): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	220	19.12	25.41	38.11	50.82	18.06	27.78	38.90	44.46	55.57
	Rate (HHs)		24.6	45.0	68.6	82.7	21.6	50.5	70.5	76.8	85.9
	Rate (people)		26.8	46.1	67.9	83.1	23.2	50.4	69.6	77.5	86.3
2005	Line	140	23.20	30.83	46.24	61.65	21.37	34.67	48.54	55.47	69.34
	Rate (HHs)		35.7	53.6	83.6	92.1	26.0	62.9	83.6	91.4	92.9
	Rate (people)		38.1	55.4	84.2	93.6	27.0	65.0	84.2	93.3	94.2
2010	Line	160	44.33	53.88	80.82	107.76	45.01	60.72	85.01	97.15	121.44
	Rate (HHs)		18.1	36.9	66.3	83.1	18.4	45.0	71.3	79.4	86.9
	Rate (people)		19.9	39.9	69.3	83.8	20.2	48.3	74.4	80.9	87.6

Figure 2 (Rajshahi Rural): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	1,360	16.81	19.65	29.47	39.29	14.24	21.48	30.08	34.38	42.97
	Rate (HHs)		42.4	57.7	85.3	94.5	27.6	65.8	86.3	91.0	95.7
	Rate (people)		44.0	58.5	86.4	94.6	29.2	66.4	87.3	91.7	95.8
2005	Line	1,700	21.56	25.20	37.80	50.40	19.81	28.34	39.68	45.35	56.68
	Rate (HHs)		33.7	49.6	81.9	92.1	24.4	60.8	84.4	89.2	94.5
	Rate (people)		35.6	52.3	83.0	92.0	26.2	63.0	85.1	89.4	94.3
2010	Line	1,880	40.62	48.88	73.31	97.75	38.24	55.08	77.12	88.14	110.17
	Rate (HHs)		20.3	33.9	70.7	86.0	16.4	46.2	73.9	81.0	90.4
	Rate (people)		22.7	36.6	72.2	86.8	18.3	48.6	75.2	82.2	90.9

Figure 2 (Rajshahi Urban): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	240	18.90	23.26	34.89	46.52	16.34	25.43	35.61	40.70	50.87
	Rate (HHs)		32.9	42.1	65.8	75.4	20.6	49.6	66.7	71.7	81.3
	Rate (people)		35.1	44.7	65.0	74.3	22.4	51.2	65.6	70.3	79.8
2005	Line	720	22.89	28.16	42.24	56.33	21.22	31.68	44.35	50.68	63.35
	Rate (HHs)		29.2	48.5	75.6	86.1	22.4	60.1	78.5	82.9	88.2
	Rate (people)		31.5	49.6	75.9	86.3	24.8	60.7	78.8	83.6	88.2
2010	Line	800	43.13	52.10	78.15	104.20	41.99	58.72	82.20	93.95	117.43
	Rate (HHs)		14.9	27.5	60.1	75.4	13.6	37.0	63.0	70.5	79.1
	Rate (people)		16.5	30.5	62.8	77.6	15.3	40.3	65.3	72.7	80.8

Figure 2 (Rajshahi SMA): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	160	18.94	22.44	33.66	44.87	16.26	24.54	34.35	39.26	49.07
	Rate (HHs)		30.0	42.5	76.3	86.9	19.1	51.9	77.5	81.3	90.6
	Rate (people)		31.6	43.4	77.7	88.2	21.3	54.7	78.7	83.1	92.5
2005	Line	100	23.75	28.14	42.21	56.28	22.91	31.65	44.31	50.64	63.30
	Rate (HHs)		12.0	19.0	53.0	72.0	11.4	28.0	59.0	65.0	80.0
	Rate (people)		11.7	20.8	55.3	71.7	10.9	29.7	61.6	66.3	81.5
2010	Line	180	40.21	51.16	76.73	102.31	42.56	57.65	80.71	92.25	115.31
	Rate (HHs)		11.7	30.6	66.7	80.0	16.4	44.4	69.4	77.2	83.3
	Rate (people)		10.8	31.7	65.9	80.0	16.1	45.4	68.0	77.2	84.2

Figure 2 (Sylhet Rural): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	340	18.42	21.72	32.57	43.43	17.43	23.75	33.25	38.00	47.49
	Rate (HHs)		22.4	37.9	75.9	87.7	17.8	49.4	76.5	83.2	90.3
	Rate (people)		26.1	41.9	78.3	87.7	21.1	53.9	78.6	84.2	89.8
2005	Line	380	22.93	27.03	40.55	54.07	21.32	30.41	42.57	48.65	60.81
	Rate (HHs)		19.5	33.2	66.8	85.3	15.6	44.0	70.0	79.0	89.7
	Rate (people)		22.3	36.1	70.2	87.3	17.9	47.4	72.4	81.2	91.3
2010	Line	660	40.77	43.11	64.67	86.23	37.36	48.59	68.02	77.74	97.18
	Rate (HHs)		21.4	27.9	62.7	80.2	13.9	38.3	66.5	75.3	84.1
	Rate (people)		23.5	30.5	64.7	81.9	15.2	42.4	68.0	76.8	86.0

Figure 2 (Sylhet Urban): Poverty lines and poverty rates by year, region, level, and poverty line

Year	Line/rate	n	% with per-capita daily expenditure below a poverty line (BDT)								
			Natl.	National Upper			USAID	Intl. 2005 PPP			
			Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
2000	Line	40	21.90	27.71	41.56	55.42	20.85	30.30	42.42	48.48	60.60
	Rate (HHs)		32.5	47.5	77.5	82.5	21.3	55.0	77.5	77.5	85.0
	Rate (people)		35.2	49.6	78.4	84.3	25.4	55.1	78.4	78.4	86.9
2005	Line	160	26.51	33.54	50.32	67.09	24.50	37.73	52.82	60.37	75.46
	Rate (HHs)		10.0	16.3	45.0	62.5	8.4	20.0	48.8	57.5	65.6
	Rate (people)		11.0	18.6	45.4	66.3	9.5	21.8	51.2	61.4	69.4
2010	Line	200	42.27	51.22	76.83	102.44	44.38	57.73	80.82	92.36	115.45
	Rate (HHs)		4.5	12.5	35.5	51.0	5.8	18.0	37.5	45.5	59.5
	Rate (people)		5.5	15.0	38.7	55.5	7.4	20.8	40.8	49.5	65.2

Figure 3: Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
1,215	How many mobile phones does the household own? (None; One; Two or more)
1,110	How many fans does the household own? (None; One; Two or more)
1,021	In the past 12 months, has anyone in the household received charity, gifts, royalties, help, Zakat, Fitra, or other such assistance in cash or in kind? If not, has anyone had consumption/expenditure on Fitra, Sadqa, Qurbani, or Zakat? (Did not give or receive alms; Only gave Sadqa, or only gave Fitra; Received Zakat (regardless of any giving); Gave Fitra and Sadqa, but not Qurbani nor Zakat; Gave Qurbani or Zakat (regardless of giving Fitra and Sadqa))
936	Does the household own any televisions with VCRs/VCPs/DVDs or dish antennas/decoders? (No; Only televisions; Both, or only VCRs/VCPs/DVDs or dish antennas/decoders)
915	Does the household own any televisions? (No; Yes)
895	Does the household own a mobile phone? (No; Yes)
894	In the past 12 months, has your household had any consumption/expenditure on Qurbani? (No; Yes)
885	Does the household have a land-line telephone connection or a mobile phone? (No; Yes)
874	What was the highest grade that the male head spouse completed? (None, Class 1 to 3, or other; Class 4; Class 5; No male head/spouse; Class 6 to 8; Class 9, or SSC/equivalent; HSC/equivalent or higher)
768	In the past year, did any household member ever do work for which he/she was paid on a daily basis? (Yes; No)
761	In the past year in the job in which they worked the most hours, were any household members paid on a daily basis? (Yes; No)
720	What was the highest grade that the female head spouse completed? (None, Class 1, or other; Class 2 to 5; Class 6 to 8; No female head/spouse; Class 9; SSC/equivalent)
700	What is the main construction material of the walls of the main room? (Hemp/hay/bamboo, or other; Mud brick, or C.I. sheet/wood; Brick/cement)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
675	Does the household have an electricity connection? (No; Yes)
675	How many household members are 12-years-old or younger? (Three or more; Two; One; None)
674	How many household members are 11-years-old or younger? (Three or more; Two; One; None)
656	Does the household own any refrigerators or freezers? (No; Yes)
644	How many household members are 13-years-old or younger? (Three or more; Two; One; None)
635	In the past year in the job in which the male head/spouse worked the most hours, what was his employment status? (Day labourer or employee in agriculture; Does not work; No male head/spouse; Day labourer in non-agriculture; Self-employed or employer in agriculture; Employee in non-agriculture; Self-employed or employer in non-agriculture)
608	How many wrist watches or wall clocks does the household own? (None; One; Two or more)
605	How many household members are 14-years-old or younger? (Three or more; Two; One; None)
602	Do all household members ages 6 to 14 currently attend a non-private or private (regardless of government subsidies/grants) school/educational institution? (No; Yes, all go to non-private; No one ages 6 to 14; Yes, some go to private)
597	In the past 12 months, has your household had any consumption/expenditure on Fitra? (No; Yes)
595	If any household members were in agriculture in the job in which they worked the most hours in the past year, how many decimals of cultivable agricultural land does the household own/rent/sharecrop/mortgage in or out? (Someone in agriculture, but no cultivable agricultural land; Someone in agriculture, and 1 to 50 decimals of cultivable agricultural land; No one in agriculture, and no cultivable agricultural land; Someone in agriculture, and 51 to 100 decimals of cultivable agricultural land; No one in agriculture, but 1 to 50 decimals of cultivable agricultural land; No one in agriculture, but 51 to 100 decimals of cultivable agricultural land; Someone in agriculture, and 101 or more decimals of cultivable agricultural land; No one in agriculture, but 101 or more decimals of cultivable agricultural land)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
586	Do all household members ages 6 to 13 currently attend a non-private or private (regardless of government subsidies/grants) school/educational institution? (No; Yes, all go to non-private; No one ages 6 to 13; Yes, some go to private)
580	Do all household members ages 6 to 12 currently attend a non-private or private (regardless of government subsidies/grants) school/educational institution? (No; Yes, all go to non-private; No one ages 6 to 12; Yes, some go to private)
578	Do all household members ages 6 to 15 currently attend a non-private or private (regardless of government subsidies/grants) school/educational institution? (No; Yes, all go to non-private; No one ages 6 to 15; Yes, some go to private)
564	If the male head/spouse worked for livelihood during the past seven days, was he paid on a daily basis in the job in which he worked the most hours? (Yes; Does not work; No male head/spouse; No)
563	How many household members are 15-years-old or younger? (Three or more; Two; One; None)
549	Do all household members ages 6 to 11 currently attend a non-private or private (regardless of government subsidies/grants) school/educational institution? (No; Yes, all go to non-private; No one ages 6 to 11; Yes, some go to private)
544	Do all household members ages 6 to 16 currently attend a non-private or private (regardless of government subsidies/grants) school/educational institution? (No; Yes, all go to non-private; No one ages 6 to 16; Yes, some go to private)
544	How many household members are 16-years-old or younger? (Four or more; Three; Two; One; None)
538	Can the male head/spouse read and write a letter? (No; No male head/spouse; Yes)
533	What is the main construction material of the roof of the main room? (Tile/wood, hemp/hay/bamboo, or other; C.I. sheet/wood; Brick/cement)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
524	What is the total usable space/area of covered rooms? (1 to 130; 131 to 220; 221 to 360; 361 to 500; 501 to 600; 601 or more)
513	Do all household members ages 6 to 17 currently attend a non-private or private (regardless of government subsidies/grants) school/educational institution? (No; Yes, all go to non-private; No one ages 6 to 17; Yes, some go to private)
509	How many rooms does your household occupy (excluding rooms used for business)? (One; Two; Three or more)
495	Do all household members ages 6 to 18 currently attend a non-private or private (regardless of government subsidies/grants) school/educational institution? (No; Yes, all go to non-private; No one ages 6 to 18; Yes, some go to private)
488	How many household members are 17-years-old or younger? (Four or more; Three; Two; One; None)
484	How many household members are 6-years-old or younger? (Two or more; One; None)
476	Can the female head/spouse read and write a letter? (No; No female head/spouse; Yes)
475	How many household members are 18-years-old or younger? (Four or more; Three; Two; One; None)
468	What type of latrine does the household use? (Other; Kacha (temporary); Kacha (permanent) or pacca (pit or water seal); Sanitary)
440	How many household members can read and write a letter? (None; One; Two; Three; Four; Five)
434	In the past year in the job in which they worked the most hours, were any household members day labourers or employees in agriculture? (Yes; No)
432	Does the household own any drawing-room furniture? (No; Yes)
430	Does the household own any drawing-room or dining-room furniture? (No; Yes)
428	Do any household members currently attend a private school (regardless of government subsidies/grants)? (No; Yes)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
392	Do all household members ages 6 to 14 currently attend a school/educational institution? (No; Yes; No one ages 6 to 14)
382	Do all household members ages 6 to 14 currently attend a school/educational institution? (No; Yes; No one ages 6 to 13)
380	Do all household members ages 6-to-12 currently attend a school/educational institution? (No; No one ages 6-to-12; Yes)
375	Does the household own (or rent/sharecrop/mortgage in or out) 51 or more decimals of cultivable agricultural land (excluding uncultivable land and dwelling-house/homestead land)? (No; Yes)
361	Does the household own, rent-in/sharecrop-in/mortgage-in, or rent-out/sharecrop-out/mortgage-out any cultivable agricultural land? (Only land rented-in/sharecropped-in/mortgaged-in; No cultivable agricultural land; Only owned land and land rented-in/sharecropped-in/mortgaged-in; Only owned; Other)
358	Do all household members ages 6 to 11 currently attend a school/educational institution? (No; Yes; No one ages 6 to 11)
351	Do all household members ages 6 to 15 currently attend a school/educational institution? (No; Yes; No one ages 6 to 15)
346	How many pieces of bedroom furniture does the household own? (None; One; Two; Three; Four; Five; Six or more)
318	In the past year in the job in which they worked the most hours, how many household members were not paid on a daily basis? (None; One; Two or more)
312	Do all household members ages 6 to 16 currently attend a school/educational institution? (No; Yes; No one ages 6 to 16)
307	Does your dwelling possess a separate dining room? (No; Yes)
284	Does the household rent-out/sharecrop-out/mortgage-out any cultivable agricultural land? (No; Yes)
273	Do all household members ages 6 to 17 currently attend a school/educational institution? (No; Yes; No one ages 6 to 17)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
260	How many household members are there? (Seven or more; Six; Five; Four; Three; One or two)
259	Does the household own any dining-room furniture? (No; Yes)
259	Does the household own any cultivable agricultural land? (No; Yes)
254	If any household members were in agriculture in the job in which they worked the most hours in the past year, did anyone in your household cultivate any crops in the last 12 months? (No one in agriculture, but someone cultivated crops; Someone in agriculture, and someone cultivated crops; No one in agriculture, and no one cultivated any crops; Someone in agriculture, but no one cultivated crops)
251	Do all household members ages 6 to 18 currently attend a school/educational institution? (No; Yes; No one ages 6 to 18)
213	In the past year in the job in which they worked the most hours, were any household members day labourers in non-agriculture? (Yes; No)
193	Does the household own any VCRs/VCPs/DVDs or dish antennas/decoders? (No; Yes)
189	If any household members were in agriculture in the job in which they worked the most hours in the past year, does your household presently own any ploughs and yokes, shallow tube wells, deep tube wells, sprayers, country boats, engine boats, threshers, power pumps, hand pumps, power tillers, ginning machines, husking machines, or tractors? (Someone in agriculture, but no big agricultural implements; No one in agriculture, and no big agricultural implements; Owns big agricultural implements (regardless of whether anyone works in agriculture)
187	If your main source of drinking water is a tubewell, has it been tested for arsenic? (Not tubewell (pond/river, well, waterfall spring, or other); Tubewell, not tested; Tubewell, tested; Not tubewell (supply water))
185	Does your dwelling possess a separate kitchen? (No; Yes)
178	Does the household own any bicycles, motorcycle/scooters, or motor cars etc.? (No; Yes)
168	What is the main source of drinking water? (Tubewell, pond/river, well, waterfall/spring, or other; Supply water)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
152	If any household members were in agriculture in the job in which they worked the most hours in the past year, does your household presently own any chickens, ducks, pigeons, or other domestic birds? (Someone in agriculture, but no poultry; Someone in agriculture, and owns poultry; No one in agriculture, but owns poultry; No one in agriculture, and no poultry)
149	In the past 12 months, has your household had any consumption/expenditure on Sadqa? (No; Yes)
147	If any household members were in agriculture in the job in which they worked the most hours in the past year, does your household presently own any cattle, buffalo, goats, or sheep? (Someone in agriculture, but no cattle, buffalo, goats, nor sheep; Someone in agriculture, and owns cattle, buffalo, goats, or sheep; No one in agriculture, but owns cattle, buffalo, goats, or sheep; No one in agriculture, and no cattle, buffalo, goats, nor sheep)
143	If any household members were in agriculture in the job in which they worked the most hours in the past year, does your household presently own any cattle or buffalo? (Someone in agriculture, but no cattle nor buffalo; Someone in agriculture, and owns cattle or buffalo; No one in agriculture, but owns cattle or buffalo; No one in agriculture, and no cattle nor buffalo)
118	What is you present occupancy status? (Squatter, provided free by relatives/employer, or other; Owner; Renter, or government residence)
113	In the past 12 months, has your household had any consumption/expenditure on Zakat? (No; Yes)
113	If any household members were in agriculture in the job in which they worked the most hours in the past year, does your household presently own any goats or sheep? (Someone in agriculture, but no goats nor sheep; Someone in agriculture, and owns goats or sheep; No one in agriculture, but owns goats or sheep; No one in agriculture, and no goats nor sheep)
110	In the past year in the job in which they worked the most hours, were any household members self-employed? (No; Yes)
108	Does the household own any bicycles? (No; Yes)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
97	In the past year in the job in which they worked the most hours, how many household members were not day labourers nor employees in agriculture? (None; One; Two or more)
93	In the past year in the job in which they worked the most hours, were any household members in agriculture? (Yes; No)
92	If the female head/spouse worked for livelihood during the past seven days, was she paid on a daily basis in the job in which she worked the most hours? (Yes; Does not work; No; No female head/spouse)
90	In the past year in the job in which they worked the most hours, were any household members employees in non-agriculture? (No; Yes)
88	How many household members are earners? (Three or more; Two; One; None)
86	Does the household own any radios or two-in-one cassette players? (No; Yes)
76	Does the household own any tubewell (for drinking water only)? (No; Yes)
75	Does the household own any sewing machines? (No; Yes)
62	Does the household have a land-line telephone connection? (No; Yes)
59	In the past 12 months, has anyone in the household received charity, gifts, royalties, help, Zakat, Fitra, or other such assistance in cash or in kind? (Yes; No)
58	How many household member worked for livelihood during the past seven days? (Three or more; Two; One; None)
56	In the last 12 months, has anyone in your family borrowed money from a microfinance institution such as Grameen Bank, BRAC, BRDB, ASA, Proshika, an other NGO, or another microfinance establishment? (Yes; No)
55	In the past year in the job in which they worked the most hours, were any household members self-employed or employers in agriculture? (No; Yes)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
54	Did anyone in your household cultivate any crops, engage in any fishing or fish farming, or engage in any farm forestry in the last 12 months? (Only forestry, only fishing, or only crop cultivation and fishing; None; Only crop cultivation; Only fishing and forestry, or only crop cultivation and forestry; All three)
37	In the past year in the job in which they worked the most hours, were any household members self-employed or employers in non-agriculture? (No; Yes)
35	In the last 12 months, has anyone in your family borrowed money from the Grameen Bank, ASA, or BRAC? (Yes; No)
32	Did anyone in your household engage in any farm forestry in the last 12 months? (No; Yes)
31	In the last 12 months, has anyone in your family borrowed money from a formal lender that is not a microfinance institution? (No; Yes)
30	In the last 12 months, has anyone in your family borrowed money from ASA? (Yes; No)
23	In the last 12 months, has any household member deposited money in a credit or microfinance institution (BRAC, Grameen Bank etc.)? (Yes; No)
23	In the last 12 months, has anyone in your family borrowed money from a microfinance institution, bank, or other formal lender? (Yes; No)
19	Is the female head/spouse an earner? (Yes; No; No female head/spouse)
18	What is the structure of household headship? (Both male and female heads/spouses; Female head/spouse only; Male head/spouse only)
17	In the past year in the job in which the female head/spouse worked the most hours, what was her employment status? (Does not work; Day labourer or employee in agriculture, self-employed or employer in agriculture, day labourer in non-agriculture, employee in non-agriculture, or self-employed or employer in non-agriculture; No female head/spouse)
16	What is the marital status of the male head/spouse? (Currently married; No male head/spouse; Never married, widowed, divorced, or separated)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
16	Did the female head/spouse work for livelihood during the past seven days? (Yes; No; No female head/spouse)
15	Is the male head/spouse an earner? (Yes; No male head/spouse; No)
12	Did anyone in your household cultivate any crops in the last 12 months? (No; Yes)
12	Did the male head/spouse work for livelihood during the past seven days? (Yes; No; No male head/spouse)
12	What is the marital status of the female head/spouse? (Widowed, divorced, or separated; Currently married; No female head/spouse, or never married)
12	In the last 12 months, has anyone in your family borrowed money from a microfinance institution other than Grameen Bank, ASA, or BRAC? (Yes; No)
10	Did anyone in your household cultivate any crops or engage in any fishing or fish farming? (None; One or both)
8	Did anyone in your household engage in any fishing or fish farming in the last 12 months? (No; Yes)
6	In the past year in the job in which they worked the most hours, how many household members were in non-agriculture? (None; One; Two or more)
4	In the last 12 months, has anyone in your family borrowed money from the Grameen Bank? (Yes; No)
2	Does the household rent/sharecrop/mortgage in any cultivable agricultural land? (No; Yes)
1	In the last 12 months, has anyone in your family borrowed money from BRAC? (Yes; No)

Source: 2010 HIES and 100% of the upper national poverty line

Tables for
100% of the Upper National Poverty Line

(and Tables Pertaining to All Nine Poverty Lines)

Figure 4 (Upper 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	87.3
5–9	84.6
10–14	82.1
15–19	68.0
20–24	62.7
25–29	50.4
30–34	40.9
35–39	36.0
40–44	26.7
45–49	19.6
50–54	14.7
55–59	7.1
60–64	5.3
65–69	4.4
70–74	2.3
75–79	1.2
80–84	0.5
85–89	0.0
90–94	0.0
95–100	0.0

Figure 5 (Upper national line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	631	÷	722	=	87.3
5–9	1,423	÷	1,683	=	84.6
10–14	2,421	÷	2,950	=	82.1
15–19	3,801	÷	5,592	=	68.0
20–24	3,837	÷	6,125	=	62.7
25–29	3,536	÷	7,012	=	50.4
30–34	3,112	÷	7,617	=	40.9
35–39	3,080	÷	8,568	=	36.0
40–44	2,530	÷	9,468	=	26.7
45–49	1,575	÷	8,035	=	19.6
50–54	1,416	÷	9,628	=	14.7
55–59	436	÷	6,156	=	7.1
60–64	384	÷	7,278	=	5.3
65–69	294	÷	6,711	=	4.4
70–74	99	÷	4,288	=	2.3
75–79	37	÷	2,982	=	1.2
80–84	16	÷	3,164	=	0.5
85–89	0	÷	879	=	0.0
90–94	0	÷	1,140	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 6 (All poverty lines): Probability that a given household's expenditure falls in a range demarcated by two adjacent poverty lines

	Likelihood (%) of having expenditure in ranges demarcated by poverty lines									
	<USAID	=>USAID and <Lower Natl.	=>Lower Natl. and <100% Upper	=>100% Upper and <$1.25/day	=>$1.25/day and <150% Upper	=>150% Upper and <$1.75/day	=>$1.75/day and <$2.00/day	=>$2.00/day and <200% Upper	=>200% Upper and <$2.50/day	=>$2.50/day
Score	<BDT43.04	=>BDT43.04 and <BDT42.90	=>BDT42.90 and <BDT52.64	=>BDT52.64 and <BDT59.32	=>BDT59.32 and <BDT78.95	=>BDT78.95 and <BDT83.05	=><BDT83.05 and <BDT94.91	=><BDT94.91 and <BDT105.27	=>BDT105.27 and <BDT118.64	=>BDT118.64
0–4	65.8	10.4	11.1	10.6	0.5	0.3	1.3	0.0	0.0	0.0
5–9	65.6	5.0	14.0	4.7	8.4	0.5	0.5	0.9	0.2	0.3
10–14	57.2	6.4	18.5	6.7	8.8	0.6	0.5	0.8	0.2	0.3
15–19	42.5	3.9	21.6	13.7	14.6	0.7	1.7	0.9	0.2	0.3
20–24	32.7	4.4	25.6	15.4	18.1	0.2	2.1	1.0	0.2	0.3
25–29	22.9	3.7	23.8	15.4	22.9	3.0	3.7	2.6	0.8	1.3
30–34	16.9	2.1	21.8	16.1	27.3	3.6	5.6	2.5	2.2	1.8
35–39	13.8	1.2	21.0	14.4	30.4	2.8	7.2	2.8	3.3	3.2
40–44	11.1	1.6	14.0	14.0	35.4	3.5	7.8	4.5	3.0	5.1
45–49	5.4	1.2	13.0	13.9	32.3	3.1	10.8	7.0	4.9	8.6
50–54	4.5	0.0	10.3	9.4	30.8	5.3	13.9	7.1	6.6	12.2
55–59	1.8	0.0	5.3	7.5	28.0	7.8	14.9	10.4	8.7	15.7
60–64	1.0	0.0	4.3	5.7	23.9	5.6	14.1	10.3	8.3	26.8
65–69	0.1	0.2	4.0	4.3	19.9	3.6	12.3	8.1	10.8	36.7
70–74	0.0	0.2	2.2	3.3	18.9	6.9	11.4	8.1	9.4	39.6
75–79	0.0	0.0	1.2	3.1	17.2	4.3	8.3	6.3	10.5	49.3
80–84	0.0	0.0	0.5	2.2	14.3	2.7	7.0	5.4	8.8	59.1
85–89	0.0	0.0	0.0	0.0	8.3	2.4	3.9	10.3	8.4	66.7
90–94	0.0	0.0	0.0	0.0	3.9	1.2	1.5	3.3	2.4	87.7
95–100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Note: All poverty likelihoods in percentage units.

The USAID "extreme" line is a relative line that is derived separately for each of 16 poverty-line regions. This is why it happens that the average USAID "extreme" line is lower than the lower national line but nevertheless gives a higher poverty rate when aggregated over all poverty-line regions.

Figure 7 (Upper national line): Average bootstrapped 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 2010 validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	–8.9	5.7	5.9	6.3
5–9	+2.3	3.8	4.7	6.0
10–14	+0.3	2.9	3.4	5.0
15–19	+1.6	2.7	3.2	4.3
20–24	–0.4	2.6	3.1	4.1
25–29	–0.3	2.5	3.0	3.8
30–34	+2.1	2.3	2.7	3.8
35–39	–1.1	2.4	2.9	3.8
40–44	–0.6	2.0	2.4	3.1
45–49	–3.4	2.8	3.1	3.4
50–54	+6.1	1.1	1.4	1.8
55–59	–6.8	4.5	4.7	5.1
60–64	+1.3	0.9	1.1	1.5
65–69	+2.4	0.8	1.0	1.2
70–74	–0.9	1.3	1.5	2.1
75–79	–0.0	0.7	0.8	1.0
80–84	+0.5	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 (Upper 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 2010 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (± percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+1.7	68.0	74.2	89.0
4	+0.9	32.0	37.4	48.0
8	+0.6	22.4	26.8	33.5
16	+0.2	15.6	18.4	25.0
32	+0.5	10.9	13.0	16.7
64	+0.5	8.0	9.4	12.1
128	+0.2	5.6	6.8	9.0
256	+0.3	3.9	4.8	6.5
512	+0.3	2.9	3.4	4.3
1,024	+0.2	2.0	2.4	3.4
2,048	+0.2	1.4	1.8	2.2
4,096	+0.2	1.0	1.2	1.6
8,192	+0.2	0.7	0.9	1.1
16,384	+0.2	0.5	0.6	0.8

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 2010 validation sample

	Poverty line								
	Natl.	National Upper			USAID	Intl. 2005 PPP			
	Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
Estimate minus true value									
Scorecard applied to 2010 validation sample	+0.5	+0.2	–0.8	–0.2	–0.0	–0.3	–0.9	–0.7	–0.0
Precision of difference									
Scorecard applied to 2010 validation sample	0.4	0.5	0.6	0.5	0.4	0.5	0.6	0.5	0.5
α factor for standard errors									
Scorecard applied to 2010 validation sample	0.85	0.86	0.93	0.97	0.93	0.86	0.95	0.95	1.00

Differences between estimates and true values are displayed in units of percentage points.
Precision is measured as 90-percent confidence intervals in units of ± percentage points.
Differences and precision estimated from 1,000 bootstrap samples of size n = 16,384.
α is estimated from 1,000 bootstrap samples of n = 256, 512, 1,024, 2,048, 4,096, 8,192, and 16,384.

Figure 10 (All lines): Average differences between estimates of changes of poverty rates and true changes between independent, representative samples from a population at two points in time, precision, and the α factor for precision, scorecard applied to the 2010 validation sample and to the full 2005 HIES and the full 2000 HIES

	Poverty line								
	Natl.	National Upper			USAID	Intl. 2005 PPP			
	Lower	100%	150%	200%	'Extreme'	$1.25	$1.75	$2.00	$2.50
Estimated change minus true change									
2010 scorecard applied to 2010 validation and 2000 HIES	–4.7	–0.3	+6.6	+5.2	—	+4.9	+8.1	+7.0	+4.8
2010 scorecard applied to 2010 validation and 2005 HIES	–4.3	–3.6	–0.6	+0.9	—	–2.6	–0.6	+1.0	+0.8
Precision of estimated change minus true change									
2010 scorecard applied to 2010 validation and 2000 HIES	0.7	0.8	0.7	0.6	—	0.8	0.7	0.6	0.6
2010 scorecard applied to 2010 validation and 2005 HIES	0.6	0.7	0.8	0.7	—	0.8	0.8	0.7	0.6
α factor for standard errors									
2010 scorecard applied to 2010 validation and 2000 HIES	1.44	1.27	1.17	1.19	—	1.21	1.19	1.18	1.22
2010 scorecard applied to 2010 validation and 2005 HIES	1.32	1.24	1.28	1.33	—	1.23	1.28	1.33	1.38

Differences between estimates and true values are displayed in units of percentage points.

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

Differences and precision estimated from 1,000 bootstrap samples of size n = 16,384.

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

There are no estimates of changes for the USAID "extreme" line. It is a relative (not absolute) line, so its real value is not constant through time.

Figure 11 (All poverty lines): Possible targeting outcomes

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

Figure 12 (National line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the 2010 validation sample

Score cut-off	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
<=4	0.7	27.8	0.0	71.5	72.2	–95.0
<=9	2.1	26.4	0.3	71.2	73.3	–84.2
<=14	4.5	24.0	0.9	70.6	75.1	–65.5
<=19	8.3	20.2	2.7	68.8	77.1	–32.5
<=24	12.0	16.5	5.1	66.5	78.5	+2.1
<=29	15.6	12.8	8.4	63.1	78.7	+39.5
<=34	18.6	9.9	13.1	58.4	76.9	+53.8
<=39	21.6	6.9	18.7	52.9	74.5	+34.4
<=44	24.2	4.2	25.5	46.0	70.2	+10.4
<=49	26.0	2.5	31.8	39.8	65.7	–11.6
<=54	27.0	1.5	40.4	31.1	58.1	–41.9
<=59	27.8	0.7	45.8	25.7	53.5	–60.8
<=64	28.1	0.3	52.7	18.8	47.0	–85.1
<=69	28.3	0.2	59.3	12.3	40.5	–108.1
<=74	28.4	0.1	63.4	8.1	36.5	–122.8
<=79	28.5	0.0	66.3	5.2	33.7	–133.0
<=84	28.5	0.0	69.5	2.0	30.5	–144.1
<=89	28.5	0.0	70.4	1.1	29.6	–147.2
<=94	28.5	0.0	71.5	0.0	28.5	–151.2
<=100	28.5	0.0	71.5	0.0	28.5	–151.2

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

Figure 13 (National line): By score cut-off, the 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 expenditure 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 2010 validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
<=4	0.7	95.8	2.4	22.6:1
<=9	2.4	86.6	7.3	6.4:1
<=14	5.4	83.2	15.7	5.0:1
<=19	10.9	75.4	29.0	3.1:1
<=24	17.1	70.3	42.1	2.4:1
<=29	24.1	64.9	54.9	1.9:1
<=34	31.7	58.5	65.2	1.4:1
<=39	40.3	53.6	75.9	1.2:1
<=44	49.7	48.7	85.1	0.9:1
<=49	57.8	45.0	91.3	0.8:1
<=54	67.4	40.0	94.8	0.7:1
<=59	73.6	37.7	97.5	0.6:1
<=64	80.8	34.8	98.8	0.5:1
<=69	87.5	32.3	99.3	0.5:1
<=74	91.8	30.9	99.8	0.4:1
<=79	94.8	30.0	100.0	0.4:1
<=84	98.0	29.1	100.0	0.4:1
<=89	98.9	28.8	100.0	0.4:1
<=94	100.0	28.5	100.0	0.4:1
<=100	100.0	28.5	100.0	0.4:1

Tables for

the Lower National Poverty Line

Figure 4 (Lower 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	76.2
5–9	70.6
10–14	63.6
15–19	46.4
20–24	37.1
25–29	26.6
30–34	19.1
35–39	15.0
40–44	12.7
45–49	6.6
50–54	3.9
55–59	1.5
60–64	0.9
65–69	0.4
70–74	0.2
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 7 (Lower national line): Average bootstrapped 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 2010 validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	–13.3	8.7	9.1	9.9
5–9	+11.2	4.7	5.8	7.3
10–14	+7.2	4.1	4.7	6.2
15–19	+0.8	2.8	3.4	4.7
20–24	+0.5	2.6	3.1	4.1
25–29	+0.0	2.1	2.6	3.5
30–34	+2.7	1.8	2.1	2.7
35–39	+0.6	1.5	1.9	2.4
40–44	–0.3	1.5	1.7	2.2
45–49	–1.9	1.7	1.8	2.1
50–54	+0.3	0.7	0.8	1.2
55–59	–0.6	0.7	0.8	1.1
60–64	+0.4	0.3	0.4	0.5
65–69	+0.4	0.0	0.0	0.0
70–74	+0.2	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 (Lower 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 2010 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (± percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.6	59.0	65.7	83.4
4	–0.3	26.0	33.0	43.5
8	–0.2	18.4	20.9	30.2
16	–0.2	12.4	15.2	20.3
32	+0.3	8.9	10.8	13.7
64	+0.4	6.4	7.7	9.8
128	+0.4	4.6	5.5	6.8
256	+0.4	3.2	3.8	4.8
512	+0.4	2.2	2.6	3.4
1,024	+0.4	1.6	1.9	2.6
2,048	+0.4	1.1	1.3	1.8
4,096	+0.5	0.8	0.9	1.2
8,192	+0.5	0.6	0.7	0.8
16,384	+0.5	0.4	0.5	0.6

Figure 12 (Lower national line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the 2010 validation sample

Score cut-off	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
<=4	0.6	14.8	0.1	84.5	85.1	–91.2
<=9	1.6	13.8	0.8	83.8	85.5	–73.7
<=14	3.3	12.1	2.1	82.5	85.8	–43.9
<=19	5.9	9.5	5.1	79.5	85.4	+9.3
<=24	8.1	7.3	8.9	75.7	83.8	+42.1
<=29	10.1	5.3	14.0	70.6	80.7	+9.4
<=34	11.4	4.0	20.3	64.3	75.7	–31.8
<=39	12.7	2.7	27.5	57.1	69.8	–78.6
<=44	14.1	1.3	35.7	48.9	63.0	–131.4
<=49	14.8	0.6	43.0	41.6	56.4	–178.8
<=54	15.2	0.2	52.2	32.4	47.6	–238.6
<=59	15.4	0.0	58.2	26.4	41.8	–277.5
<=64	15.4	0.0	65.4	19.2	34.6	–324.4
<=69	15.4	0.0	72.1	12.5	27.9	–367.9
<=74	15.4	0.0	76.4	8.2	23.6	–395.7
<=79	15.4	0.0	79.4	5.2	20.6	–415.1
<=84	15.4	0.0	82.6	2.0	17.4	–435.6
<=89	15.4	0.0	83.4	1.1	16.6	–441.3
<=94	15.4	0.0	84.6	0.0	15.4	–448.7
<=100	15.4	0.0	84.6	0.0	15.4	–448.7

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

Figure 13 (Lower national line): By score cut-off, the 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 expenditure 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 2010 validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
<=4	0.7	87.4	4.1	7.0:1
<=9	2.4	68.4	10.7	2.2:1
<=14	5.4	61.4	21.3	1.6:1
<=19	10.9	53.9	38.3	1.2:1
<=24	17.1	47.7	52.8	0.9:1
<=29	24.1	42.0	65.7	0.7:1
<=34	31.7	35.9	73.9	0.6:1
<=39	40.3	31.6	82.6	0.5:1
<=44	49.7	28.3	91.3	0.4:1
<=49	57.8	25.6	96.0	0.3:1
<=54	67.4	22.6	98.7	0.3:1
<=59	73.6	20.9	99.7	0.3:1
<=64	80.8	19.1	100.0	0.2:1
<=69	87.5	17.6	100.0	0.2:1
<=74	91.8	16.8	100.0	0.2:1
<=79	94.8	16.3	100.0	0.2:1
<=84	98.0	15.7	100.0	0.2:1
<=89	98.9	15.6	100.0	0.2:1
<=94	100.0	15.4	100.0	0.2:1
<=100	100.0	15.4	100.0	0.2:1

Tables for

150% of the Upper National Poverty Line

Figure 4 (150% of the upper 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	98.4
5–9	97.7
10–14	97.6
15–19	96.2
20–24	96.1
25–29	88.7
30–34	84.3
35–39	80.8
40–44	76.1
45–49	65.8
50–54	55.0
55–59	42.6
60–64	34.8
65–69	28.6
70–74	24.6
75–79	21.4
80–84	17.0
85–89	8.3
90–94	3.9
95–100	0.0

Figure 7 (150% of the upper national line): Average bootstrapped 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 2010 validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+1.0	2.2	2.8	3.8
5–9	–2.3	1.1	1.1	1.1
10–14	+0.6	1.3	1.5	1.9
15–19	+0.5	1.1	1.3	1.8
20–24	–0.1	0.9	1.1	1.5
25–29	–4.7	2.9	3.0	3.2
30–34	+3.0	1.9	2.2	3.1
35–39	–2.2	1.9	2.1	2.8
40–44	+2.0	2.1	2.4	3.1
45–49	–5.8	4.0	4.2	4.5
50–54	–1.9	2.2	2.6	3.6
55–59	–3.7	3.3	3.5	4.3
60–64	–0.7	2.6	3.0	3.9
65–69	+3.4	2.4	2.7	3.8
70–74	+2.5	2.8	3.5	4.4
75–79	–2.1	3.7	4.5	5.8
80–84	–0.6	3.1	3.7	4.9
85–89	–4.8	6.3	7.7	9.9
90–94	+1.7	1.6	1.9	2.3
95–100	+0.0	0.0	0.0	0.0

Figure 8 (150% of the upper 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 2010 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (± percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.7	73.0	77.9	89.6
4	+0.5	35.1	41.9	55.5
8	+0.3	24.3	30.0	41.3
16	–0.3	18.1	21.5	28.2
32	–0.3	12.9	15.7	19.8
64	–0.4	9.8	11.2	15.1
128	–0.6	6.3	7.8	9.7
256	–0.8	4.4	5.3	7.1
512	–0.8	3.3	3.9	5.1
1,024	–0.9	2.3	2.8	3.5
2,048	–0.8	1.7	2.0	2.4
4,096	–0.8	1.2	1.4	1.9
8,192	–0.8	0.8	1.0	1.3
16,384	–0.8	0.6	0.7	0.9

Figure 12 (150% of the upper national line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the 2010 validation sample

Score cut-off	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
<=4	0.7	62.8	0.0	36.4	37.1	–97.8
<=9	2.4	61.2	0.0	36.4	38.8	–92.5
<=14	5.2	58.3	0.1	36.3	41.6	–83.3
<=19	10.6	53.0	0.4	36.1	46.7	–66.1
<=24	16.4	47.1	0.6	35.8	52.3	–47.3
<=29	23.0	40.6	1.1	35.3	58.3	–26.0
<=34	29.2	34.4	2.5	33.9	63.1	–4.2
<=39	36.2	27.4	4.1	32.4	68.5	+20.3
<=44	43.2	20.4	6.6	29.9	73.0	+46.2
<=49	48.8	14.8	9.0	27.4	76.2	+67.6
<=54	54.2	9.3	13.2	23.3	77.5	+79.3
<=59	57.1	6.5	16.5	20.0	77.0	+74.1
<=64	59.7	3.9	21.2	15.3	74.9	+66.7
<=69	61.4	2.2	26.2	10.3	71.7	+58.8
<=74	62.4	1.2	29.5	7.0	69.3	+53.6
<=79	63.0	0.6	31.8	4.6	67.6	+49.9
<=84	63.4	0.1	34.5	1.9	65.3	+45.6
<=89	63.5	0.0	35.3	1.1	64.6	+44.4
<=94	63.6	0.0	36.4	0.0	63.6	+42.6
<=100	63.6	0.0	36.4	0.0	63.6	+42.6

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

Figure 13 (150% of the upper national line): By score cut-off, the 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 expenditure 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 2010 validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
<=4	0.7	97.5	1.1	39.5:1
<=9	2.4	99.3	3.8	133.9:1
<=14	5.4	97.9	8.2	46.1:1
<=19	10.9	96.7	16.7	29.0:1
<=24	17.1	96.3	25.9	26.3:1
<=29	24.1	95.3	36.1	20.5:1
<=34	31.7	92.0	45.9	11.5:1
<=39	40.3	89.9	56.9	8.9:1
<=44	49.7	86.8	67.9	6.6:1
<=49	57.8	84.4	76.7	5.4:1
<=54	67.4	80.5	85.3	4.1:1
<=59	73.6	77.6	89.8	3.5:1
<=64	80.8	73.8	93.9	2.8:1
<=69	87.5	70.1	96.6	2.3:1
<=74	91.8	67.9	98.1	2.1:1
<=79	94.8	66.4	99.1	2.0:1
<=84	98.0	64.7	99.8	1.8:1
<=89	98.9	64.2	99.9	1.8:1
<=94	100.0	63.6	100.0	1.7:1
<=100	100.0	63.6	100.0	1.7:1

Tables for

200% of the Upper National Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	99.5
10–14	99.5
15–19	99.5
20–24	99.5
25–29	97.9
30–34	96.0
35–39	93.6
40–44	91.9
45–49	86.6
50–54	81.3
55–59	75.6
60–64	64.9
65–69	52.5
70–74	51.0
75–79	40.3
80–84	32.0
85–89	24.9
90–94	9.9
95–100	0.0

Figure 7 (200% of the upper national line): Average bootstrapped 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 2010 validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	–0.5	0.2	0.2	0.2
10–14	+0.4	0.8	0.9	1.2
15–19	+0.1	0.4	0.5	0.6
20–24	–0.1	0.3	0.4	0.5
25–29	–0.8	0.6	0.7	0.8
30–34	+0.8	1.1	1.3	1.6
35–39	–0.4	1.0	1.2	1.6
40–44	–1.5	1.2	1.3	1.5
45–49	–6.3	3.7	3.8	4.0
50–54	–0.2	1.7	2.1	2.7
55–59	+0.8	2.6	3.0	3.8
60–64	+3.6	2.5	3.1	4.0
65–69	+1.2	2.9	3.4	4.4
70–74	+6.2	3.5	4.1	5.1
75–79	–6.0	5.1	5.5	6.4
80–84	+0.5	3.9	4.4	5.7
85–89	–1.2	7.2	8.5	11.2
90–94	–2.6	3.9	4.6	6.2
95–100	+0.0	0.0	0.0	0.0

Figure 8 (200% of the upper 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 2010 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (± percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.3	61.5	71.8	82.0
4	+0.2	30.9	36.5	45.7
8	+0.2	22.5	26.6	33.0
16	–0.1	15.8	18.9	25.3
32	–0.1	11.4	13.1	16.3
64	–0.0	8.1	9.6	12.6
128	–0.3	5.5	6.9	8.5
256	–0.2	4.1	4.7	6.2
512	–0.2	2.8	3.2	4.2
1,024	–0.2	2.0	2.4	3.1
2,048	–0.2	1.4	1.6	2.3
4,096	–0.2	1.0	1.2	1.6
8,192	–0.2	0.7	0.8	1.1
16,384	–0.2	0.5	0.6	0.7

Figure 12 (200% of the upper national line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the 2010 validation sample

Score cut-off	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
<=4	0.7	79.6	0.0	19.6	20.4	–98.2
<=9	2.4	78.0	0.0	19.6	22.0	–94.0
<=14	5.3	75.0	0.0	19.6	25.0	–86.7
<=19	10.9	69.5	0.1	19.6	30.5	–72.8
<=24	17.0	63.4	0.1	19.6	36.5	–57.6
<=29	23.9	56.5	0.2	19.5	43.3	–40.3
<=34	31.2	49.2	0.5	19.1	50.2	–21.8
<=39	39.2	41.2	1.1	18.6	57.7	–1.1
<=44	47.9	32.4	1.8	17.8	65.7	+21.5
<=49	55.2	25.2	2.6	17.1	72.3	+40.6
<=54	63.0	17.4	4.4	15.2	78.2	+62.3
<=59	67.6	12.7	5.9	13.7	81.3	+75.7
<=64	72.1	8.3	8.8	10.9	82.9	+89.1
<=69	75.6	4.8	12.0	7.7	83.2	+85.1
<=74	77.6	2.8	14.2	5.4	83.0	+82.3
<=79	79.0	1.4	15.8	3.8	82.8	+80.3
<=84	80.0	0.4	18.0	1.6	81.6	+77.6
<=89	80.2	0.2	18.7	1.0	81.2	+76.8
<=94	80.4	0.0	19.6	0.0	80.4	+75.6
<=100	80.4	0.0	19.6	0.0	80.4	+75.6

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

Figure 13 (200% of the upper national line): By score cut-off, the 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 expenditure 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 2010 validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
<=4	0.7	100.0	0.9	Only poor targeted
<=9	2.4	100.0	3.0	Only poor targeted
<=14	5.4	99.6	6.6	232.7:1
<=19	10.9	99.5	13.6	185.9:1
<=24	17.1	99.5	21.1	188.2:1
<=29	24.1	99.2	29.7	125.3:1
<=34	31.7	98.3	38.8	56.9:1
<=39	40.3	97.3	48.8	36.0:1
<=44	49.7	96.3	59.6	26.3:1
<=49	57.8	95.5	68.7	21.4:1
<=54	67.4	93.4	78.4	14.3:1
<=59	73.6	91.9	84.1	11.4:1
<=64	80.8	89.1	89.7	8.2:1
<=69	87.5	86.3	94.0	6.3:1
<=74	91.8	84.5	96.6	5.5:1
<=79	94.8	83.3	98.3	5.0:1
<=84	98.0	81.6	99.5	4.4:1
<=89	98.9	81.1	99.8	4.3:1
<=94	100.0	80.4	100.0	4.1:1
<=100	100.0	80.4	100.0	4.1:1

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	65.8
5–9	65.6
10–14	57.2
15–19	42.5
20–24	32.7
25–29	22.9
30–34	16.9
35–39	13.8
40–44	11.1
45–49	5.4
50–54	4.5
55–59	1.8
60–64	1.0
65–69	0.1
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 7 (USAID "extreme" line): Average bootstrapped 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 2010 validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	–16.9	11.2	11.6	12.2
5–9	+11.3	4.9	6.0	7.9
10–14	+4.8	4.1	4.8	6.3
15–19	+2.7	2.8	3.3	4.4
20–24	+0.9	2.6	3.0	4.0
25–29	–0.8	2.1	2.6	3.3
30–34	+0.4	1.7	2.1	2.6
35–39	–2.3	2.1	2.3	3.1
40–44	+0.7	1.3	1.6	2.0
45–49	–3.8	2.7	2.8	3.3
50–54	+1.6	0.6	0.7	1.0
55–59	–2.4	1.8	2.0	2.2
60–64	+0.5	0.3	0.4	0.5
65–69	+0.1	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	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 2010 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (± percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.2	61.3	64.4	80.4
4	+0.0	25.8	30.4	44.3
8	–0.4	18.2	21.5	29.3
16	–0.4	12.9	15.2	21.1
32	–0.2	9.1	11.2	14.5
64	+0.0	6.4	7.6	10.3
128	–0.0	4.5	5.4	7.0
256	–0.0	3.3	3.9	5.1
512	–0.0	2.3	2.8	3.6
1,024	–0.1	1.7	2.0	2.7
2,048	–0.1	1.2	1.4	1.7
4,096	–0.0	0.8	0.9	1.3
8,192	–0.0	0.6	0.7	0.9
16,384	–0.0	0.4	0.5	0.6

Figure 12 (USAID "extreme" line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the 2010 validation sample

Score cut-off	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
<=4	0.6	13.2	0.1	86.0	86.6	–90.5
<=9	1.5	12.2	0.9	85.3	86.8	–71.4
<=14	3.1	10.7	2.3	83.9	86.9	–38.9
<=19	5.3	8.5	5.6	80.5	85.8	+17.9
<=24	7.2	6.6	9.9	76.3	83.5	+28.4
<=29	9.0	4.8	15.1	71.1	80.1	–9.4
<=34	10.2	3.6	21.4	64.7	74.9	–55.8
<=39	11.5	2.3	28.7	57.4	68.9	–108.8
<=44	12.5	1.3	37.2	49.0	61.5	–170.2
<=49	13.2	0.6	44.5	41.6	54.8	–223.5
<=54	13.5	0.3	53.8	32.3	45.8	–291.0
<=59	13.7	0.0	59.8	26.4	40.1	–334.2
<=64	13.8	0.0	67.0	19.2	32.9	–386.8
<=69	13.8	0.0	73.7	12.5	26.2	–435.5
<=74	13.8	0.0	78.0	8.2	21.9	–466.7
<=79	13.8	0.0	81.0	5.2	18.9	–488.3
<=84	13.8	0.0	84.2	2.0	15.8	–511.3
<=89	13.8	0.0	85.0	1.1	14.9	–517.7
<=94	13.8	0.0	86.2	0.0	13.8	–526.0
<=100	13.8	0.0	86.2	0.0	13.8	–526.0

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

Figure 13 (USAID "extreme" line): By score cut-off, the 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 expenditure 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 2010 validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
<=4	0.7	80.7	4.2	4.2:1
<=9	2.4	63.5	11.1	1.7:1
<=14	5.4	57.1	22.2	1.3:1
<=19	10.9	48.4	38.5	0.9:1
<=24	17.1	42.2	52.3	0.7:1
<=29	24.1	37.3	65.3	0.6:1
<=34	31.7	32.2	74.2	0.5:1
<=39	40.3	28.5	83.3	0.4:1
<=44	49.7	25.1	90.7	0.3:1
<=49	57.8	22.8	95.7	0.3:1
<=54	67.4	20.0	98.1	0.3:1
<=59	73.6	18.6	99.6	0.2:1
<=64	80.8	17.0	100.0	0.2:1
<=69	87.5	15.7	100.0	0.2:1
<=74	91.8	15.0	100.0	0.2:1
<=79	94.8	14.5	100.0	0.2:1
<=84	98.0	14.0	100.0	0.2:1
<=89	98.9	13.9	100.0	0.2:1
<=94	100.0	13.8	100.0	0.2:1
<=100	100.0	13.8	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	97.9
5–9	89.3
10–14	88.8
15–19	81.6
20–24	78.0
25–29	65.8
30–34	57.0
35–39	50.3
40–44	40.8
45–49	33.5
50–54	24.2
55–59	14.5
60–64	10.9
65–69	8.7
70–74	5.6
75–79	4.3
80–84	2.7
85–89	0.0
90–94	0.0
95–100	0.0

Figure 7 ($1.25/day line): Average bootstrapped 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 2010 validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.4	2.2	2.8	3.8
5–9	–2.8	2.7	3.2	4.1
10–14	–2.2	2.0	2.5	3.5
15–19	–3.6	2.8	3.0	3.1
20–24	+1.2	2.3	2.8	3.6
25–29	–7.5	4.9	5.2	5.6
30–34	+4.8	2.4	2.8	3.6
35–39	–2.6	2.5	2.9	3.7
40–44	+4.5	2.1	2.5	3.2
45–49	–2.8	2.6	2.9	4.1
50–54	+4.1	1.8	2.1	2.7
55–59	–7.6	5.1	5.3	5.9
60–64	+1.7	1.4	1.7	2.4
65–69	+2.9	1.3	1.5	2.0
70–74	–1.3	1.9	2.3	3.1
75–79	–1.6	2.1	2.4	3.2
80–84	+0.1	1.4	1.6	2.1
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 2010 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (± percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+1.5	61.7	79.3	90.8
4	+1.0	34.3	41.2	54.7
8	+0.4	24.6	28.6	35.9
16	+0.1	17.7	21.0	26.9
32	+0.0	12.3	14.7	19.6
64	+0.0	8.7	10.4	13.4
128	–0.2	5.9	7.0	9.9
256	–0.2	4.3	5.1	6.8
512	–0.2	3.1	3.8	4.9
1,024	–0.2	2.2	2.6	3.5
2,048	–0.2	1.5	1.8	2.4
4,096	–0.2	1.1	1.3	1.6
8,192	–0.2	0.7	0.9	1.1
16,384	–0.3	0.5	0.6	0.8

Figure 12 ($1.25/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the 2010 validation sample

Score cut-off	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
<=4	0.7	38.3	0.0	61.0	61.7	–96.3
<=9	2.3	36.7	0.2	60.9	63.1	–88.0
<=14	4.9	34.0	0.4	60.6	65.5	–73.6
<=19	9.6	29.3	1.3	59.7	69.4	–47.2
<=24	14.2	24.7	2.8	58.2	72.5	–19.6
<=29	19.4	19.6	4.7	56.3	75.7	+11.5
<=34	23.3	15.7	8.4	52.6	76.0	+41.2
<=39	27.7	11.3	12.6	48.4	76.1	+67.6
<=44	31.2	7.8	18.6	42.5	73.7	+52.4
<=49	33.9	5.0	23.8	37.2	71.1	+38.8
<=54	36.0	2.9	31.4	29.7	65.7	+19.5
<=59	37.3	1.7	36.3	24.8	62.1	+6.9
<=64	38.1	0.9	42.7	18.3	56.4	–9.7
<=69	38.5	0.5	49.1	12.0	50.5	–26.0
<=74	38.7	0.2	53.1	7.9	46.7	–36.3
<=79	38.9	0.1	55.9	5.1	44.0	–43.5
<=84	39.0	0.0	59.0	2.0	41.0	–51.5
<=89	39.0	0.0	59.9	1.1	40.1	–53.8
<=94	39.0	0.0	61.0	0.0	39.0	–56.7
<=100	39.0	0.0	61.0	0.0	39.0	–56.7

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

Figure 13 ($1.25/day line): By score cut-off, the 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 expenditure 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 2010 validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
<=4	0.7	97.5	1.8	39.5:1
<=9	2.4	93.7	5.8	14.8:1
<=14	5.4	91.8	12.6	11.2:1
<=19	10.9	88.0	24.7	7.3:1
<=24	17.1	83.5	36.6	5.0:1
<=29	24.1	80.4	49.7	4.1:1
<=34	31.7	73.5	59.8	2.8:1
<=39	40.3	68.7	71.0	2.2:1
<=44	49.7	62.7	80.1	1.7:1
<=49	57.8	58.7	87.1	1.4:1
<=54	67.4	53.4	92.5	1.1:1
<=59	73.6	50.7	95.8	1.0:1
<=64	80.8	47.1	97.8	0.9:1
<=69	87.5	44.0	98.8	0.8:1
<=74	91.8	42.2	99.4	0.7:1
<=79	94.8	41.0	99.8	0.7:1
<=84	98.0	39.8	100.0	0.7:1
<=89	98.9	39.4	100.0	0.7:1
<=94	100.0	39.0	100.0	0.6:1
<=100	100.0	39.0	100.0	0.6:1

Tables for

the $1.75/day 2005 PPP Poverty Line

Figure 4 ($1.75/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	98.8
5–9	98.2
10–14	98.2
15–19	96.9
20–24	96.3
25–29	91.6
30–34	87.9
35–39	83.6
40–44	79.6
45–49	68.8
50–54	60.3
55–59	50.4
60–64	40.4
65–69	32.2
70–74	31.5
75–79	25.8
80–84	19.7
85–89	10.7
90–94	5.1
95–100	0.0

Figure 7 ($1.75/day line): Average bootstrapped 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 2010 validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+1.3	2.2	2.8	3.8
5–9	–1.8	0.9	0.9	0.9
10–14	+0.8	1.2	1.5	1.9
15–19	+0.9	1.1	1.3	1.6
20–24	–0.8	0.9	1.0	1.3
25–29	–3.4	2.2	2.3	2.5
30–34	+3.1	1.8	2.0	2.6
35–39	–2.0	1.8	1.9	2.6
40–44	+1.6	1.9	2.2	2.8
45–49	–9.6	5.8	6.0	6.4
50–54	–1.6	2.2	2.6	3.4
55–59	–3.5	3.2	3.4	4.2
60–64	+0.6	2.6	3.2	4.1
65–69	+0.3	2.5	3.0	3.9
70–74	+7.6	2.9	3.5	4.7
75–79	–3.2	4.0	4.7	6.0
80–84	+1.3	3.2	3.8	4.9
85–89	–3.1	6.3	7.6	9.8
90–94	+2.9	1.6	1.9	2.3
95–100	+0.0	0.0	0.0	0.0

Figure 8 ($1.75/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 2010 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (± percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.2	69.6	78.0	88.5
4	+0.3	35.1	40.5	54.6
8	+0.2	24.9	29.4	38.2
16	–0.3	18.1	21.4	26.8
32	–0.4	12.7	15.3	20.2
64	–0.5	9.5	11.1	13.8
128	–0.7	6.2	7.6	9.7
256	–0.9	4.4	5.2	7.1
512	–0.9	3.1	3.8	5.1
1,024	–0.9	2.3	2.7	3.4
2,048	–0.9	1.6	2.0	2.4
4,096	–0.9	1.2	1.4	1.8
8,192	–0.9	0.8	1.0	1.3
16,384	–0.9	0.6	0.7	0.9

Figure 12 ($1.75/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the 2010 validation sample

Score cut-off	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
<=4	0.7	66.5	0.0	32.8	33.5	–97.9
<=9	2.4	64.8	0.0	32.8	35.2	–92.9
<=14	5.3	61.9	0.1	32.7	38.0	–84.2
<=19	10.6	56.5	0.3	32.5	43.1	–67.9
<=24	16.5	50.6	0.5	32.3	48.9	–49.9
<=29	23.2	44.0	0.9	31.9	55.1	–29.6
<=34	29.6	37.5	2.1	30.8	60.4	–8.7
<=39	36.9	30.2	3.3	29.5	66.4	+15.0
<=44	44.2	22.9	5.5	27.3	71.6	+39.9
<=49	50.3	16.8	7.5	25.4	75.7	+60.9
<=54	56.3	10.8	11.1	21.8	78.1	+83.5
<=59	59.6	7.6	14.0	18.9	78.5	+79.2
<=64	62.5	4.7	18.3	14.5	77.0	+72.7
<=69	64.7	2.5	22.9	10.0	74.7	+66.0
<=74	65.8	1.4	26.1	6.8	72.5	+61.2
<=79	66.5	0.6	28.3	4.6	71.1	+57.9
<=84	67.0	0.1	31.0	1.9	68.9	+53.9
<=89	67.1	0.0	31.7	1.1	68.2	+52.7
<=94	67.2	0.0	32.8	0.0	67.2	+51.1
<=100	67.2	0.0	32.8	0.0	67.2	+51.1

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

Figure 13 ($1.75/day line): By score cut-off, the 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 expenditure 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 2010 validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
<=4	0.7	97.5	1.0	39.5:1
<=9	2.4	99.3	3.6	133.9:1
<=14	5.4	98.2	7.8	55.9:1
<=19	10.9	97.0	15.8	32.5:1
<=24	17.1	96.9	24.6	31.5:1
<=29	24.1	96.3	34.5	25.7:1
<=34	31.7	93.5	44.1	14.4:1
<=39	40.3	91.7	55.0	11.1:1
<=44	49.7	88.9	65.9	8.0:1
<=49	57.8	87.1	74.9	6.7:1
<=54	67.4	83.6	83.9	5.1:1
<=59	73.6	81.0	88.7	4.3:1
<=64	80.8	77.3	93.0	3.4:1
<=69	87.5	73.9	96.3	2.8:1
<=74	91.8	71.6	97.9	2.5:1
<=79	94.8	70.2	99.1	2.4:1
<=84	98.0	68.4	99.8	2.2:1
<=89	98.9	67.9	99.9	2.1:1
<=94	100.0	67.2	100.0	2.0:1
<=100	100.0	67.2	100.0	2.0:1

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	98.7
10–14	98.7
15–19	98.6
20–24	98.4
25–29	95.3
30–34	93.5
35–39	90.7
40–44	87.4
45–49	79.6
50–54	74.2
55–59	65.2
60–64	54.6
65–69	44.5
70–74	42.9
75–79	34.0
80–84	26.7
85–89	14.6
90–94	6.6
95–100	0.0

Figure 7 ($2.00/day line): Average bootstrapped 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 2010 validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	–1.3	0.7	0.7	0.7
10–14	–0.4	0.8	0.9	1.2
15–19	–0.5	0.5	0.6	0.8
20–24	–0.4	0.6	0.7	0.8
25–29	–2.0	1.4	1.4	1.5
30–34	+0.1	1.2	1.5	1.8
35–39	+1.1	1.4	1.7	2.2
40–44	–1.2	1.4	1.6	2.1
45–49	–7.8	4.7	4.8	5.0
50–54	+1.3	2.1	2.4	3.3
55–59	–4.4	3.6	3.8	4.1
60–64	+1.1	2.7	3.1	3.9
65–69	+0.4	2.9	3.3	4.2
70–74	+4.9	3.4	4.0	4.9
75–79	–1.3	4.1	4.9	6.4
80–84	+1.7	3.5	4.1	5.3
85–89	–3.1	6.5	7.8	10.2
90–94	+0.3	2.7	3.3	4.3
95–100	+0.0	0.0	0.0	0.0

Figure 8 ($2.00/day line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the 2010 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (± percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.1	67.6	76.7	83.4
4	+0.6	32.4	38.8	49.2
8	+0.1	23.5	27.6	35.1
16	–0.4	17.0	19.7	25.9
32	–0.4	12.1	14.1	18.1
64	–0.4	8.5	10.3	13.6
128	–0.6	5.9	6.9	9.4
256	–0.7	4.0	5.0	6.4
512	–0.7	3.0	3.5	4.6
1,024	–0.7	2.2	2.5	3.2
2,048	–0.7	1.5	1.8	2.4
4,096	–0.7	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 12 ($2.00/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the 2010 validation sample

Score cut-off	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
<=4	0.7	74.7	0.0	24.6	25.3	–98.1
<=9	2.4	73.0	0.0	24.6	27.0	–93.6
<=14	5.3	70.1	0.0	24.6	29.9	–85.8
<=19	10.9	64.5	0.1	24.5	35.4	–71.1
<=24	16.9	58.5	0.2	24.4	41.3	–54.9
<=29	23.7	51.7	0.4	24.2	48.0	–36.6
<=34	30.8	44.5	0.9	23.8	54.6	–17.0
<=39	38.5	36.9	1.7	22.9	61.4	+4.5
<=44	46.8	28.6	3.0	21.6	68.4	+28.0
<=49	53.6	21.8	4.2	20.4	74.0	+47.7
<=54	60.7	14.7	6.7	17.9	78.5	+69.9
<=59	64.9	10.5	8.6	16.0	80.9	+83.7
<=64	68.7	6.7	12.1	12.5	81.2	+84.0
<=69	71.7	3.7	15.8	8.8	80.5	+79.0
<=74	73.4	2.0	18.4	6.2	79.6	+75.5
<=79	74.4	1.0	20.4	4.2	78.6	+72.9
<=84	75.2	0.2	22.8	1.8	76.9	+69.7
<=89	75.3	0.1	23.6	1.1	76.4	+68.8
<=94	75.4	0.0	24.6	0.0	75.4	+67.4
<=100	75.4	0.0	24.6	0.0	75.4	+67.4

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

Figure 13 ($2.00/day line): By score cut-off, the 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 expenditure 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 2010 validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
<=4	0.7	100.0	1.0	Only poor targeted
<=9	2.4	100.0	3.2	Only poor targeted
<=14	5.4	99.6	7.1	232.7:1
<=19	10.9	99.3	14.4	142.6:1
<=24	17.1	99.0	22.4	100.9:1
<=29	24.1	98.5	31.5	65.4:1
<=34	31.7	97.3	40.9	36.0:1
<=39	40.3	95.7	51.1	22.0:1
<=44	49.7	94.0	62.0	15.7:1
<=49	57.8	92.7	71.0	12.7:1
<=54	67.4	90.0	80.5	9.0:1
<=59	73.6	88.3	86.1	7.5:1
<=64	80.8	85.0	91.2	5.7:1
<=69	87.5	81.9	95.1	4.5:1
<=74	91.8	79.9	97.4	4.0:1
<=79	94.8	78.5	98.7	3.6:1
<=84	98.0	76.7	99.7	3.3:1
<=89	98.9	76.2	99.9	3.2:1
<=94	100.0	75.4	100.0	3.1:1
<=100	100.0	75.4	100.0	3.1:1

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	99.7
10–14	99.7
15–19	99.7
20–24	99.7
25–29	98.7
30–34	98.2
35–39	96.9
40–44	94.9
45–49	91.5
50–54	87.9
55–59	84.3
60–64	73.2
65–69	63.3
70–74	60.4
75–79	50.7
80–84	40.9
85–89	33.3
90–94	12.3
95–100	0.0

Figure 7 ($2.50/day line): Average bootstrapped 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 2010 validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	–0.3	0.1	0.1	0.1
10–14	+0.6	0.8	0.9	1.2
15–19	+0.0	0.3	0.3	0.4
20–24	–0.0	0.3	0.4	0.4
25–29	+0.0	0.5	0.7	0.8
30–34	+2.0	0.9	1.1	1.4
35–39	+1.1	0.9	1.0	1.4
40–44	–1.9	1.3	1.4	1.5
45–49	–4.5	2.6	2.7	2.9
50–54	+0.4	1.5	1.8	2.4
55–59	–1.5	1.9	2.3	3.0
60–64	+2.8	2.3	2.9	3.7
65–69	+2.0	2.7	3.1	3.9
70–74	+6.7	3.6	4.1	5.6
75–79	–3.0	4.3	4.9	6.7
80–84	–1.4	4.1	4.8	6.1
85–89	+3.4	7.3	8.9	11.3
90–94	–14.5	10.4	10.9	11.9
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 2010 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (± percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.0	51.5	68.6	82.4
4	+0.0	28.2	34.2	43.4
8	+0.5	20.4	23.9	31.0
16	+0.3	14.9	17.7	22.8
32	+0.1	10.5	12.2	16.2
64	+0.2	7.6	9.0	11.1
128	–0.1	5.2	6.1	8.0
256	+0.0	3.7	4.4	6.2
512	–0.0	2.6	3.1	4.0
1,024	–0.0	1.9	2.2	3.0
2,048	+0.0	1.3	1.5	2.1
4,096	–0.0	0.9	1.1	1.5
8,192	–0.0	0.6	0.8	1.0
16,384	–0.0	0.5	0.6	0.7

Figure 12 ($2.50/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the 2010 validation sample

Score cut-off	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
<=4	0.7	84.3	0.0	15.0	15.7	–98.3
<=9	2.4	82.6	0.0	15.0	17.4	–94.3
<=14	5.3	79.7	0.0	14.9	20.3	–87.4
<=19	10.9	74.1	0.0	14.9	25.8	–74.3
<=24	17.0	68.0	0.1	14.9	31.9	–59.9
<=29	23.9	61.1	0.2	14.8	38.7	–43.5
<=34	31.3	53.8	0.4	14.5	45.8	–26.0
<=39	39.4	45.6	0.8	14.1	53.6	–6.3
<=44	48.5	36.5	1.2	13.8	62.3	+15.6
<=49	56.1	28.9	1.6	13.3	69.4	+34.0
<=54	64.5	20.5	2.9	12.1	76.6	+55.1
<=59	69.7	15.3	3.8	11.1	80.9	+68.5
<=64	74.9	10.1	5.9	9.0	83.9	+83.2
<=69	79.1	6.0	8.5	6.5	85.6	+90.0
<=74	81.5	3.5	10.3	4.7	86.2	+87.9
<=79	83.2	1.9	11.6	3.3	86.5	+86.3
<=84	84.5	0.5	13.5	1.5	86.0	+84.1
<=89	84.7	0.3	14.1	0.9	85.6	+83.4
<=94	85.0	0.0	15.0	0.0	85.0	+82.4
<=100	85.0	0.0	15.0	0.0	85.0	+82.4

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

Figure 13 ($2.50/day line): By score cut-off, the 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 expenditure 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 2010 validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
<=4	0.7	100.0	0.8	Only poor targeted
<=9	2.4	100.0	2.8	Only poor targeted
<=14	5.4	99.6	6.3	232.7:1
<=19	10.9	99.6	12.8	267.7:1
<=24	17.1	99.7	20.0	285.5:1
<=29	24.1	99.4	28.1	154.9:1
<=34	31.7	98.6	36.8	69.9:1
<=39	40.3	97.9	46.4	47.1:1
<=44	49.7	97.6	57.1	40.5:1
<=49	57.8	97.2	66.0	34.1:1
<=54	67.4	95.7	75.9	22.2:1
<=59	73.6	94.8	82.0	18.2:1
<=64	80.8	92.7	88.1	12.6:1
<=69	87.5	90.3	93.0	9.3:1
<=74	91.8	88.8	95.9	7.9:1
<=79	94.8	87.7	97.8	7.1:1
<=84	98.0	86.2	99.4	6.3:1
<=89	98.9	85.7	99.7	6.0:1
<=94	100.0	85.0	100.0	5.7:1
<=100	100.0	85.0	100.0	5.7:1