Simple Poverty Scorecard® Poverty-Assessment Tool Nigeria

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This document and related tools are available at `SimplePovertyScorecard.com`.

Abstract

The Simple Poverty Scorecard®-brand poverty-assessment tool uses ten low-cost indicators from Nigeria's 2012/13 General Household Panel Survey to estimate the likelihood that a household has consumption below a given poverty line. Field workers can collect responses in about ten minutes. The scorecard's accuracy is reported for a range of poverty lines. The scorecard is a practical way for pro-poor programs in Nigeria to measure poverty rates, to track changes in poverty rates over time, and to segment clients for targeted services.

Version note

This paper replaces Chen, Schreiner, and Woller (2008). The new scorecard should be used from now on, as it uses more recent data and an improved definition of *poverty*. Estimates from the old and new scorecards are not comparable. To measure change, an existing user who has a baseline from the old scorecard can apply both the old and new scorecards at the same time to the same households, measuring change between the two applications of the old scorecard and creating a new baseline with the new one.

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Simple Poverty Scorecard® Poverty-Assessment Tool

			Name	Identifier
Interview ID:				
Interview date:		Participant:		
Country:	NGA	Field agent:		
Scorecard:	002	Service point:		
Sampling wgt.:			Number of household members:	

Indicator	Response	Points	Score
1. How many members does the household have?	A. Ten or more	0	
	B. Eight or nine	5	
	C. Seven	10	
	D. Six	11	
	E. Five	17	
	F. Four	19	
	G. Three	25	
	H. One or two	32	
2. How many separate rooms do the members of the household occupy (do not count bathrooms, toilets, storerooms, or garage)?	A. One	0	
	B. Two	4	
	C. Three	5	
	D. Four	6	
	E. Five or more	7	
3. The roof of the main dwelling is predominantly made of what material?	A. Grass, clay tiles, asbestos or plastic sheets, or others	0	
	B. Concrete, zinc, or iron sheets	4	
4. What kind of toilet facility does the household use?	A. None, bush, pail/bucket, or other	0	
	B. Uncovered pit latrine, or V.I.P. latrine	3	
	C. Covered pit latrine, or toilet on water	6	
	D. Flush to septic tank, or flush to sewage	15	
5. Does the household own a gas cooker, stove (electric, gas table, or kerosene), or microwave?	A. No	0	
	B. Yes	3	
6. How many mattresses does the household own?	A. None	0	
	B. One	6	
	C. Two	8	
	D. Three or more	10	
7. Does the household own a TV set?	A. No	0	
	B. Yes	8	
8. How many mobile phones does the household own?	A. None	0	
	B. One	2	
	C. Two	5	
	D. Three or more	7	
9. Does the household own a motorbike or a car or other vehicle?	A. No	0	
	B. Only motorbike	3	
	C. Car (regardless of motorbike)	11	
10. Does any member of this household practice any agricultural activity such as crop, livestock, or fish farming, or own land that is not cultivated? If so, does the household own any sprayers, wheelbarrows, or sickles?	A. Farms or has uncultivated land, but no sprayers, wheelbarrows, or sickles	0	
	B. Farms or has uncultivated land, and has sprayers, wheelbarrows, or sickles	3	
	C. Does not farm nor has uncultivated land	3	

Score:

Back-page Worksheet: Household Membership

In the header, record the interview identifier, the interview date, and the participant's sampling weight (if known). Write the name and identification number of the participant, of the field agent, and of the service point that the participant uses.

Read to the respondent: *Please tell me the names of all the members of your household. A* household *is one or more people—regardless of blood or marital ties—who normally live in the same residence, eat together, and recognize the same head. To count as a* household member*, a person must have normally lived and eaten with the household for at least six of the last 12 months. Please be sure to include household members who are temporarily absent, servants, students away at boarding school, infants, and small children.* Write down the names of all household members.

Count household members, and write the count by "Number of household members:" in the scorecard header. Then circle the response to the scorecard's first indicator.

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

Name
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.

Look-up table to convert scores to poverty likelihoods

	Poverty likelihood (%)											
	National				Poorest 1/2	2005 PPP					2011 PPP	
Score	**Food**	**100%**	**150%**	**200%**	**< 100% natl.**	**$1.25**	**$2.00**	**$2.50**	**$4.00**	**$5.00**	**$1.90**	**$3.10**
0–4	92.7	100.0	100.0	100.0	96.3	100.0	100.0	100.0	100.0	100.0	96.3	100.0
5–9	92.7	100.0	100.0	100.0	96.3	100.0	100.0	100.0	100.0	100.0	96.3	100.0
10–14	55.5	87.9	98.5	100.0	67.0	81.0	98.5	100.0	100.0	100.0	75.7	95.4
15–19	51.9	82.1	98.5	100.0	60.1	77.7	98.5	100.0	100.0	100.0	71.4	95.3
20–24	44.2	75.9	95.8	97.7	50.4	74.1	96.1	97.5	99.7	99.8	62.5	92.0
25–29	28.8	69.6	92.8	96.8	37.6	63.1	92.9	96.4	99.6	99.8	48.0	87.5
30–34	19.2	53.4	84.1	93.8	27.1	48.8	85.0	92.5	99.2	99.8	36.8	76.4
35–39	12.7	40.1	75.4	90.9	18.5	35.8	76.6	87.5	98.5	99.2	25.9	65.8
40–44	6.0	30.6	61.2	81.2	10.2	25.8	62.4	78.5	96.5	98.3	15.4	50.7
45–49	4.4	20.9	55.6	78.8	8.3	16.8	56.7	75.5	95.3	98.1	10.6	42.5
50–54	1.9	13.4	43.1	66.4	5.2	11.1	43.5	63.0	90.2	96.6	7.9	32.0
55–59	1.1	5.0	32.0	54.4	2.0	4.6	32.5	49.2	84.3	91.6	2.9	20.4
60–64	0.2	3.8	25.9	49.4	0.3	2.9	26.5	44.9	82.3	87.7	0.5	15.4
65–69	0.2	2.7	14.2	35.4	0.3	2.5	14.3	32.1	70.0	83.2	0.5	7.8
70–74	0.2	2.6	9.3	22.4	0.3	2.5	9.5	19.1	55.3	73.6	0.5	4.8
75–79	0.0	0.0	2.7	7.9	0.0	0.0	2.7	7.1	43.2	59.9	0.0	1.8
80–84	0.0	0.0	0.0	4.5	0.0	0.0	0.0	3.5	22.5	43.1	0.0	0.0
85–89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.7	26.9	0.0	0.0
90–94	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	19.0	0.0	0.0
95–100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.4	0.0	0.0

Note on measuring changes in poverty rates over time using the old 2003/4 and new 2012/13 scorecards

This paper uses data from Nigeria's 2012/13 General Household Panel Survey (GHPS). It replaces Chen, Schreiner, and Woller (2008), which uses data from the 2003/4 National Living Standards Survey (NLSS). The new 2012/13 Simple Poverty Scorecard® here should be used from now on.

The definition of *poverty* differs in the 2003/4 NLSS and the 2012/13 GHPS. This means that point-in-time estimates of poverty rates from the old 2003/4 scorecard are not comparable with estimates from the new 2012/13 scorecard.

Some pro-poor programs in Nigeria already use the old 2003/4 scorecard. If these legacy users—after switching to the new 2012/13 scorecard—want to estimate changes in poverty rates over time with existing baseline estimates from the old 2003/4 scorecard, then they must apply the old 2003/4 scorecard again to get a comparable follow-up estimate. It is not possible to estimate changes over time with a baseline from the old 2003/4 scorecard and a follow-up from the new 2012/13 scorecard.

If a legacy user applies the old 2003/4 scorecard for a second time as just described, then it should take advantage of being with a participant in his/her homestead to also apply the new 2012/13 scorecard in the same visit. This will provide the best baseline for future estimates of change over time.

In sum, both first-time and legacy users should use the new 2012/13 scorecard from now on. Looking forward, this establishes the best baseline. Looking backward, legacy users of Nigeria's old 2003/4 scorecard can still use existing estimates when measuring change, but only for the old 2003/4 definition of *poverty* with the old 2003/4 scorecard.

Users should not estimate changes in poverty rates for the period from A to C by splicing together an estimate of change for the period from A to B based on the old 2003/4 scorecard and its definition of *poverty* with an estimate of change for the period from B to C based on the new 2012/13 scorecard and its different definition of *poverty*. This is because the "parallel lines" assumption does not hold. That is, the rate of change under the old definition differs a lot from the rate of change under the new definition. In particular, the estimated rate of change for all of Nigeria between the 2003/4 and 2009/10 NLSS is about 0.25 percentage points per year, while the estimate between the 2010/11 and 2012/13 GHPS is about 1 percentage point per year (World Bank, 2014). Of course, the two time periods do not overlap and so the estimates are not fully comparable, but economic growth in Nigeria has been consistently rapid (about 6 to 8 percent per year) from 2003 to 2013, and World Bank (2013) convincingly argues that that new-definition estimates are more accurate.

Simple Poverty Scorecard® Poverty-Assessment Tool Nigeria

1. Introduction

Pro-poor programs in Nigeria can use the Simple Poverty Scorecard® poverty-assessment tool to estimate the likelihood that a household has consumption 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 segment clients for targeted services.

The direct approach to poverty measurement via surveys is difficult and costly, asking households about a lengthy list of consumption items. As a case in point, Nigeria's 2012/13 General Household Panel Survey (GHPS) runs 114 pages. Enumerators applied the GHPS questionnaire to each sample household twice, once in the post-planting season of September to November 2012, and once during the post-harvest season of February to April 2013. Each of the two rounds asks a given household hundreds of questions. Many of these questions are repeated many times, for example, for each household member, consumption item, or agricultural plot. Enumerators completed interviews at a rate of about one per day.

In contrast, the indirect approach via the scorecard is simple, quick, and low-cost. It uses ten verifiable indicators (such as "What kind of toilet facility does the household use?" and "Does the household own a TV set?") to get a score that is highly correlated with poverty status as measured by the exhaustive GHPS survey.

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

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

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

[2] USAID defines a household as *very poor* if its daily per-capita consumption is less than the highest of the $1.25/day line (NGN214.86 in prices on average in all of Nigeria in the first quarter of 2013) or the line (NGN162.58) that marks the poorest half of people below 100% of the national poverty line. USAID (2014, p. 8) has approved the Simple Poverty Scorecard tool—re-branded as the Progress Out of Poverty Index® tool—for use by their microenterprise partners.

may be able to implement a low-cost scorecard to help with monitoring poverty and (if desired) segmenting clients for targeted services.

The statistical approach here aims to be understood by non-specialists. After all, if managers are to adopt the scorecard on their own and apply it to inform their decisions, then they 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 often 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, transparent scoring approaches can be about as accurate as complex, opaque ones (Schreiner, 2012a; Caire and Schreiner, 2012).

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

The scorecard is based on data from the 2012/13 GHPS done by Nigeria's National Bureau of Statistics (NBS). 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 Nigeria

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

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

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

Third, the scorecard can estimate changes in the poverty rate for a group of households (or for two independent samples of households, both of which are representative of the same population) between two points in time. For households in the group(s), this estimate is the change in the average baseline poverty likelihood versus the average follow-up likelihood (with two independent samples) or the average of each household's change from baseline to follow-up (with a single group of households scored twice).

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

This paper presents a single scorecard whose indicators and points are derived from household consumption data and Nigeria's national poverty line. Scores from this one scorecard are calibrated to poverty likelihoods for ten poverty lines.

The scorecard is constructed and calibrated using half of the completed interviews from the 2012/13 GHPS, and its accuracy is validated on the other half of the interviews.

All three scoring-based estimators (the poverty likelihood of a household, the poverty rate of a group of households at a point in time, and the change in the poverty rate of households over time) are *unbiased*. That is, they match the true value on average in repeated samples when constructed from (and applied to) a single, unchanging population in which the relationship between scorecard indicators and poverty is unchanging. Like all predictive models, the scorecard here is constructed from a single sample and so misses the mark to some unknown extent when applied (in this paper) to a validation sample. Furthermore, it is biased when applied (in practice) to a different population or when applied after 2012/13 (because the relationships between indicators and poverty change over time).[3]

Thus, while the indirect scoring approach is less costly than the direct survey approach, it is also biased when applied in practice. (The survey approach is unbiased by definition.) There is bias because the scorecard necessarily assumes that future

[3] Important cases include nationally representative samples at a later point in time or sub-groups that are not nationally representative (Diamond *et al.*, 2014; Tarozzi and Deaton, 2009).

relationships between indicators and poverty in all possible groups of households will be the same as in the construction interviews. Of course, this assumption—inevitable in predictive modeling—holds only partly.

On average across 1,000 bootstraps of $n = 16{,}384$ from the validation sample, the difference between scorecard estimates of groups' poverty rates versus the true rates at a point in time for the national poverty line is +0.2 percentage points. Across all ten poverty lines, the average absolute difference is about 0.7 percentage points, and the maximum absolute difference is 1.8 percentage points. These differences reflect sampling variation, not bias; the average difference would be zero if the whole 2012/13 GHPS survey was to be repeatedly re-fielded and divided into sub-samples before repeating the entire process of constructing and validating scorecards.

With $n = 16{,}384$, the 90-percent confidence intervals for these estimates are ± 0.6 percentage points or less. For $n = 1{,}024$, the 90-percent intervals are ± 2.6 percentage points or less.

Section 2 below 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 new scorecard here in the context of existing poverty-measurement tools for Nigeria. Section 10 is a summary.

The "Guidelines for the Interpretation of Scorecard Indicators" appears as an annex after the bibliographic references. The "Guidelines" tell how to ask questions (and how to interpret responses) so as to mimic how the 2012/13 GHPS was done as closely as possible. These "Guidelines" (and the "Back-page Worksheet") are integral parts of the Simple Poverty Scorecard® tool.

2. Data, *poverty*, and poverty lines

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

2.1 Data

The scorecard is based on data from 9,122 interviews with households in the 2012/13 GHPS. This is Nigeria's most recent nationally representative consumption survey.

The 2012/13 GHPS has two rounds: September to November 2012 (*post-planting*), and February to April 2013 (*post-harvest*). Almost all households in the data (4,532) completed interviews in both rounds. Thirty-two households completed only a post-planting interview, and 26 households completed only a post-harvest interview. Each household that completed both interviews contributes two observations to the data set. Each completed interview is analyzed here as if it came from a distinct household.

For the purposes of the scorecard, the interviews in the 2012/13 GHPS 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

Because most households contribute two interviews to the data, and because each interview is treated as if it came from a distinct household, a household's two interviews could end up:

- Both in the construction/calibration sub-sample
- Both in the validation sub-sample
- One in each sub-sample

Because some households' observations are in both sub-samples, and because a given household's poverty status[4] (and its poverty indicators)[5] are correlated across rounds, the accuracy tests here are not fully out-of-sample; some of the data used to construct the scorecard is also used to test it. The estimates of accuracy in this paper are thus over-stated. While the exact extent of this over-statement is not known, it probably is not large, as estimated accuracy here for Nigeria is broadly similar to that for the scorecard in other countries.

[4] By the national poverty line, 59.1 percent of households are non-poor in both rounds, 19.0 percent are poor in both rounds, 13.6 percent are poor in post-harvest but not in post-planting, and 8.3 percent are poor in post-planting but not in post-harvest.

[5] Beyond the fact that the values of poverty indicators for a given household are unlikely to change in the six months between rounds, the 2012/13 GHPS asked about housing characteristics only in post-harvest. This paper assumes that these values are the same in post-planting. The 32 households with only a post-planting interview are not used to construct or test the scorecard, although they are included in the values reported in Figures 1 and 2.

2.2 Poverty rates at the household, person, or participant level

A *poverty rate* is the share of units in households in which total household consumption (divided by the number of household members) is below a given poverty line. The unit of analysis is either the household itself or a person in the household. Each household member has the same poverty status (or estimated poverty likelihood) as the other household members.

To illustrate, suppose a program serves two households. The first household is poor (its per-capita consumption is less than a given poverty line), and it has three members, one of whom is a program participant. The second household is non-poor and has four members, two of whom are program participants.

Poverty rates are in terms of either households or people. If the program defines its *participants* as households, then the household level is relevant. The estimated household-level poverty rate is the weighted[6] average of poverty statuses (or estimated poverty likelihoods) across households with participants. 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

[6] The example here assumes simple random sampling at the household level. This means that each household has the same weight, taken here to be one (1).

denominator is the sum of the weights of the two households. Household-level weights are used 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[7] 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, a program might count 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

[7] Given simple random sampling, a household's person-level weight is its household size.

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—assuming simple random sampling—the weights are the number of relevant units in the household. When reporting, organizations should make explicit the unit of analysis—household, household member, or participant—and explain why that unit is relevant.

Figure 1 reports poverty lines and poverty rates for households and people in the 2012/13 GHPS for Nigeria as a whole and for the construction/calibration and validation sub-samples. Figure 2 reports poverty lines and poverty rates for households and people for Nigeria as a whole and for each of Nigeria's 6 poverty-line regions (which are its six geo-political zones). Household-level poverty rates are reported because—as shown above—household-level poverty likelihoods can be straightforwardly converted into poverty rates for other units of analysis. This is also why the scorecard is constructed, calibrated, and validated with household weights. Person-level poverty rates are also included in Figures 1 and 2 because these are the rates reported by the government of Nigeria and by the World Bank and because person-level rates are usually used in policy discussions.

The all-Nigeria person-level poverty rate of 32.9 percent by 100% of the national poverty line reported in Figure 1 is close to the 33.1 percent reported by World Bank (2014, p. 17) and echoed by Nigeria's then-president Jonathan Goodluck (Wakili, 2015).[8] The two poverty rates differ by 0.2 percentage points for two reasons:

- In 544 post-harvest interviews, World Bank counts as *household members* people marked as no longer being household members. This increases household size, decreases per-capita consumption, and increases the poverty rate
- For the 4,532 households who completed two interviews, World Bank determines poverty status by averaging per-capita consumption across rounds and then comparing it with the average across rounds of the national poverty line. This does not affect poverty status for the 78.1 percent of households who were poor in both rounds or non-poor in both rounds, but it forces the other 21.9 percent of households (who were poor in one round and non-poor in the other) to be counted as either always poor or always non-poor

In this paper, consumption and poverty status are not averaged across rounds, partly because this would also requiring averaging the values of scorecard indicators. But the values of scorecard indicators can change between rounds, and categorical values cannot be averaged. For example, it is not clear what "average TV ownership" is for a household that owns a TV in post-harvest but not in post-planting. Even numeric indicators (such as the number of household members or the number of occupied rooms) are not feasible because the scorecard cannot list all possible non-integer average values as response options. In any case, when the scorecard is applied, it is applied once per estimate, not twice per estimate.

[8] Vasco Molini of the World Bank graciously shared the poverty data as well as some of the software used to produce it.

2.3 Definition of *poverty*

Poverty is whether a household is poor or non-poor. In Nigeria, this is determined by whether per-capita aggregate household consumption is below a given poverty line. Thus, a definition of *poverty* has two aspects: a measure of aggregate household consumption, and a poverty line.

The definition of *poverty* used with the 2012/13 GHPS differs from that used with the 2003/4 Nigeria Living Standards Survey (NLSS) that underpins the old scorecard (Chen, Schreiner, and Woller, 2008). In particular, definitions changed for both consumption and poverty lines.

This means that point-in-time poverty-rate estimates based on the old 2003/4 scorecard can*not* be combined with point-in-time estimates from the new 2012/13 scorecard to estimate changes in poverty rates over time.[9]

Legacy users who already have a baseline estimate from the old 2003/4 scorecard can measure change over time by applying the old 2003/4 scorecard again as a follow-up. At the same time and with the same households, these legacy users should also apply the new 2012/13 scorecard. While non-comparable with estimates from the old 2003/4 scorecard, this new baseline is the best for measuring change over time in future follow-up rounds (also using the new 2012/13 scorecard). The estimates of change over time derived from the old and new definitions are so different that the "parallel lines"

[9] World Bank (2014, p. 16) says, "There are some important differences in methodology that prevent the direct comparison of results from the GHPS with the NLSS."

assumption does not hold, implying that users should *not* splice estimates of change over time under the two definitions to make a grand combined estimate of change based on two applications of the old 2003/4 scorecard with an estimate of change based on two applications of the new 2012/13 scorecard.

2.3.1 Definition of *consumption*

Consumption is measured differently in the 2003/4 NLSS versus the 2012/13 GHPS. In particular, "the NLSS gathers consumption data from households for an entire year, whereas the GHPS covers activities in only two periods. . . . In addition, consumption data are collected for the GHPS using a 7-day recall period, whereas the NLSS uses a diary" (World Bank, 2014, p. 16).

2.3.2 Definition of national poverty lines

The 2012/13 GHPS uses Nigeria's national poverty line (World Bank, 2014, p. 17). Based on the cost-of-basic-needs method (Ravaillon, 1998), the definition of the national line starts with a food line based on the cost of 3,000 Calories from the food basket observed to be consumed by the poorest 40 percent of people (NBS, 2010). In the 2012/13 GHPS, this food line (on average for Nigeria as a whole, in average prices during the first quarter of 2013) is NGN143.61 per person per day (Figure 1). This gives a household-level poverty rate of 9.0 percent and a person-level poverty rate of 12.5 percent.

The national line (sometimes called here "100% of the national line") is then the food line, plus a non-food component that is defined as the average observed non-food consumption of the 100 households whose food consumption is just below the food line and of the 100 households whose food consumption is just above the food line.

This (food-plus-non-food) national line is adjusted for cost-of-living differences across Nigeria's six geo-political zones. On average for all of Nigeria, the national line is NGN226.14 per person per day, giving poverty rates of 25.6 percent (households) and 32.9 percent (people). As noted earlier, this person-level poverty rate is very close to the published rate of 33.1 percent (World Bank, 2014, p. 17), and the reasons for the slight difference are known.

The national line differs between the 2012/13 GHPS and the 2003/4 NLSS in two ways. First, the food line is based on the cost of 2,900 Calories, not 3,000 (NBS, 2005). Second, the national line for the 2003/4 NLSS is adjusted for cost-of-living differences across urban and rural areas in each of Nigeria's then-37 states. There are separate adjustments for the food and non-food components in each of the resulting 74 poverty-line regions (Chen, Schreiner, and Woller, 2008).

These differences in the definition of *poverty*—that is, differences in the measure of consumption and in the definition of the national poverty line—lead to vastly different person-level poverty rates: 62.6 percent in the 2009/10 NLSS versus 35.2 in the 2010/11 GHPS and 33.1 in the 2012/13 GHPS (World Bank, 2014, p. 17). This is why estimates from the new 2012/13 scorecard cannot be compared with estimates from the old 2003/4 scorecard.[10]

Which definition is better? World Bank (2014) favors the GHPS definition, noting that the NLSS estimate of change in the person-level poverty rate by the national line between 2003/4 and 2009/10 is about two percentage points. This small decrease does not square with Nigeria's rapid economic growth in the period. World Bank (2013) convincingly argues that consumption is under-measured in the the 2009/10 NLSS, leading to poverty estimates that are too low.

[10] Comparisons would possible if the 2003/4 definition of *poverty* were applied to the 2012/13 GHPS data or if the 2012/13 definition of *poverty* were applied to the 2003/4 NLSS data. But no one has done this, and it might not even be possible, due to differences in the questionnaires and in their application in the field.

2.4 Poverty lines

Because pro-poor organizations in Nigeria may want to use different or various poverty lines beyond the food line and the national (food-plus-non-food) line, this paper calibrates scores from its single scorecard to poverty likelihoods for 10 lines:

- Food
- 100% of national
- 150% of national
- 200% of national
- Line marking the poorest half of people below 100% of the national line
- $1.25/day 2005 PPP
- $2.00/day
- $2.50/day
- $4.00/day
- $5.00/day

How are these poverty lines defined? The lines for 150% and 200% of national are multiples of the national line.

The line that marks the poorest half of people below 100% of the national line is defined—separately in each of Nigeria's six geo-political zones—as the median aggregate household per-capita consumption of people (not households) below 100% of the national line (U.S. Congress, 2004).

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

- 2005 PPP factor (World Bank, 2008): NGN78.583
- Average all-Nigeria Consumer Price Index in 2005:[11] 66.575
- Average all-Nigeria CPI in the third quarter of 2010: 113.473
- Average all-Nigeria CPI used by Molini (2015) to go from the third quarter of 2010 to the first quarter of 2013: 165.101 and 211.884
- All-Nigeria average national poverty line (Figure 1): NGN226.14
- National poverty lines in Nigeria's six geo-political zones (Figure 2)

The $1.25/day 2005 PPP poverty line in average prices in Nigeria overall on average during the first quarter of 2013 is then (Sillers, 2006):

$$1.25 \cdot 78.583 \cdot \left(\frac{\text{CPI}_{2010q3}}{\text{CPI}_{2005}}\right) \cdot \left(\frac{\text{CPI}_{2013q1}}{\text{CPI}_{2010q3}}\right) = 1.25 \cdot 78.583 \cdot \left(\frac{113.473}{66.575}\right) \cdot \left(\frac{211.884}{165.101}\right) = \text{NGN}214.86.$$

The $2.00, $2.50, $4.00, and $5.00 2005 PPP lines are multiples of the $1.25/day line.

The 2005 PPP lines in Figure 1 apply to Nigeria on average. In a given geo-political zone (Figure 2), the $1.25/day line is the all-Nigeria $1.25/day line, multiplied the national line in that geo-political zone, and divided by Nigeria's average national line.

For example, the $1.25/day 2005 PPP line in the North Central geo-political zone is the all-Nigeria $1.25/day line of NGN214.86 (Figure 1), multiplied by the national line in North Central of NGN218.40 (Figure 2), and divided by the average all-

[11] `cenbank.org/Functions/export.asp?tablename=InflationRates`, retrieved 24 July 2015.

Nigeria national line of NGN226.14 (Figure 1). This gives a $1.25/day line in the North Central geo-political zone of 214.86 x 218.40 ÷ 226.14 = NGN207.50 (Figure 2).

The World Bank's PovcalNet[12] does not report a $1.25/day 2005 PPP poverty rate for 2012/13.

USAID microenterprise partners in Nigeria who use the scorecard to report poverty rates to USAID should use the $1.25/day 2005 PPP line. This is because USAID defines the "very poor" as those people in households whose daily per-capita consumption is below the highest of the following two poverty lines:

- The line that marks the poorest half of people below 100% of the national line (NGN162.58, with a person-level poverty rate of 16.5 percent, Figure 1)
- $1.25/day 2005 PPP (NGN214.86, with a person-level poverty rate of 29.6 percent)

[12] `iresearch.worldbank.org/PovcalNet/index.htm`, retrieved 25 July 2015.

3. Scorecard construction

For Nigeria, about 90 candidate indicators are initially prepared in the areas of:

- Household composition (such as the number of members)
- Education (such as the literacy of the (oldest) female head/spouse)
- Housing (such as the type of roof)
- Ownership of durable assets (such as mattresses or mobile phones)
- Employment (such as the number of household members who work)
- Agriculture (such as the number of household members who farm)

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 status on its own.[13]

One possible application of the scorecard is to measure *changes* in poverty through time. Thus, when selecting indicators and holding other considerations constant, preference is given to more sensitive indicators. For example, the ownership of a mattress 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 100% of the national poverty line and Logit regression on the construction sub-sample. Indicator selection uses both judgment and statistics. The first step is to use Logit to build one scorecard for each candidate indicator. Each scorecard's power to rank households by poverty status is measured as "c" (SAS Institute Inc., 2004).

[13] The uncertainty coefficient is not used as a criterion when selecting scorecard indicators; it is just a way to order the candidate indicators in Figure 3.

One of these one-indicator scorecards is then selected based on several factors (Schreiner *et al.*, 2014; 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, tendency to have a slow-changing relationship with poverty, relevance for distinguishing among households at the poorer end of the distribution of consumption, and verifiability.

A series of two-indicator scorecards are then built, each adding a second indicator to the one-indicator scorecard selected from the first round. The best two-indicator scorecard is then selected, again using judgment to balance "c" with the non-statistical criteria. These steps are repeated until the scorecard has 10 indicators that work well together.[14]

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).

[14] For Nigeria, the selection of the final 10 indicators was also informed by feedback from future users via desk-based review and field testing by Propcom Mai-karfi.

This algorithm is similar to common R^2-based stepwise least-squares regression. It differs from naïve stepwise in that the selection of indicators considers both statistical[15] and non-statistical criteria. The use of non-statistical criteria can improve robustness through time and helps ensure that indicators are simple, sensible, and acceptable to users.

The single scorecard here applies to all of Nigeria. Tests for Indonesia (World Bank, 2012), Bangladesh (Sharif, 2009), India and Mexico (Schreiner, 2006 and 2005a), Sri Lanka (Narayan and Yoshida, 2005), and Jamaica (Grosh and Baker, 1995) suggest that segmenting scorecards by urban/rural does not improve targeting accuracy much. In general, however, segmentation may improve the accuracy of estimates of poverty rates (Diamond *et al.*, 2016; Tarozzi and Deaton, 2009), but it may also increase the risk of overfitting (Haslett, 2012).

[15] The statistical criterion for selecting an indicator is not the p values of its coefficients but rather the indicator's contribution to the ranking of households by poverty status.

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 the organization to decide to do what is needed to integrate scoring in its processes and to train and convince its employees to use the scorecard properly (Schreiner, 2002). After all, most reasonable scorecards have similar targeting accuracy, thanks to the empirical phenomenon known as the "flat maximum" (Caire and Schreiner, 2012; Hand, 2006; Baesens *et al.*, 2003; Lovie and Lovie, 1986; Kolesar and Showers, 1985; Stillwell, Barron, and Edwards, 1983; Dawes, 1979; Wainer, 1976; Myers and Forgy, 1963). The bottleneck is less technical and more human, not statistics but organizational-change management. Accuracy is easier to achieve than adoption.

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

To this end, Nigeria'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 "multiple-choice" indicators
- Only simple points (non-negative integers, and no arithmetic beyond addition)

A field worker using Nigeria's scorecard would:

- Record the interview identifier, the date of the interview, the country identifier ("NGA"), the scorecard identifier ("002"), and the sampling weight assigned by the survey design to the household of the participant
- Record the names and identifiers of the participant (who may or may not be the respondent), of the field agent, and of the relevant organizational service point
- Complete the "Back-page Worksheet" with each household member's name
- Record household size in the header next to "Number of household members:"
- Record the responses to the scorecard's first indicator based on the responses on the "Back-page Worksheet"
- Read each of the remaining nine questions one-by-one from the scorecard, drawing a circle around the relevant responses and their points, and writing each point value in the far right-hand column
- Add up the points to get a total score.
- Implement targeting policy (if any)
- Deliver the paper scorecard to a central office for data capture 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 if they 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).[16] IRIS Center (2007a) and

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

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

In particular, while collecting scorecard indicators is relatively easier than alternative ways of measuring poverty, it is still absolutely difficult. Training and explicit definitions of terms and concepts in the scorecard are essential, and field workers should scrupulously study and follow the "Guidelines for the Interpretation of Scorecard Indicators" found after the "References" in this paper, as the "Guidelines" and the "Back-page Worksheet" are integral parts of the Simple Poverty Scorecard® tool.[17]

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

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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 workers and respondents. Even if points are hidden, field workers and respondents can apply common sense to guess how response options are linked with poverty.

[17] The "Guidelines" here are the only ones that organizations should give to field workers. All other issues of interpretation should be left to the judgment of field workers and respondents, as this seems to be what Nigeria's NBS does in the GHPS.

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

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

- Who will do the interviews
- 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 program's goals for the exercise, the questions to be answered, and the budget. The main goal should be to make sure that the sample is representative of a well-defined population and that the scorecard will inform an issue that matters to the organization.

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

- Employees of the organization
- Third parties

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

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

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

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

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

The frequency of application can be:

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

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

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

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

5. Estimates of household poverty likelihoods

The sum of scorecard points for a household is called the *score*. For Nigeria, 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 poor, the scores themselves have only relative units. For example, doubling the score decreases the likelihood of being below a given poverty line, but it does not cut it in half.

To get absolute units, scores must be converted to *poverty likelihoods*, that is, probabilities of being below a poverty line. This is done via simple look-up tables. For the example of 100% of the national line, scores of 35–39 have a poverty likelihood of 40.1 percent, and scores of 40–44 have a poverty likelihood of 30.6 percent (Figure 4).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 35–39 are associated with a poverty likelihood of 40.1 percent for 100% of the national line but of 35.8 percent for the $1.25/day 2005 PPP line.[18]

5.1 Calibrating scores with poverty likelihoods

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

[18] Starting with Figure 4, many figures have 10 versions, one for each of the 10 poverty lines. To keep them straight, the figures are grouped by poverty line. Single tables pertaining to all lines are placed with the tables for 100% of the national line.

For the example of 100% of the national line (Figure 5), there are 9,837 (normalized) households in the calibration sub-sample with a score of 35–39. Of these, 3,944 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 35–39 is then 40.1 percent, as 3,944 ÷ 9,837 = 40.1 percent.

To illustrate with 100% of the national line and a score of 40–44, there are 11,063 (normalized) households in the calibration sample, of whom 3,389 (normalized) are below the line (Figure 5). The poverty likelihood for this score range is then 3,389 ÷ 11,063 = 30.6 percent.

The same method is used to calibrate scores with estimated poverty likelihoods for all 10 poverty lines.[19]

Even though the scorecard is constructed partly based on judgment related to non-statistical criteria, the calibration process produces poverty likelihoods that are objective, that is, derived from quantitative poverty lines and from survey data on consumption. The calibrated poverty likelihoods would be objective even if the process of selecting indicators and points did not use any data at all. In fact, objective scorecards of proven accuracy are often constructed using only expert judgment to select indicators and points (Fuller, 2006; Caire, 2004; Schreiner *et al.*, 2014). Of course, the scorecard here is constructed with both data and judgment. The fact that this paper

[19] To ensure that poverty likelihoods never increase as scores increase, likelihoods across series of adjacent scores are sometimes iteratively averaged before grouping scores into ranges. This preserves unbiasedness while keeping users from balking when sampling variation in score ranges with low numbers of households would otherwise lead to higher scores being linked with higher poverty likelihoods.

acknowledges that some choices in scorecard construction—as in most statistical analysis—are informed by judgment in no way impugns the objectivity of the poverty likelihoods, as this objectivity depends on using data in score calibration, not on using data (and nothing else) in scorecard construction.

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

5.2 Accuracy of estimates of households' poverty likelihoods

As long as the relationships between indicators and poverty do not change over time, and as long as the scorecard is applied to households that are representative of the same population from which the scorecard was originally constructed, then this calibration process produces unbiased estimates of poverty likelihoods. *Unbiased* means that in repeated samples from the same population, the average estimate matches the true value in the population. Given the assumptions above, 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.[20]

Of course, the relationships between indicators and poverty do change to some unknown extent over time and also across sub-national groups in Nigeria's population. Thus, the scorecard will generally be biased when applied after April 2013 (the last month of fieldwork for the 2012/13 GHPS) or when applied with sub-groups that are not nationally representative.

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

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

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

For each score range and for $n = 16{,}384$, Figure 6 shows the average difference between estimated and true poverty likelihoods as well as confidence intervals for the differences.

For the example of 100% of the national line, the average poverty likelihood across bootstrap samples for scores of 35–39 in the validation sample is too high by 2.4 percentage points. For scores of 40–44, the estimate is too low by 2.2 percentage points.[21]

The 90-percent confidence interval for the differences for scores of 35–39 is ±2.4 percentage points (100% of the national line, Figure 6). This means that in 900 of 1,000 bootstraps, the difference between the estimate and the true value is between 0 and +4.8 percentage points (because +2.4 – 2.4 = 0, and +2.4 + 2.4 = +4.8). In 950 of 1,000 bootstraps (95 percent), the difference is +2.4 ± 2.9 percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is +2.4 ± 4.0 percentage points.

A few differences between estimated poverty likelihoods and true values in Figure 6 are large. These are not of great concern, however, as they occur in three score ranges (5 to 9, 10 to 14, and 15 to 19) that account for only 2.4 percent of households in Nigeria (Figure 11). There are these differences because the validation sample is a single sample that—thanks to sampling variation—differs in distribution from the

[21] These differences are not zero, despite the estimator's unbiasedness, because the scorecard comes from a single sample from the 2012/13 GHPS. The average difference by score range would be zero if the GHPS was repeatedly applied to samples of the population of Nigeria and then split into sub-samples before repeating the entire process of scorecard construction/calibration and validation.

construction/calibration sub-samples and from Nigeria's population. For targeting, however, what matters is less the difference in all score ranges and more the differences in the score ranges just above and below the targeting cut-off. This mitigates the effects of bias and sampling variation on targeting (Friedman, 1997). Section 8 below looks at targeting accuracy in detail.

In addition, if estimates of groups' poverty rates are to be usefully accurate, then errors for individual households' poverty likelihoods must largely balance out. As discussed in the next section, this is generally the case for nationally representative samples.

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 GHPS fieldwork in April 2013. That is, the scorecard may fit the data from the 2012/13 GHPS so closely that it captures not only some real patterns but also some random patterns that, due to sampling variation, show up only in the 2012/13 GHPS but not in the overall population of Nigeria. Or the scorecard may be overfit in the sense that it is not robust when relationships between indicators and poverty change over time or when the scorecard is applied to samples that are not nationally representative.

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 for nationally representative samples (see the next section). Furthermore, at least some of the differences in change-through-time estimates may come from non-scorecard sources such as changes in the relationships between indicators and poverty, sampling variation, changes in poverty lines, inconsistencies in data quality across time, and imperfections in cost-of-living adjustments across time and across geographic regions. These factors can be addressed only by improving the availability, frequency, quantity, and quality of data from national consumption surveys (which is beyond the scope of the scorecard) or by reducing overfitting (which likely has limited returns, given the scorecard's parsimony).

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

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

To illustrate, suppose an organization samples three households on 1 January 2016 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 75.9, 53.4, and 30.6 percent (100% of the national line, Figure 4). The group's estimated poverty rate is the households' average poverty likelihood of (75.9 + 53.4 + 30.6) ÷ 3 = 53.3 percent.

Be careful; the group's poverty rate is *not* the poverty likelihood associated with the average score. Here, the average score is 30, which corresponds to a poverty likelihood of 53.4 percent. This differs from the 53.3 percent found as the average of the three individual poverty likelihoods associated with each of the three scores (and usually it will differ more than it does in this example). 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 meaningfully be added up or averaged across households. Only three operations are valid for scores: conversion to poverty likelihoods, analysis of distributions (Schreiner, 2012a), or comparison—if desired—with a cut-off for targeting. The safest rule to follow is: Always use poverty likelihoods, never scores.

6.1 Accuracy of estimated poverty rates at a point in time

For the Nigeria scorecard applied to 1,000 bootstraps of $n = 16{,}384$ from the validation sample and using 100% of the national poverty line, the average difference between the estimated poverty rate at a point in time versus the true rate is +0.2 percentage points (Figure 8, summarizing Figure 7 across all poverty lines). Across all 10 poverty lines in the the validation sample, the maximum absolute difference is 1.8 percentage points, and the average absolute difference is about 0.7 percentage points. At least part of these differences is due to sampling variation in the division of the 2012/13 GHPS into two sub-samples.[22]

When estimating poverty rates at a point in time, the bias reported in Figure 8 should be subtracted from the average poverty likelihood to make the estimate unbiased. For the example of Nigeria's scorecard and 100% of the national line, bias is +0.2 percentage points, so the unbiased estimate in the three-household example above is 53.3 – (+0.2) = 53.1 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 better (Figure 8). 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.

[22] As noted earlier, these accuracy measures are over-stated to some unknown extent because some households contribute an observation to both the construction and validation sub-samples and because a given household's poverty status tends to be correlated across the post-planting and post-harvest rounds in the GHPS.

For example, suppose that the average poverty likelihood in a sample of $n =$ 16,384 with the Nigeria scorecard and 100% of the national line is 53.3 percent. Then estimates in 90 percent of such samples would be expected to fall in the range of 53.3 – (+0.2) – 0.5 = 52.6 percent to 53.3 – (+0.2) + 0.5 = 53.6 percent, with the most likely true value being the unbiased estimate in the middle of this range, that is, 53.3 – (+0.2) = 53.1 percent. This is because the original (biased) estimate is 53.3 percent, bias is +0.2 percentage points, and the 90-percent confidence interval for 100% of the national line with this sample size is ±0.6 percentage points (Figure 8).

6.2 Formula for standard errors for estimates of poverty rates

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

Schreiner (2008a) proposes an approach to deriving a formula for the standard errors of estimated poverty rates at a point in time from indirect measurement via scorecards. It starts with Cochran's (1977) textbook formula of $\pm c = \pm z \cdot \sigma$ that relates confidence intervals with standard errors in the case of direct measurement of ratios, where:

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

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

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

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

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

N is the population size, and

n is the sample size.

For example, Nigeria's 2012/13 GHPS gives a direct-measurement estimate of the household-level poverty rate for 100% of the national line in the validation sample of $\hat{p} = 25.6$ percent (Figure 1). If this estimate came from a sample of $n = 16{,}384$ households from a population N of 30,746,665 (the number of households in Nigeria in 2012/13 according to the GHPS sampling weights), then the finite population correction

ϕ is $\sqrt{\frac{30{,}746{,}665 - 16{,}384}{30{,}746{,}665 - 1}} = 0.9997$, which very close to $\phi = 1$. If the desired confidence level is 90-percent ($z = 1.64$), then the confidence interval $\pm c$ is

$$\pm\, z \cdot \sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}} = \pm 1.64 \cdot \sqrt{\frac{0.256 \cdot (1 - 0.256)}{16{,}384}} \cdot \sqrt{\frac{30{,}746{,}665 - 16{,}384}{30{,}746{,}665 - 1}} =$$

± 0.559 percentage points. (If ϕ were taken as 1, then the interval is still ± 0.559 percentage points.)

Scorecards, however, do not measure poverty directly, so this formula is not applicable. To derive a formula for the Nigeria scorecard, consider Figure 7, which reports empirical confidence intervals $\pm c$ for the differences for the scorecard applied to 1,000 bootstraps of various sizes from the validation sample. For example, with $n =$ 16,384 and 100% of the national line, the 90-percent confidence interval is ± 0.488 percentage points.[23]

Thus, the 90-percent confidence interval with $n = 16{,}384$ is ± 0.488 percentage points for the Nigeria scorecard and ± 0.559 percentage points for direct measurement. The ratio of the two intervals is $0.488 \div 0.559 = 0.87$.

Now consider the same exercise, but with $n = 8{,}192$. The confidence interval under direct measurement and 100% of the national line in the validation sample is

$$\pm\, 1.64 \cdot \sqrt{\frac{0.256 \cdot (1 - 0.256)}{8{,}192}} \cdot \sqrt{\frac{30{,}746{,}665 - 8{,}192}{30{,}746{,}665 - 1}} = \pm 0.791$$ percentage points. The

[23] Due to rounding, Figure 7 displays 0.5, not 0.488.

empirical confidence interval with the Nigeria scorecard (Figure 7) is ±0.676 percentage points. Thus for n = 8,192, the ratio of the two intervals is 0.676 ÷ 0.791 = 0.85.

This ratio of 0.85 for n = 8,192 is close to the ratio of 0.87 for n = 16,384. Across all sample sizes of 256 or more in Figure 7, the ratios are generally close to each other, and the average ratio in the the validation sample turns out to be 0.86, implying that confidence intervals for indirect estimates of poverty rates via the Nigeria scorecard and 100% of the national poverty line are—for a given sample size—about 14-percent narrower than confidence intervals for direct estimates via the 2012/13 GHPS. This 0.86 appears in Figure 8 as the "α factor" because if $\alpha = 0.86$, then the formula for confidence intervals c for the Nigeria 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. It turns out that α is less than 1.00 for six of 10 poverty lines in Figure 8.

The formula relating confidence intervals with standard errors for the scorecard can be rearranged to give a formula for determining sample size before measurement. If $\tilde{p}$ is the expected poverty rate before measurement, then the formula for sample size n from a population of size N that is based on the desired confidence level that corresponds to z and the desired confidence interval $\pm c$ is

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

To illustrate how to use this, suppose the population N is 30,746,665 (the number of households in Nigeria in 2012/13), suppose $c = 0.03797$, $z = 1.64$ (90-percent confidence), and the relevant poverty line is 100% of the national line so that the most sensible expected poverty rate $\widetilde{p}$ is Nigeria's overall poverty rate for that line in 2012/13 (25.6 percent at the household level, Figure 1). The α factor is 0.86 (Figure 8). Then the sample-size formula gives

$$n = 30{,}746{,}665 \cdot \left(\frac{1.64^2 \cdot 0.86^2 \cdot 0.256 \cdot (1 - 0.256)}{1.64^2 \cdot 0.86^2 \cdot 0.256 \cdot (1 - 0.256) + 0.03797^2 \cdot (30{,}746{,}665 - 1)} \right) = 263,$$

which is not far from the sample size of 256 observed for these parameters in Figure 7 for 100% of the national line. Taking the finite population correction factor ϕ as one (1) gives the same result, as $n = \left(\frac{0.86 \cdot 1.64}{0.03797} \right)^2 \cdot 0.256 \cdot (1 - 0.256) = 263.$[24]

[24] Although USAID has not specified confidence levels nor intervals, IRIS Center (2007a and 2007b) says that a sample size of $n = 300$ is sufficient for USAID reporting. USAID microenterprise partners in Nigeria should report using the \$1.25/day line. Given the α factor of 0.86 for this line (Figure 8), an expected before-measurement household-level poverty rate of 22.9 percent (the all-Nigeria rate in 2012/13, Figure 1), and a confidence level of 90 percent ($z = 1.64$), then $n = 300$ implies a confidence interval of $\pm 1.64 \cdot 0.86 \cdot \sqrt{\frac{0.229 \cdot (1 - 0.229)}{300}} = \pm 3.4$ percentage points.

Of course, the α factors in Figure 8 are specific to Nigeria, its poverty lines, its poverty rates, and its scorecard. The derivation of the formulas for standard errors using the α factors, however, is valid for any poverty-assessment tool following the approach in this paper.

In practice after the end of fieldwork for the GHPS in April 2013, a program would select a poverty line (say, 100% of the national line), note its participants' population size (for example, $N = 10{,}000$ participants), select a desired confidence level (say, 90 percent, or $z = 1.64$), select a desired confidence interval (say, ±2.0 percentage points, or $c = \pm 0.02$), make an assumption about $\widetilde{p}$ (perhaps based on a previous measurement such as the household-level poverty rate for 100% of the national line for Nigeria of 25.6 percent in the 2012/13 GHPS in Figure 1), look up α (here, 0.86 in Figure 8), assume that the scorecard will still work in the future and for sub-groups that are not nationally representative,[25] and then compute the required sample size. In this illustration, $n = 10{,}000 \cdot \left(\frac{1.64^2 \cdot 0.86^2 \cdot 0.256 \cdot (1 - 0.256)}{1.64^2 \cdot 0.86^2 \cdot 0.256 \cdot (1 - 0.256) + 0.02^2 \cdot (10{,}000 - 1)} \right) =$ 866.

[25] This paper reports accuracy for the scorecard applied to the validation sample, but it cannot test accuracy for later years or for sub-groups. Performance after April 2013 will resemble that in the 2012/13 GHPS 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

There are two approaches for estimating the change in a population's poverty rate between two points in time (Schreiner, 2015a):

- With two independent samples from the same population, the estimate is the difference in the average poverty likelihood among households in the baseline sample versus the average poverty likelihood among households in the follow-up sample
- With one sample in which each household is scored twice, the change is the average across households of the difference in each given household's baseline poverty likelihood and its follow-up poverty likelihood

Because the 2003/4 NLSS and the 2012/13 GHPS use different definitions of *poverty*, this paper cannot measure the accuracy of estimates of change over time for Nigeria, and it can only suggest approximate formulas for standard errors. Nonetheless, the relevant concepts are presented here because, in practice, local pro-poor organizations in Nigeria can apply the scorecard to collect their own data and measure change through time.

7.1 Warning: Change is not impact

Scoring can estimate change. Of course, poverty could get better or worse, and scoring does not indicate what causes change. This point is often forgotten or confused, so it bears repeating: the scorecard simply estimates change, and it does not, in and of itself, indicate the reason for the change. In particular, estimating the impact on poverty due to participation with a given program requires knowing what would have happened to participants if they had not been participants. Knowing this requires either

strong assumptions or a control group that resembles participants in all ways except participation. To belabor the point, the scorecard can help estimate the impact of participation only if there is some way to know—or explicit assumptions about—what would have happened in the absence of participation. And that information must come from beyond the scorecard.

7.2 Estimating changes in poverty rates over time

Consider the illustration begun in the previous section. On 1 January 2016, an organization samples three households who score 20, 30, and 40 and so have poverty likelihoods of 75.9, 53.4, and 30.6 percent (100% of the national line, Figure 4). Adjusting for the known bias in the validation sample of +0.2 percentage points (Figure 8), the group's baseline estimated poverty rate is the households' average poverty likelihood of [(75.9 + 53.4 + 30.6) ÷ 3] – (+0.2) = 53.1 percent.

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

- Score a new, independent sample from the same population
- Score the same sample that was scored at baseline

By way of illustration, suppose that two years later on 1 January 2018, the organization samples three additional households who are in the same population as the three original households and finds that their scores are 25, 35, and 45 (poverty likelihoods of 69.6, 40.1, and 20.9 percent, 100% of the national line, Figure 4). Adjusting for the known bias, the average poverty likelihood at follow-up is [(69.6 + 40.1 + 20.9) ÷ 3] – (+0.2) = 43.3 percent, an improvement of 53.1 – 43.3 = 9.8

percentage points.[26] Given that exactly two years passed between the average baseline interview and the average follow-up interview, the estimated annual decrease in poverty is 9.8 ÷ 2 = 4.9 percentage points per year. About one in ten participants in this hypothetical example cross the poverty line in 2016/8.[27] Among those who start below the line, about one in five or six (9.8 ÷ 53.1 = 18.5 percent) on net end up above the line.[28]

Alternatively, suppose that three original households who were scored at baseline are scored again on 1 January 2018. Given scores of 25, 35, and 45, their follow-up poverty likelihoods are 69.6, 40.1, and 20.9 percent. The average across households of the difference in each given household's baseline poverty likelihood and its follow-up poverty likelihood is [(75.9 – 69.6) + (53.4 – 40.1) + (30.6 – 20.9)] ÷ 3 = 9.8. In this example, there are again exactly two years between each household's interviews, so the estimated annual decrease in poverty is still 9.8 ÷ 2 = 4.9 percentage points per year.

Both approaches to estimating change through time are unbiased, but, in general, they will give different estimates due to differences in the timing of interviews and in the composition of the samples.

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

7.3 Precision for estimates of change in two samples

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

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

Here, z, c, $\hat{p}$ and N are defined as above, n is the sample size at both baseline and follow-up,[29] and α is the average (across a range of bootstrap samples of various sample sizes) of the ratio of the observed confidence interval from a scorecard and the theoretical confidence interval under direct measurement.

As before, the formula for standard errors can be rearranged to give a formula for sample sizes before indirect measurement via a scorecard, where $\tilde{p}$ 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 $n = 2 \cdot \left(\frac{\alpha \cdot z}{c} \right)^2 \cdot \tilde{p} \cdot (1 - \tilde{p})$.

This α has been measured for 11 countries (Schreiner, 2015b, 2015c, 2013a, 2013b, 2012b, 2010a, 2010b, 2009a, 2009b, 2009c, 2009d, 2008b; and Chen and Schreiner, 2009). The simple average of α across countries—after averaging α across

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

poverty lines and survey years within each country—is 1.09. This rough figure is as reasonable as any to use for Nigeria.

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 100% of the national line, $\alpha = 1.09$, $\hat{p} = 0.256$ (the household-level poverty rate in 2012/13 for 100% of the national line in Figure 1), and the population N is large enough relative to the expected sample size n that the finite population correction ϕ can be taken as one. Then the baseline sample size is $n = 2 \cdot \left(\frac{1.09 \cdot 1.64}{0.02} \right)^2 \cdot 0.256 \cdot (1 - 0.256) \cdot 1 = 3{,}044$, and the follow-up sample size is also 3,044.

7.4 Precision for estimated change for one sample, scored twice

Analogous to previous derivations, the general formula relating the confidence interval $\pm c$ to the standard error σ when using a scorecard to estimate change for a single group of households, all of whom are scored at two points in time, is:[30]

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

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

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 simple assumption is that the change in the poverty rate will be zero, which implies $\tilde{p}_{12} = \tilde{p}_{21} = \tilde{p}_{*}$, giving:

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

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

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

Given this, a sample-size formula for a group of households to whom the Nigeria scorecard is applied twice (once after April 2013 and then again later) is

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

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

To illustrate the use of this formula, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is ± 2.0 percentage points ($\pm c = \pm 0.02$), the poverty line is 100% of the national line, the sample will first be scored in 2016 and then again in 2019 ($y = 3$), and the population N is so large relative to the expected sample size n that the finite population correction ϕ can be taken as one. The pre-baseline poverty rate $p_{2012/13}$ is taken as 25.6 percent (Figure 1), and α is assumed to be 1.30. Then the baseline sample size is

$n = 2 \cdot \left(\frac{1.30 \cdot 1.64}{0.02} \right)^2 \cdot \{-0.02 + 0.016 \cdot 3 + 0.47 \cdot [0.256 \cdot (1 - 0.256)]\} \cdot 1 = 2{,}671$. The same 2,671 households are scored at follow-up as well.

8. Targeting

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

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

Households who score at or below a given cut-off should be labeled as *targeted*,[31] not as *poor*. After all, unless all targeted households have poverty likelihoods of 100 percent, some of them are non-poor (their consumption is above a given poverty line). With the scorecard, the terms *poor* and *non-poor* have specific definitions. Using these same terms for targeting status is both incorrect and misleading.

[31] A label is acceptable as long as it does not confuse targeting status (having a score below a program-selected cut-off) with poverty status (having consumption below an externally defined poverty line). Examples of acceptable labels include *Groups A, B, and C*; *Households scoring 29 or less, 30 to 69, or 70 or more*; and *Households who qualify for reduced fees, or do not qualify for reduced fees.*

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 9 depicts these four possible targeting outcomes. Targeting accuracy varies by the cut-off score; a higher cut-off has better inclusion (but more leakage), while a lower cut-off has better exclusion (but higher 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 10 shows the distribution of households by targeting outcome for Nigeria. For an example cut-off of 39 or less, outcomes for 100% of the national line in the validation sample are:

- Inclusion: 17.2 percent are below the line and correctly targeted
- Undercoverage: 8.4 percent are below the line and mistakenly not targeted
- Leakage: 13.4 percent are above the line and mistakenly targeted
- Exclusion: 61.0 percent are above the line and correctly not targeted

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

- Inclusion: 20.7 percent are below the line and correctly targeted
- Undercoverage: 4.9 percent are below the line and mistakenly not targeted
- Leakage: 20.9 percent are above the line and mistakenly targeted
- Exclusion: 53.5 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 10 for a given poverty line
- Select the cut-off with the highest total net benefit

The most difficult step is assigning benefits and costs to targeting outcomes. A program that uses targeting—with or without scoring—should thoughtfully consider how it values successful inclusion and exclusion versus errors of undercoverage and leakage. It is healthy to go through a process of thinking explicitly and intentionally about how possible targeting outcomes are valued.

A common choice of benefits and costs is the "hit rate", where total net benefit is the number of households correctly included or correctly excluded:

Hit rate =	1	x	Households correctly included	–
	0	x	Households mistakenly undercovered	–
	0	x	Households mistakenly leaked	+
	1	x	Households correctly excluded.	

Figure 10 shows the hit rate for all cut-offs for the Nigeria scorecard. For 100% of the national line in the validation sample, the hit rate is greatest (80.5 percent) for a cut-off of 34 or less, with about four in five households in Nigeria correctly classified.

The hit rate weighs successful inclusion of households below the line the same as successful exclusion of households above the line. If a program values inclusion more (say, twice as much) than exclusion, then it can reflect this by setting the benefit for inclusion to 2 and the benefit for exclusion to 1. Then the chosen cut-off will maximize (2 x Households correctly included) + (1 x Households correctly excluded).[32]

As an alternative to assigning benefits and costs to targeting outcomes and then choosing a cut-off to maximize total net benefits, a program could set a cut-off to achieve a desired poverty rate among targeted households. The third column of Figure 11 ("% targeted HHs who are poor") shows, for the Nigeria scorecard applied to the validation sample, the expected poverty rate among households who score at or below a given cut-off. For the example of 100% of the national line, targeting households in the validation sample who score 39 or less would target 30.6 percent of all households

[32] Figure 10 also reports BPAC, the Balanced Poverty Accuracy Criterion adopted by USAID for certifying poverty-assessment tools. It is discussed in the next section.

(second column) and would be associated with a poverty rate among those targeted of 56.2 percent (third column).

Figure 11 also reports two other measures of targeting accuracy. The first is a version of coverage ("% poor HHs who are targeted"). For the example of 100% of the national line with the validation sample and a cut-off of 39 or less, 67.2 percent of all poor households are covered.

The final targeting measure in Figure 11 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For 100% of the national line with the validation sample and a cut-off of 39 or less, covering 1.3 poor households means leaking to 1 non-poor household.

9. The context for poverty-assessment tools in Nigeria

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

- Use of data from the most recent available nationally representative consumption survey
- Use of a consumption-based definition of *poverty* that is widely used
- Reporting bias and precision for estimates of poverty rates at a point in time from out-of-sample tests, including formulas for standard errors
- Targeting accuracy that is similar to that of alternatives
- Feasibility for local, pro-poor programs, due to its simplicity and transparency

9.1 Gwatkin *et al.*

Gwatkin *et al.* (2007) construct a poverty-assessment tool for Nigeria 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 7,225 households in Nigeria's 2003 DHS.[33] The PCA index is like the scorecard here except that, because the DHS does not collect data on consumption, the index is based on a different conception of *poverty*, its accuracy vis-à-vis consumption-based poverty is unknown, and it can only be assumed

[33] All DHS datasets for Nigeria since 2003 include each household's index value on an asset index (`dhsprogram.com/topics/wealth-index/`, retrieved 25 July 2015).

to be a proxy for long-term wealth/economic status.[34] Well-known examples of the PCA asset-index approach include Stifel and Christiaensen (2007), Zeller *et al.* (2006), Sahn and Stifel (2003 and 2000), Henry *et al.* (2003), and Filmer and Pritchett (2001).

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

- Characteristics of the residence:
  - — Number of rooms
  - — Presence of electricity
  - — Type of floor
  - — Type of cooking fuel
  - — Type of toilet arrangement
  - — Number of people per sleeping room
- Ownership of consumer durables:
  - — Gas cookers
  - — Radios
  - — Televisions
  - — Telephones
  - — Refrigerators
  - — Electric fans
  - — Electric irons
  - — Bicycles
  - — Motorcycles/scooters
  - — Cars or trucks
  - — Canoes, boats, or ships
  - — Donkeys, horses, or camels
- Presence of a domestic worker not related to the head
- Whether any household members work their own or family's agricultural land

[34] Nevertheless, the indicators are similar and the "flat maximum" is important, so carefully built PCA indexes and consumption-based poverty-assessment tools may pick up the same underlying construct (perhaps "permanent income", see Bollen, Glanville, and Stecklov, 2007), and they may rank households much the same. Comparisons of rankings by PCA indexes and consumption-based poverty-assessment tools include Filmer and Scott (2012), Lindelow (2006), Wagstaff and Watanabe (2003), and Montgomery *et al.* (2000).

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

- Segmenting households by the quintile of their index value to see how health varies with socio-economic status
- Monitoring (via exit surveys) how well local health-service posts reach the poor
- Measuring local coverage of health services via small-scale surveys

The first goal is akin to targeting, and the last two goals deal with performance monitoring, so the asset index would be used much like the scorecard here.

Still, the Gwatkin *et al.* index is more costly and difficult-to-use than the scorecard. The index has 20 indicators (versus 10), and while the scorecard requires adding up 10 integers (some of them usually zeroes), Gwatkin *et al.*'s index requires adding up 100 numbers, each with five decimal places and half with negative signs.

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

In essence, Gwatkin *et al.*—like all asset indexes—define *poverty* in terms of the indicators and the points in the index itself. Thus, the index is not a proxy standing in for something else (such as consumption); rather, it is a direct measure of a non-consumption-based definition of *poverty*. There is nothing wrong—and a lot right—about defining *poverty* in this way, but it is not as common as a consumption-based definition. It also means that ranks from different asset indexes are not comparable, because the definition of *poverty* changes when the indicators and points in a country's asset index changes.

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

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

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

9.2 IRIS Center

USAID commissioned IRIS Center (2011) to build a "Poverty Assessment Tool" (PAT) using data from the 2003/4 NLSS so that USAID's microenterprise partners in Nigeria could report the share of their participants who are "very poor". In general, the PAT for Nigeria is like the scorecard, except that the PAT:

- Estimates consumption directly (rather than poverty likelihoods) and then converts estimated consumption into a poverty likelihood of either 0 or 100 percent (rather than between 0 and 100)
- Has more indicators (19 rather than 10)

The PAT supports five 2005 PPP poverty lines:

- \$0.75/day
- \$1.00/day
- \$1.25/day
- \$2.00/day
- \$2.50/day

IRIS tests four regression-based approaches in both one-stage and two-stage versions (IRIS, 2005), settling on a one-step quantile regression that estimates the 54th percentile of the logarithm of per-capita household consumption. It uses 19 indicators (IRIS, 2011) that are simple and verifiable:

- Demographics:
  - — Household size (and its square)
  - — Age of the head (and its square)
- Education:
  - — Share of household members (excluding head) with no educational qualification
  - — Share of household members (excluding head) whose highest educational qualification is the First School Leaving Certificate
  - — Share of household members (excluding head) whose highest educational qualification is the National Certificate of Education or National Diploma
  - — Share of household members (excluding head) whose highest educational qualification is a bachelor's degree or a higher national diploma program
  - — Whether the head's highest educational qualification is the First School Leaving Certificate
  - — Whether the head can read a letter in English
  - — Whether the head can do written calculations
- Whether the head was involved in farming, livestock, or fishing in the past 12 months
- Characteristics of the residence:
  - — Whether the residence is shared with other households
  - — Number of rooms
  - — Use of electricity for lighting
  - — Type of floor
  - — Type of roof
  - — Source of drinking water
  - — Type of toilet arrangement
- Location:
  - — Geo-political zone
  - — Urban/rural

Schreiner (2014) reports an apples-to-apple comparison of IRIS (2011) versus the old 2003/4 scorecard from Chen, Schreiner, and Woller (2008).[35] In out-of-sample tests, the PAT and the scorecard have about the same absolute bias (0.7 versus 0.8 percentage points).[36] The PAT is more precise (α of 1.13 versus 1.26). For targeting, the PAT correctly classifies 0.1 more people per 100 than does the scorecard. Thus, in terms of accuracy in Nigeria, the PAT and the old 2003/4 scorecard are about tied.

IRIS also reports accuracy in terms of the Balanced Poverty Accuracy Criterion. IRIS Center (2005) introduced BPAC, and USAID adopted it as its criterion for approving poverty-assessment tools for use by its microenterprise partners. BPAC considers accuracy in terms of targeting inclusion and in terms of the absolute difference between undercoverage and leakage (which, under the PAT's approach, is equal to the absolute value of the bias of the estimated poverty rate). The formula is:

$$\text{BPAC} = 100 \cdot \left(\frac{\text{Inclusion} - |\ \text{Undercoverage} - \text{Leakage}\ |}{\text{Inclusion} + \text{Undercoverage}} \right).$$

Because bias (in the PAT approach) is the difference between undercoverage and leakage, and because the normalization term $\dfrac{100}{\text{Inclusion} + \text{Undercoverage}}$ is possibly

[35] Schreiner (2014) derives a \$1.25/day line that replicates the poverty rate reported by IRIS (who mistakenly deflate the 2005 PPP factor to calendar year 2004 when in fact the 2003/4 NLSS was fielded from September 2003 to August 2004). IRIS also omits from its analysis 4,045 households with no data on asset ownership. In contrast, Chen, Schreiner, and Woller (2008) include these households, assuming that they have no asset records because they do not own any of the assets asked about in the 2003/4 NLSS. Schreiner (2014, p. 64) argues that the data are consistent with this assumption.

[36] When bias is known, it can be removed, so both the PAT and scorecard are unbiased.

relevant only when comparing poverty-assessment tools across populations with different poverty rates (but irrelevant when selecting among alternative tools for a given country in a given year for a given poverty line), the simpler formula BPAC = Inclusion− | Bias | ranks poverty-measurement tools the same as the more complex formula.

Expressing BPAC as Inclusion− | Bias | helps to show why BPAC is not useful for comparing the PAT with the scorecard (Schreiner, 2014). Given the assumptions discussed earlier,[37] the scorecard produces unbiased estimates of poverty rates, regardless of whether undercoverage differs from leakage. While BPAC can be used to compare alternative tools that all use the PAT's consumption-estimation approach, it does not make sense to apply BPAC to the scorecard's likelihood-estimation approach. This is because—unlike the PAT—the scorecard does not use a single cut-off to classify households as either 100-percent poor or 0-percent poor. Instead, households have an estimated poverty likelihood somewhere between 0 to 100 percent. If a scorecard user sets a targeting cut-off, then that cut-off matters only for targeting, without affecting the estimation of poverty rates at all.

Although IRIS reports the PAT's targeting accuracy and although the BPAC formula considers targeting accuracy in terms of inclusion, IRIS says that the PAT should not be used for targeting.[38]

[37] The unbiasedness of the PAT also requires these assumptions.
[38] `povertytools.org/faq/faq.html#11`, retrieved 19 February 2009.

IRIS also doubts that the PAT can be useful for measuring change over time, 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 unless the tools are exceptionally accurate, then the changes identified are likely to be contained within the margin of error."[39]

In contrast, targeting and estimating changes over time are possible uses that are supported for the scorecard. In particular, this paper reports targeting accuracy so users can decide for themselves whether scoring targets adequately for their purposes.

[39] `povertytools.org/faq/faq2.html`, retrieved 7 December 2012.

10. Conclusion

The Simple Poverty Scorecard® tool can be used in Nigeria to estimate the likelihood that a given household has consumption 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 to segment clients for targeted services.

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

The scorecard is constructed with half of the completed interviews from Nigeria's 2012/13 GHPS, calibrated to 10 poverty lines, and tested on the other half of completed interviews. Bias and precision are reported for estimates of households' poverty likelihoods, groups' poverty rates at a point in time, and changes in groups' poverty rates over time. Of course, the scorecard's estimates of change are not the same as estimates of program impact. Accuracy for targeting is also reported.

When the scorecard is applied to the the validation sample, the maximum absolute difference between estimates versus true poverty rates for groups of households at a point in time is 1.8 percentage points. The average absolute bias across the 10 poverty lines is about 0.7 percentage points. Unbiased estimates may be had by subtracting the known bias for a given poverty line from the original estimates.

For $n = 16{,}384$ and 90-percent confidence, the precision of these differences is ± 0.6 percentage points or better.

If an organization wants to use the scorecard for targeting, then the results here provide useful information for selecting a cut-off that fits its 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 scorecard is kept simple, using ten indicators that are straightforward, low-cost, and verifiable. Points are all zeros or positive integers, and scores range from 0 (most likely below a poverty line) to 100 (least likely below a poverty line). Scores are converted to poverty likelihoods via simple look-up tables, and targeting cut-offs are likewise straightforward to apply. The design attempts to facilitate voluntary adoption by helping managers to understand and trust scoring and by allowing non-specialists to add up scores quickly in the field.

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

References

Adams, Niall M.; and David J. Hand. (2000) "Improving the Practice of Classifier Performance Assessment", *Neural Computation*, Vol. 12, pp. 305–311.

Baesens, Bart; Van Gestel, Tony; Viaene, Stijn; Stepanova, Maria; Suykens, Johan A. K.; and Jan Vanthienen. (2003) "Benchmarking State-of-the-Art Classification Algorithms for Credit Scoring", *Journal of the Operational Research Society*, Vol. 54, pp. 627–635.

Bollen, Kenneth A.; Glanville, Jennifer L.; and Guy Stecklov. (2007) "Socio-Economic Status, Permanent Income, and Fertility: A Latent-Variable Approach", *Population Studies*, Vol. 61, No. 1, pp. 15–34.

Caire, Dean. (2004) "Building Credit Scorecards for Small-Business Lending in Developing Markets", `microfinance.com/English/Papers/Scoring_SMEs_Hybrid.pdf`, retrieved 25 July 2015.

_____; and Mark Schreiner. (2012) "Cross-Tab Weighting for Retail and Small-Business Scorecards in Developing Markets", `business-school.ed.ac.uk/waf/schoolbiz/get_file.php?asset_file_id=2085&salt=1336725347`, retrieved 25 July 2015.

Camacho, Adriana; and Emily Conover. (2011) "Manipulation of Social-Program Eligibility", *American Economic Journal: Economic Policy*, Vol. 3, No. 2, pp. 41–65.

Carter, Michael R.; and Christopher B. Barrett. (2006) "The Economics of Poverty Traps and Persistent Poverty: An Asset-Based Approach", *Journal of Development Studies,* Vol. 42, No. 2, pp. 178–199.

Chen, Shiyuan; and Mark Schreiner. (2009) "Simple Poverty Scorecard Poverty-Assessment Tool: Vietnam", `SimplePovertyScorecard.com/VNM_2006_ENG.pdf`, retrieved 25 July 2015.

_____; Schreiner, Mark; and Gary Woller. (2008) "Simple Poverty Scorecard Poverty-Assessment Tool: Nigeria", `SimplePovertyScorecard.com/NGA_2003_ENG.pdf`, retrieved 25 July 2015.

Coady, David; Grosh, Margaret; and John Hoddinott. (2004) *Targeting of Transfers in Developing Countries*, `hdl.handle.net/10986/14902`, retrieved 13 May 2016.

Cochran, William G. (1977) *Sampling Techniques, Third Edition*, New York: Wiley.

Dawes, Robyn M. (1979) "The Robust Beauty of Improper Linear Models in Decision Making", *American Psychologist*, Vol. 34, No. 7, pp. 571–582.

Diamond, Alexis; Gill, Michael; Rebolledo Dellepiane, Miguel Angel; Skoufias, Emmanuel; Vinha, Katja; and Yiqing Xu. (2016) "Estimating Poverty Rates in Target Populations: An Assessment of the Simple Poverty Scorecard Poverty-Assessment Tool and Alternative Approaches", World Bank Policy Research Working Paper No. 7793, `hdl.handle.net/10986/25038`, retrieved 11 January 2017.

Filmer, Deon; and Lant Pritchett. (2001) "Estimating Wealth Effects without Expenditure Data—or Tears: An Application to Educational Enrollments in States of India", *Demography*, Vol. 38, No. 1, pp. 115–132.

_____; and Kinnon Scott. (2012) "Assessing Asset Indices", *Demography*, Vol. 49, pp. 359–392.

Friedman, Jerome H. (1997) "On Bias, Variance, 0–1 Loss, and the Curse-of-Dimensionality", *Data Mining and Knowledge Discovery*, Vol. 1, pp. 55–77.

Fuller, Rob. (2006) "Measuring the Poverty of Microfinance Clients in Haiti", `microfinance.com/English/Papers/Scoring_Poverty_Haiti_Fuller.pdf`, retrieved 25 July 2015.

Goodman, Leo A.; and Kruskal, William H. (1979) *Measures of Association for Cross Classification*.

Grosh, Margaret; and Judy L. Baker. (1995) "Proxy-Means Tests for Targeting Social Programs: Simulations and Speculation", World Bank LSMS Working Paper No. 118, `go.worldbank.org/W9OWN57PD0`, retrieved 25 July 2015.

Gwatkin, Davidson R.; Rutstein, Shea; Johnson, Kiersten; Suliman, Eldaw; Wagstaff, Adam; and Agbessi Amouzou. (2007) "Socio-Economic Differences in Health, Nutrition, and Population: Nigeria 1990, 2003", World Bank Country Reports on HNP, `go.worldbank.org/T6LCN5A340`, retrieved 25 July 2015.

Hand, David J. (2006) "Classifier Technology and the Illusion of Progress", *Statistical Science*, Vol. 22, No. 1, pp. 1–15.

Haslett, Stephen. (2012) "Practical Guidelines for the Design and Analysis of Sample Surveys for Small-Area Estimation", *Journal of the Indian Society of Agricultural Statistics*, Vol. 66, No. 1, pp. 203–212.

Henry, Carla; Sharma, Manohar; Lapenu, Cecile; and Manfred Zeller. (2003) "Microfinance Poverty Assessment Tool", CGAP Technical Tool No. 5, cgap.org/publications/microfinance-poverty-assessment-tool, retrieved 25 July 2015.

Hoadley, Bruce; and Robert M. Oliver. (1998) "Business Measures of Scorecard Benefit", *IMA Journal of Mathematics Applied in Business and Industry*, Vol. 9, pp. 55–64.

IRIS Center. (2011) "Poverty-Assessment Tool Accuracy Submission: USAID/IRIS Tool for Nigeria", 5 August, povertytools.org/countries/Nigeria/USAID_PAT_Nigeria.pdf, retrieved 25 July 2015.

_____. (2007a) "Manual for the Implementation of USAID Poverty Assessment Tools", povertytools.org/training_documents/Manuals/USAID_PAT_Manual_Eng.pdf, retrieved 25 July 2015.

_____. (2007b) "Introduction to Sampling for the Implementation of PATs", povertytools.org/training_documents/Sampling/Introduction_Sampling.ppt, retrieved 25 July 2015.

_____. (2005) "Notes on Assessment and Improvement of Tool Accuracy", povertytools.org/other_documents/AssessingImproving_Accuracy.pdf, retrieved 25 July 2015.

Johnson, Glenn. (2007) "Lesson 3: Two-Way Tables—Dependent Samples", https://onlinecourses.science.psu.edu/stat504/node/96, retrieved 25 July 2015.

Kolesar, Peter; and Janet L. Showers. (1985) "A Robust Credit-Screening Model Using Categorical Data", *Management Science*, Vol. 31, No. 2, pp. 124–133.

Lindelow, Magnus. (2006) "Sometimes More Equal Than Others: How Health Inequalities Depend on the Choice of Welfare Indicator", *Health Economics*, Vol. 15, pp. 263–279.

Lovie, Alexander D.; and Patricia Lovie. (1986) "The Flat-Maximum Effect and Linear Scoring Models for Prediction", *Journal of Forecasting*, Vol. 5, pp. 159–168.

Martinelli, César; and Susan W. Parker. (2007) "Deception and Misreporting in a Social Program", *Journal of the European Economic Association*, Vol. 4, No. 6, pp. 886–908.

Matul, Michal; and Sean Kline. (2003) "Scoring Change: Prizma's Approach to Assessing Poverty", Microfinance Centre for Central and Eastern Europe and the New Independent States Spotlight Note No. 4, mfc.org.pl/sites/mfc.org.pl/files/spotlight4.PDF, retrieved 25 July 2015.

McNemar, Quinn. (1947) "Note on the Sampling Error of the Difference between Correlated Proportions or Percentages", *Psychometrika*, Vol. 17, pp. 153–157.

Molini, Vasco. (2015) "Data Cleaning and Survey-to-Survey Re-estimation", STATA program.

Montgomery, Mark; Gragnolati, Michele; Burke, Kathleen A.; and Edmundo Paredes. (2000) "Measuring Living Standards with Proxy Variables", *Demography*, Vol. 37, No. 2, pp. 155–174.

Myers, James H.; and Edward W. Forgy. (1963) "The Development of Numerical Credit-Evaluation Systems", *Journal of the American Statistical Association*, Vol. 58, No. 303, pp. 779–806.

Narayan, Ambar; and Nobuo Yoshida. (2005) "Proxy-Means Tests for Targeting Welfare Benefits in Sri Lanka", Report No. SASPR–7, documents.worldbank.org/curated/en/2005/07/6209268/proxy-means-test-targeting-welfare-benefits-sri-lanka, retrieved 25 July 2015.

National Bureau of Statistics. (2010) "Nigeria: Poverty Profile, 2010", nigerianstat.gov.ng/pdfuploads/Nigeria%20Poverty%20Profile%202010.pdf, retrieved 25 July 2015.

_____. (2005) "Poverty Profile for Nigeria", catalog.ihsn.org/index.php/catalog/3322/download/48492, accessed 25 July 2015.

Onwujekwe, Obinna; Hanson, Kara; and Julia Fox-Rushby. (2006) "Some Indicators of Socio-Economic Status May Not Be Reliable and Use of Indexes with These Data Could Worsen Equity", *Health Economics*, Vol. 15, pp. 639–644.

Ravallion, Martin. (1998) "Poverty Lines in Theory and Practice", World Bank LSMS Working Paper No. 133, go.worldbank.org/8P3IBJPQS1, retrieved 25 July 2015.

Rutstein, Shea Oscar; and Kiersten Johnson. (2004) "The DHS Wealth Index", DHS Comparative Reports No. 6, measuredhs.com/pubs/pdf/CR6/CR6.pdf, retrieved 25 July 2015.

Sahn, David E.; and David Stifel. (2003) "Exploring Alternative Measures of Welfare in the Absence of Expenditure Data", *Review of Income and Wealth*, Series 49, No. 4, pp. 463–489.

_____. (2000) "Poverty Comparisons over Time and across Countries in Africa", *World Development*, Vol. 28, No. 12, pp. 2123–2155.

SAS Institute Inc. (2004) "The LOGISTIC Procedure: Rank Correlation of Observed Responses and Predicted Probabilities", in *SAS/STAT User's Guide, Version 9*, `support.sas.com/documentation/cdl/en/statug/63033/HTML/default/statug_logistic_sect035.htm`, retrieved 25 July 2015.

Schreiner, Mark. (2015a) "The Process of Poverty-Scoring Analysis", `SimplePovertyScorecard.com/Process_Poverty_Scoring_Analysis.pdf`, retrieved 26 July 2015.

_____. (2015b) "Simple Poverty Scorecard Poverty-Assessment Tool: Ghana", `SimplePovertyScorecard.com/GHA_2012_ENG.pdf`, retrieved 25 July 2015.

_____. (2015b) "Simple Poverty Scorecard Poverty-Assessment Tool: Cambodia", `SimplePovertyScorecard.com/KHM_2011_ENG.pdf`, retrieved 25 July 2015.

_____. (2014) "How Do the Simple Poverty Scorecard Poverty-Assessment Tool and the PAT Differ?", `microfinance.com/English/Papers/Scorecard_versus_PAT.pdf`, retrieved 25 July 2015.

_____. (2013a) "Simple Poverty Scorecard Poverty-Assessment Tool: Bangladesh", `SimplePovertyScorecard.com/BGD_2010_ENG.pdf`, retrieved 25 July 2015.

_____. (2013b) "Simple Poverty Scorecard Poverty-Assessment Tool: Nicaragua", `SimplePovertyScorecard.com/NIC_2009_ENG.pdf`, retrieved 25 July 2015.

_____. (2012a) "An Expert-Based Poverty Scorecard for Rural China", `microfinance.com/English/Papers/Scoring_Poverty_China_EN.pdf`, retrieved 25 July 2015.

_____. (2012b) "Simple Poverty Scorecard Poverty-Assessment Tool: Peru", `SimplePovertyScorecard.com/PER_2010_ENG.pdf`, retrieved 25 July 2015.

_____. (2011) "Simple Poverty Scorecard Poverty-Assessment Tool: Colombia", `SimplePovertyScorecard.com/COL_2009_ENG.pdf`, retrieved 25 July 2015.

_____. (2010a) "Simple Poverty Scorecard Poverty-Assessment Tool: Honduras", SimplePovertyScorecard.com/HND_2007_ENG.pdf, retrieved 25 July 2015.

_____. (2010b) "Simple Poverty Scorecard Poverty-Assessment Tool: Guatemala", SimplePovertyScorecard.com/GTM_2006_ENG.pdf, retrieved 25 July 2015.

_____. (2009a) "Simple Poverty Scorecard Poverty-Assessment Tool: Philippines", SimplePovertyScorecard.com/PHL_2004_ENG.pdf, retrieved 25 July 2015.

_____. (2009b) "Simple Poverty Scorecard Poverty-Assessment Tool: Pakistan", SimplePovertyScorecard.com/PAK_2005_ENG.pdf, retrieved 25 July 2015.

_____. (2009c) "Simple Poverty Scorecard Poverty-Assessment Tool: Bolivia", SimplePovertyScorecard.com/BOL_2007_ENG.pdf, retrieved 25 July 2015.

_____. (2009d) "Simple Poverty Scorecard Poverty-Assessment Tool: Mexico", SimplePovertyScorecard.com/MEX_2008_ENG.pdf, retrieved 25 July 2015.

_____. (2009e) "Simple Poverty Scorecard Poverty-Assessment Tool: Peru", SimplePovertyScorecard.com/PER_2007_ENG.pdf, retrieved 25 July 2015.

_____. (2008a) "Simple Poverty Scorecard Poverty-Assessment Tool: Peru", SimplePovertyScorecard.com/PER_2003_ENG.pdf, retrieved 25 July 2015.

_____. (2008b) "Simple Poverty Scorecard Poverty-Assessment Tool: India", SimplePovertyScorecard.com/IND_2005_ENG.pdf, retrieved 25 July 2015.

_____. (2006) "Is One Simple Poverty Scorecard Poverty-Assessment Tool Enough for India?", microfinance.com/English/Papers/Scoring_Poverty_India_Segments.pdf, retrieved 25 July 2015.

_____. (2005a) "Herramienta Índice de Calificación de la Pobreza™: México", SimplePovertyScorecard.com/MEX_2002_SPA.pdf, retrieved 25 July 2015.

_____. (2005b) "IRIS Questions on the Simple Poverty Scorecard Poverty-Assessment Tool", microfinance.com/English/Papers/Scoring_Poverty_Response_to_IRIS.pdf, retrieved 25 July 2015.

_____. (2002) *Scoring: The Next Breakthrough in Microfinance?* CGAP Occasional Paper No. 7, microfinance.com/English/Papers/Scoring_Breakthrough_CGAP.pdf, retrieved 13 May 2016.

_____; Matul, Michal; Pawlak, Ewa; and Sean Kline. (2014) "Poverty Scoring: Lessons from a Microlender in Bosnia-Herzegovina", *Poverty and Public Policy*, Vol. 6, No. 4, pp. 407–428.

_____; and Michael Sherraden. (2006) *Can the Poor Save? Saving and Asset Accumulation in Individual Development Accounts.*

_____; and Gary Woller. (2010) "Simple Poverty Scorecard Poverty-Assessment Tool: Guatemala", `SimplePovertyScorecard.com/GTM_2006_ENG.pdf`, retrieved 25 July 2015.

Sharif, Iffath Anwar. (2009) "Building a Targeting System for Bangladesh Based on Proxy-Means Testing", World Bank Social Protection Discussion Paper No. 0914, `siteresources.worldbank.org/SOCIALPROTECTION/Resources/SP-Discussion-papers/Safety-Nets-DP/0914.pdf`, retrieved 25 July 2015.

Sherraden, Michael. (1991) *Assets and the Poor: A New American Welfare Policy.*

Sillers, Don. (2006) "National and International Poverty Lines: An Overview", `pdf.usaid.gov/pdf_docs/Pnadh069.pdf`, retrieved 25 July 2015.

Stifel, David; and Luc Christiaensen. (2007) "Tracking Poverty over Time in the Absence of Comparable Consumption Data", *World Bank Economic Review*, Vol. 21, No. 2, pp. 317–341.

Stillwell, William G.; Barron, F. Hutton; and Ward Edwards. (1983) "Evaluating Credit Applications: A Validation of Multi-Attribute Utility-Weight Elicitation Techniques", *Organizational Behavior and Human Performance*, Vol. 32, pp. 87–108.

Tarozzi, Alessandro; and Angus Deaton. (2009) "Using Census and Survey Data to Estimate Poverty and Inequality for Small Areas", *Review of Economics and Statistics*, Vol. 91, No. 4, pp. 773–792.

Toohig, Jeff. (2008) "PPI: Training Guide", `microfinancegateway.org/sites/default/files/mfg-en-paper-progress-out-of-poverty-index-ppi-pilot-training-mar-2008.pdf`, retrieved 25 July 2015.

USAID. (2014) *Microenterprise Results Reporting: Annual Report to Congress, Fiscal Year 2013*, `eads.usaid.gov/mrr/publications/ar2013.pdf`, retrieved 25 July 2015.

United States Congress. (2004) "Microenterprise Results and Accountability Act of 2004 (HR 3818 RDS)", November 20, smith4nj.com/laws/108-484.pdf, retrieved 25 July 2015.

Wagstaff, Adam; and Naoko Watanabe. (2003) "What Difference Does the Choice of SES Make in Health-Inequality Measurement?", *Health Economics*, Vol. 12, No. 10, pp. 885–890.

Wainer, Howard. (1976) "Estimating Coefficients in Linear Models: It Don't Make No Nevermind", *Psychological Bulletin*, Vol. 83, pp. 223–227.

Wakili, Isiaka. (2015) "Nigeria: Jonathan Puts Nigeria's Poverty Rate at 33.1 Percent", 23 March, allafrica.com/stories/201503240151.html, retrieved 25 July 2015.

World Bank. (2014) "Nigeria Economic Report", documents.worldbank.org/curated/en/2014/07/19883231/nigeria-economic-report-no-2, retrieved 25 July 2015.

_____. (2013) "Where has all the growth gone? A poverty update for Nigeria", Report No. 78908, documents.worldbank.org/curated/en/2013/08/19873872/all-growth-gone-poverty-update-nigeria-policy-note, retrieved 25 July 2015.

_____. (2012) *Targeting Poor and Vulnerable Households in Indonesia*, documents.worldbank.org/curated/en/2012/01/15879773/targeting-poor-vulnerable-households-indonesia, retrieved 25 July 2015.

_____. (2008) "International Comparison Project: Tables of Results", siteresources.worldbank.org/ICPINT/Resources/icp-final-tables.pdf, retrieved 25 July 2014.

Zeller, Manfred. (2004) "Review of Poverty Assessment Tools", pdf.usaid.gov/pdf_docs/PNADH120.pdf, retrieved 25 July 2015.

_____; Sharma, Manohar; Henry, Carla; and Cécile Lapenu. (2006) "An Operational Method for Assessing the Poverty-Outreach Performance of Development Policies and Projects: Results of Case Studies in Africa, Asia, and Latin America", *World Development*, Vol. 34, No. 3, pp. 446–464.

Guidelines for the Interpretation of Scorecard Indicators

The following comes from documents by Nigeria's National Bureau of Statistics (2012 or 2013, Abuja, `go.worldbank.org/GEW72B4QO0`, retrieved 12 June 2015):

"Interviewer Instruction Manual, General Household Panel Survey, Post-Planting (2nd Wave, 2012/13)" (the "*Post-Planting Manual*")

"Interviewer Instruction Manual, General Household Panel Survey, Post-Harvest (2nd Wave, 2012/13)" (the "*Post-Harvest Manual*")

"General Household Panel Survey, Wave 1 (2012/13) Post-Planting Visit: Household Questionnaire" (the "*Post-Planting Questionnaire*")

"General Household Panel Survey, Wave 2 (2012/13) Post-Harvest Visit: Household Questionnaire" (the "*Post-Harvest Questionnaire*")

When an issue arises that is not addressed here, its resolution should be left to the unaided judgment of the enumerator, as that apparently was the practice in the 2012/13 GHPS. That is, an organization using the scorecard should not promulgate any definitions or rules (other than those in these "Guidelines") to be used by all its field agents. Anything not explicitly addressed in these "Guidelines" is to be left to the unaided judgment of the individual enumerator.

General Guidelines

Fill out the scorecard header and the "Back-page Worksheet" first, following the directions on the "Back-page Worksheet". In particular, do not ask the first scorecard indicator directly. Instead, use the information recorded on the "Back-page Worksheet" to determine the proper response for the first indicator.

Do not read the response options to the respondent. Unless instructed otherwise here, read the question, and then stop; wait for a response. If the respondent asks for clarification or otherwise hesitates or seems confused, then read the question again or provide additional assistance based on these "Guidelines" or as you, the enumerator, deem appropriate.

In general, you should accept the responses given by the respondent. Nevertheless, if the respondent says something—or if you see or sense something—that suggests that the response may not be accurate, that the respondent is uncertain about his/her response, or that the respondent desires assistance in figuring out how to respond, then you should read the question again and provide whatever assistance you deem appropriate based on these "Guidelines".

While most indicators in the scorecard are verifiable, you do not—in general—need to verify responses unless something suggests to you that the response may not be accurate and thus that verification might improve data quality. For example, you might choose to verify if the respondent hesitates, seems nervous, or otherwise gives signals that he/she may be lying or be confused. Likewise, verification is probably appropriate if a child in the household or neighbor says something that does not square with the respondent's answer. Verification is also a good idea if you can see something yourself—such as a consumer durable that the respondent avers not to have, or a child eating in the room who has not been counted as a member of the household—that suggests that the response may not be accurate.

In general, the application of the scorecard should mimic as closely as possible the application of the 2012/13 GHPS. For example, the poverty-scoring interview should take place in the respondent's homestead because the 2012/13 GHPS took place in respondents' homesteads.

The 2012/13 GHPS left to each individual enumerator (or to local translators) to translate the survey instrument on the fly when needed to languages other than English. While the application of the scorecard should, in general, mimic the application of the 2012/13 GHPS, it makes sense to have a standard, well-done, cross-checked translation of the scorecard to languages and dialects that are common in Nigeria. Without a standard translation, the variation in translations and interpretations across enumerators could greatly harm data quality. Any translation should reflect the meaning in the original English GHPS survey instrument as closely as possible. Ideally, all organizations using the scorecard in a given language or dialect would coordinate and use a single translation.

How to do the interview

Introducing yourself and the survey:

According to pp. 18–19 and 27 of the *Post-Planting Manual*, "The moment when the interviewer and respondent meet for the first time is crucial for interview success. Thus, first impressions are important, as is the interviewer's appearance. Also, his/her attitude at the very beginning and what he/she says is crucial for further work. Interviewers should be properly and professionally dressed for their work.

"Once a selected household are located, the interviewer should ask to talk to the head of the household or his/her spouse. He/she should kindly and in a friendly manner greet the person and introduce him/herself. Then the interviewer should explain briefly and concisely the purpose of the survey [to get to know better how participants of your organization live], the importance of the project, and the need for cooperation.

"An example of how the interviewer could introduce him/herself, is:

Good morning/afternoon, I work for [your organization], which is implementing [a survey to understand better how its participants live]. Your cooperation and answers are be extremely important. . . . I would appreciate it if you and your household members participated. . . .

"It is important that the interviewer have a friendly attitude towards the respondent and self-confidence. If the interviewer gives the impression of nervousness or insecurity, then he/she would not inspire enough confidence to the respondent in order to obtain the necessary cooperation, participation, and attention.

"The interviewer should always try to maintain the same mood throughout the interview: if the respondent for any reason gets tired or disturbed, allow a few minutes break or offer to return the following day or at the next convenient time."

Confidentiality:

According to p. 19 of the *Post-Planting Manual*, "After the interviewer introduces him/herself . . ., the interviewer must explain the purpose of the survey [to learn more about how the participants with your organization live] and emphasize that collected data are confidential. This crucial to avoid any fear of misuse of the answers given. All data will be used for statistical purposes, and data which identify in any way any person or any household will not be divulged."

Have rhythm:

According to p. 19 of the *Post-Planting Manual*, "The rhythm of the survey, tone of questions, adequate speed in question formulation, dynamics of the interview itself, and knowledge about the questions and their order are all factors that determine the success of the interview. If the interviewer reads questions with a monotonous or nervous voice, or without any rhythm, the obtained information is likely to be of poor quality, and the respondent will not be interested in answering."

Be friendly and open:
According to p. 19 of the *Post-Planting Manual*, "The interviewer should not give the impression that he/she considers him/herself to be an important person because of the assignment he/she performs. . . . He/she should be open, friendly, and decisive, showing that he/she is an experienced, professional person. He/she should not be authoritative or aggressive. The best communication is established when the respondent sees that the interviewer is honest and up to his/her task."

How to read the questions:
According to pp. 17 and 25 of the *Post-Planting Manual*, "Each question should be read clearly and exactly as presented in the questionnaire. You should make sure that the way the question is read preserves the sense of the English question, rather than being a word-by-word translation. If you have questions about how to phrase a question, you should ask your supervisor.

"After reading the question, time should be allowed for the respondent to answer. If it appears that the respondent did not hear the question, then it should be read again and time allowed for a response. In cases where there has to be translation, the question should be translated as literally as possible."

Sensitivity to cultural differences:
According to pp. 18 and 26 of the *Post-Planting Manual*, "Keep in mind that the households to be interviewed could have different cultural backgrounds and different reactions, attitudes, and behaviors in terms of the survey. The interviewer will have to interact with households of different structures, different social and economic statuses, and different levels of education, employment statuses, habits, religions, etc. This means that the interviewer will have to develop significant capability of understanding and communication in order to be able to establish good relations with different persons, and in that way achieve success in difficult situations which he/she could face during the survey.

"Besides the above, the interviewer must inspire confidence with the respondent, enabling him/her to get reliable and positive survey results."

Additional advice:
According to pp. 19–20 of the *Post-Planting Manual*, enumerators should always:

- "Plan sufficient time for the interview
- Behave appropriately throughout the interview
- Do not give any information about which you are not sure; it is better to seem uninformed, but honest
- Avoid any conversation or attitude which could lead to a discussion or argument with the respondent
- Limit the conversation to the survey topics only
- Give neither promises nor offer anything as an incentive for the respondent to participate in the survey
- To the extent possible, try to avoid doing the interview in the presence of a person who is not a household member; the respondent could give different answers in the presence of another person
- Do not show surprise to any answer given by the respondent, either by the tone of your voice or your actions
- Comply strictly with the order and format in asking questions from the questionnaire. In other words, comply strictly with instructions given [including this one]. Any modification could jeopardize the integrity of the information
- Read questions without applying any pressure on the respondent in any way. Never say something like: 'You worked last week, right?' Never assume that you know the answer in advance
- In terms of the rhythm of the interview, keep in mind that the interview consists of questions, answers, moments of silence, and breaks. When you read questions, try to keep the same rhythm all the time. Give the respondent time to think about the answer. The interviewer must assess the level of the respondent's understanding: question-reading speed depends on this. Besides, the interviewer must pronounce every single word he/she reads clearly
- Read questions literally as they are written in the questionnaire (without any modification). In the case that the respondent does not understand, read the question again. If the respondent does not understand after the second reading, then explain carefully to him/her the purpose of the question, taking care not to amend in any way the original meaning of the question and without influencing the answer
- Allow the respondent enough time to answer the question. Try to ensure that the respondent does not amend the meaning of the question. Do it in a friendly way; experience will show the best ways to achieve this
- To complete the interview, express thanks for the information received: be kind
- Do not offer copies of the questionnaire, nor any other material, nor anything else that you are not authorized to distribute
- When leaving the household, thank all the respondents for their cooperation in the survey, the time they spent, and the effort they invested"

The respondent

According to p. 40 of the *Post-Planting Manual*, the respondent "should preferably be the head of the household. If the head is absent, then a responsible and knowledgeable adult—preferably the spouse of the household head—should be interviewed. This person should be a member of the household and must be capable of providing all the necessary information on each household member. The interviewer may have to ask a few questions to be able to identify a suitable respondent. Note that other members of the household can help by adding information or details in the questions concerning themselves."

Note that the respondent does not need to be a participant with your organization.

Guidelines for the interpretation of specific indicators

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

The documentation for the 2012/13 GHPS has a number of slightly different definitions of *household* and *household member*. Some are incomplete, so the more-complete ones are preferred. Also, some contradict each other, in which case those that follow international common practice are preferred.

These "Guidelines" first present a clear, consolidated definition. After that, it quotes the excerpts from the GHPS documentation from which the consolidated definition is derived.

A *household* is one or more people—regardless of blood or marital ties—who normally live in the same residence, eat together, and recognize the same head.

To count as a *household member*, a person must have normally lived and eaten with the household for at least six of the 12 months preceeding the interview, regardless of whether the person happens to be present or absent on the day of the interview.

In some cases, a person is counted as a *household member* even if he/she has not normally lived and eaten with the household for six of the previous 12 months. These exceptions include:

- The person identified by the household members as the head
- New-born children of a household member
- Newly-wed spouses
- Students (such as those at a boarding school) supported by the household
- Seasonal migrant workers who are not members of other households
- Guests who have stayed and ate for free with the household for at least six months
- Domestic servants or workers (and their families) who do not have another residence to return to and who receive at least part of their pay in-kind as lodging and food

People who are not counted as *household members* include:

- Tenants (those who pay the household for lodging or food)
- Visitors who have another residence to return to

The preceeding consolidated definition is derived from the following excerpts from the GHPS documentation.

According to p. 20 of the *Post-Planting Manual*, a *household* is a "social unit of one or more persons who use joint accommodation and food. In other words, a *household* is a group of persons who normally live in the same household unit ('live under the same roof'), who are or are not related, and who eat together ('eat from the same pot')."

According to p. 38 of the *Post-Harvest Manual*, a *household* is "a person or group of people who usually sleep in the same dwelling and with a recognized head and who share a common eating arrangement for more than six months preceding the interview."

According to p. 5 of the *Post-Planting Questionnaire* and pp. 40–41 of the *Post-Planting Manual*, a *household* is "a group of people who have usually slept in the same dwelling and share their meals together. Examples of households are:

- A man and his wife/wives and children, father/mother, nephew, and other relatives
- A single person
- A couple (or several couples) with or without children

"All persons who have been away from the household for more than six months are not considered to be *household members* except:

- The person identified as the head of the household, even if he/she has not been with the household for more than six months out of the last 12
- New-born (or new-adopted) children
- Students or seasonal workers who have not been living in or as part of another household
- New spouses"

According to p. 21 of the *Post-Planting Manual*, a *household member* is "anybody who meets the following criteria:

- Present at the moment of interview, if that is the place where he/she spent at least six months of the previous 12 months
- The household head should be listed as a member even if he/she did not spend six of the previous 12 months in the household
- Persons absent at the moment of interview, if he/she is absent less than six months during the previous 12 months
- Guests or other persons who live in the household longer than six months during the previous 12 months. (A *guest* is a person who uses joint accommodation and food free-of-charge together with household members)
- Newborn babies irrespectively of duration of their stay in the household as well as the head of the household
- Students who are absent longer than six months but who are supported by household members

The following are not considered to be *household members*:

- "Persons absent from the household longer than six months (including ones serving military service, in prison, religious service, etc.)
- Those who live elsewhere, or visitors or tourists who are in the household less than six months
- Tenants who eat and who do not eat with the household. (A *tenant* is a person who pays for accommodation in a part of a household. This person is not a member of the household whether they eat on their own or prepare food separately. A tenant is considered as a separate household)
- Those who eat in the household but live elsewhere, or those who live in the household but eat elsewhere
- Similar to tenants, students who pay the household for accommodation and food"

According to p. 25 of the *Post-Planting Manual*, "The process of listing household members should be done carefully to ensure that no one is missed. All persons who usually eat and sleep in the dwelling are considered to be *household members*. To ensure complete coverage, the interviewer should explicitly ask about three types of persons which are commonly overlooked by survey respondents. The first is persons who are temporarily absent; they should be included. The second are servants. Finally, the interviewer should ask whether there are any infants or small children who have not been listed, as very young children are often overlooked in accounting for household members. . . . Children at boarding school are to be included."

2. How many separate rooms do the members of the household occupy (do not count bathrooms, toilets, storerooms, or garage)?
    A. One
    B. Two
    C. Three
    D. Four
    E. Five or more

According to p. 73 in the *Post-Harvest Manual*, "This does not include bathrooms, toilets, storerooms, or garages."

3. The roof of the main dwelling is predominantly made of what material?
    A. Grass, clay tiles, asbestos or plastic sheets, or others
    B. Concrete, zinc, or iron sheets

According to p. 73 of the *Post-Harvest Manual*, "The interviewer will record the main/predominant roofing material.

- *Grass* includes thatch or any form of natural vegetation for roofing
- *Clay tiles* are a type of roofing using wood/bamboo covered with blocks
- *Asbestos sheets/tiles* are made from cement and other materials. When made into solid sheets, they become good protection or insulation against fire and heat. They are also used for industrial purposes as protection against perishable things
- *Plastic sheeting* is a type of modern-day roofing that is transparent
- *Other* includes cardboard etc.
- *Concrete* roofing is done with cement and stone
- *Iron sheets* are processed or galvanized iron or steel sheets or aluminium sheets

"If there is more than one type of material used for roofing, then the interviewer will record the main or predominant one."

4. What kind of toilet facility does the household use?
    A. None, bush, pail/bucket, or other
    B. Uncovered pit latrine, or V.I.P. latrine
    C. Covered pit latrine, or toilet on water
    D. Flush to septic tank, or flush to sewage

According to pp. 75–76 of the *Post-Harvest Manual*, "Record the main one.

- *Pail/bucket*: This is a bucket in a residential area and is emptied or drained by pouring water to flush out contents or by disposing the contents somewhere else
- *Ventilated Improved Pit (V.I.P.) latrine*: The primary features of VIP latrines consist of an enclosed structure (roof and walls) with a large diameter (110mm) PVC vertical ventilation pipe running outside the structure from the pit of the latrine to vent above the roof. They often will have concrete slabs containing the latrine hole
- A *flush toilet* or water closet (WC) is a toilet that disposes of human waste by using water to flush it through a drainpipe to another location. It uses a cistern or holding tank for flushing water. The concept is *flushing* and other forms are:
    — A *sewer system* is an artificial conduit (or pipe) or system of conduits used to remove sewage (human liquid waste) and to provide drainage
    — A *septic tank* is a single-story, water-tight system for domestic sewage, consisting of one or more compartments in which sanitary flow is detained. Septic tanks have limited use in urban areas where there are sewers and municipal treatment plants

"If the respondent answers that they use the bush, the fields, or a cleared corner of the compound, then record 'None'."

5. Does the household own a gas cooker, stove (electric, gas table, or kerosene), or microwave?
    A. No
    B. Yes

According to p. 60 of the *Post-Planting Questionnaire*, "a *gas cooker* is a combination stove that has both burners and an oven, that is, a range with gas rings/burners which can have 4 or 6 burners and an oven for cooking/baking with gas. It is also known as a 'gas range' or 'gas stove'.

"A *gas table stove* is a stove that has only burners. It is a table-top kind of stove and has no oven."

According to p. 58 of the *Post-Planting Questionnaire*, a gas cooker, stove (electric, gas table, or kerosene), or microwave counts for the purposes of this question only if it is "owned by a member of the household and is in good working condition."

6. How many mattresses does the household own?
    A. None
    B. One
    C. Two
    D. Three or more

According to p. 58 of the *Post-Planting Questionnaire*, a mattress counts for the purposes of this question only if it is "owned by a member of the household and is in good working condition."

7. Does the household own a TV set?
    A. No
    B. Yes

According to p. 58 of the *Post-Planting Questionnaire*, a TV set counts for the purposes of this question only if it is "owned by a member of the household and is in good working condition."

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

According to p. 58 of the *Post-Planting Questionnaire*, a mobile phone counts for the purposes of this question only if it is "owned by a member of the household and is in good working condition."

9. Does the household own a motorbike or a car or other vehicle?
    A. No
    B. Only motorbike
    C. Car (regardless of motorbike)

According to p. 58 of the *Post-Planting Questionnaire*, a motorbike, car, or other vehicle counts for the purposes of this question only if it is "owned by a member of the household and is in good working condition."

A bicycle does not count as an "other vehicle".

The response marked depends on the responses to the two embedded questions:

Owns motorbike?	**Owns car or other vehicle?**	**Response**
No	No	A
Yes	No	B
No	Yes	C
Yes	Yes	C

10. Does any member of this household practice any agricultural activity such as crop, livestock, or fish farming, or own land that is not cultivated? If so, does the household own any sprayers, wheelbarrows, or sickles?
    A. Farms or has uncultivated land, but no sprayers, wheelbarrows, or sickles
    B. Farms or has uncultivated land, and has sprayers, wheelbarrows, or sickles
    C. Does not farm nor has uncultivated land

This question has two parts. The first asks whether the household practices agriculture, or whether the household owns agricultural land that is not cultivated. If the household is agricultural or if the household owns agricultural land, then the second part asks whether the household owns any sprayers, wheelbarrows, or sickles.

According to p. 108 of the *Post-Harvest Manual*, a sprayer, wheelbarrow, or sickle counts for the purposes of this question only if it is "in good working condition."

The response marked depends on the responses to the three embedded questions:

Practices ag.?	**Owns ag. land?**	**Owns sprayer/wheelbarrow/sickle?**	**Resp.**
No	No	N/A	C
No	Yes	No	A
No	Yes	Yes	B
Yes	No	No	A
Yes	No	Yes	B
Yes	Yes	No	A
Yes	Yes	Yes	B

According to pp. 40 and 70 of the *Post-Planting Manual*, *agriculture* is "the system of cultivating soil for production of crops, horticulture, livestock/poultry, fishing, forestry and in varying degrees."

Figure 1: Sample sizes, poverty lines, and poverty rates (for households and people) for all of Nigeria and for the construction and validation sub-samples

				Poverty rates (% with consumption less than a poverty line) and poverty lines (NGN per person per day)											
				National				Poorest 1/2	2005 PPP					2011 PPP	
Sample	**Line or rate**	**Level**	***n***	**Food**	**100%**	**150%**	**200%**	**< 100% natl.**	**$1.25**	**$2.00**	**$2.50**	**$4.00**	**$5.00**	**$1.90**	**$3.10**
All Nigeria	Line	People	9,122	144	226	339	452	163	215	344	430	688	859	183	299
	Rate	HHs		9.0	25.6	50.1	66.3	12.5	22.9	50.7	63.5	85.2	90.9	16.7	41.3
		People		12.5	32.9	59.7	75.3	16.5	29.6	60.4	72.7	90.7	94.8	22.0	50.5
Construction and calibration: Selecting indicators and points, and associating scores with likelihoods															
	Rate	HHs	4,528	9.0	25.7	50.1	66.3	12.6	22.9	50.7	63.5	85.3	90.9	16.7	41.5
Validation: Measuring accuracy															
	Rate	HHs	4,594	9.0	25.6	50.0	66.4	12.4	22.8	50.8	63.4	85.1	90.9	16.6	41.1

Source: 2012/13 General Household Panel Survey.

Poverty lines are NGN/person/day in prices on average in all of Nigeria in the first quarter of 2013.

Figure 2: Sample sizes, poverty lines, and poverty rates (for households and people) for Nigeria as a whole and by geographic zone (that is, poverty-line region)

Zone	Line or rate for households or people	n	Poverty lines (NGN/day/person) and poverty rates (%)											
			National				Poorest 1/2	2005 PPP					2011 PPP	
			Food	100%	150%	200%	< 100% natl.	$1.25	$2.00	$2.50	$4.00	$5.00	$1.90	$3.10
Nigeria	Line	9,122	144	226	339	452	163	215	344	430	688	859	183	299
	Rate (HHs)		9.0	25.6	50.1	66.3	12.5	22.9	50.7	63.5	85.2	90.9	16.7	41.3
	Rate (people)		12.5	32.9	59.7	75.3	16.5	29.6	60.4	72.7	90.7	94.8	22.0	50.5
North Central	Line	1,547	139	218	328	437	151	207	332	415	664	830	177	288
	Rate (HHs)		10.3	26.3	52.6	70.7	13.0	23.7	53.3	67.3	88.0	94.0	17.6	43.7
	Rate (people)		12.9	31.9	60.2	78.5	15.9	28.8	60.8	75.3	92.3	96.7	21.3	50.6
North East	Line	1,471	136	214	321	428	141	203	325	406	650	813	173	282
	Rate (HHs)		20.0	44.6	70.3	82.8	21.9	40.4	71.1	81.4	93.3	95.7	30.7	63.1
	Rate (people)		23.3	50.6	77.2	88.9	25.3	46.2	78.0	87.7	96.8	98.4	35.5	69.6
North West	Line	1,728	134	212	318	423	151	201	322	402	644	804	171	279
	Rate (HHs)		14.8	41.9	70.3	83.9	20.1	37.5	71.1	81.4	95.4	97.1	27.5	62.3
	Rate (people)		17.3	46.3	74.4	85.8	23.1	41.8	75.1	83.8	96.2	97.5	31.2	66.9
South East	Line	1,502	158	249	374	499	182	237	379	474	758	948	202	329
	Rate (HHs)		2.1	10.7	28.7	45.4	3.8	9.4	29.3	42.4	68.0	79.1	5.5	20.8
	Rate (people)		3.0	13.7	35.4	55.2	4.6	11.8	36.0	51.7	75.6	85.2	6.9	25.2
South South	Line	1,453	158	249	374	499	182	237	379	474	758	948	202	329
	Rate (HHs)		5.9	18.8	39.8	55.1	9.3	16.8	40.3	52.7	76.9	84.8	11.7	30.8
	Rate (people)		7.8	23.6	47.9	64.2	11.8	21.1	48.4	61.5	83.1	90.0	14.9	37.3
South West	Line	1,421	155	243	365	487	191	231	370	462	740	925	197	321
	Rate (HHs)		2.8	12.4	36.6	55.8	6.4	10.3	37.1	52.0	80.8	88.1	7.1	26.2
	Rate (people)		3.1	14.4	42.9	63.3	7.3	11.9	43.8	59.5	87.1	92.7	8.3	30.8

Poverty lines are NGN/person/day in prices on average in all of Nigeria in the first quarter of 2013.

Figure 3: Poverty indicators, ordered by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
1,358	Does your household own a TV set and a DVD player or a satellite dish? (None; Only TV; DVD or dish (regardless of TV))
1,277	Does your household own a fan? (No; Yes)
1,261	Does your household own a TV set? (No; Yes)
1,124	Does your household own a DVD player or a satellite dish? (No; Yes)
1,087	The outer walls of the main dwelling of the household are predominantly made of what material? (Grass, or stone; Mud; Mud brick (unfired); Compacted earth, burnt bricks, wood, or iron sheets; Concrete, or concrete and cement blocks)
1,074	What kind of toilet facility does the household use? (None, bush, pail/bucket, or other; Uncovered pit latrine, or V.I.P. latrine; Covered pit latrine, or toilet on water; Flush to septic tank, or flush to sewage)
1,074	Does the household own a gas cooker, stove (electric, gas table, or kerosene), or microwave? (No; Yes)
1,010	What is your main source of lighting fuel? (Battery/dry cell (torch), other; Collected firewood, candles, or grass; Kerosene, lamp, lantern, purchased firewood, or charcoal; Generator, rural electricity, turbine, or gas; PHCN electricity)
997	Do you have electricity working in your dwelling? (No; Yes)
953	How many household member are 18-years-old or younger? (Seven or more; Six; Five; Four; Three; Two; One; None)
949	How many household member are 17-years-old or younger? (Six or more; Five; Four; Three; Two; One; None)
935	How many household member are 16-years-old or younger? (Six or more; Five; Four; Three; Two; One; None)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
934	What is the highest educational level that the female head/spouse completed? (Quaranic, integrated Quaranic, or adult education; None; N1, N2, or P1 to P4; P5, or P6; JS1 to JS3, or SS1 to SS3; No female head/spouse; Lower 6, or higher)
934	How many household member are 15-years-old or younger? (Six or more; Five; Four; Three; Two; One; None)
888	How many household member are 14-years-old or younger? (Six or more; Five; Four; Three; Two; One; None)
887	What is the highest educational level that the male head/spouse completed? (Quaranic, integrated quaranic, or adult education; None; N1, N2, or P1 to P4; P5, or P6; No male head/spouse; JS1 to JS3, or SS1 to SS3; Lower 6, or higher)
883	How many household member are 13-years-old or younger? (Five or more; Four; Three; Two; One; None)
882	Does any member of this household practice an agricultural activity such as crop, livestock, or fish farming, or does a member of this household own land that was not cultivated? If so, does your household own now any cows, bulls, oxen, heifers, steers, female calves, or male calves (present at your farm or away)? (Farms or has uncultivated land, but no cattle; Farms or has uncultivated land, and has cattle; Does not farm nor has uncultivated land)
853	Does any member of this household practice an agricultural activity such as crop, livestock, or fish farming, or does a member of this household own land that was not cultivated? If so, does your household own now any wheelbarrows? (Farms or has uncultivated land, but no wheelbarrows; Farms or has uncultivated land, and has wheelbarrows; Does not farm nor has uncultivated land)
844	How many household member are 12-years-old or younger? (Five or more; Four; Three; Two; One; None)
813	The floor of the main dwelling is predominantly made of what material? (Sand/dirt/straw, smoothed mud, or smooth cement; Wood, tile, or other)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
810	How many household member are 11-years-old or younger? (Five or more; Four; Three; Two; One; None)
808	Does any member of this household do any agricultural activity such as crop, livestock, or fish farming, or does a member of this household own land that was not cultivated? If so, does your household own now any goats, sheep, cows, bulls, oxen, heifers, steers, female calves, male calves, donkeys, horses, or pigs (present at your farm or away)? (Agricultural activity or uncultivated land, and has large livestock; Agricultural activity or uncultivated land, but no large livestock; No agricultural activity and no uncultivated land)
808	Does your household own a fridge or freezer? (No; Yes)
807	Are all household members ages 6 to 15 presently in school? (No; Yes; No members ages 6 to 15)
802	Are all household members ages 6 to 16 presently in school? (No; Yes; No members ages 6 to 16)
801	Does any member of this household practice an agricultural activity such as crop, livestock, or fish farming, or does a member of this household own land that was not cultivated? If so, does your household own now any hoes? (Farms or has uncultivated land, but no hoes; Farms or has uncultivated land, and has hoes; Does not farm nor has uncultivated land)
800	Are all household members ages 6 to 13 presently in school? (No; Yes; No members ages 6 to 13)
794	Does your household own an iron? (No; Yes)
790	Does any member of this household practice an agricultural activity such as crop, livestock, or fish farming, or does a member of this household own land that was not cultivated? If so, does your household own now any goats or sheep (present at your farm or away)? (Farms or has uncultivated land, but no goats or sheep; Farms or has uncultivated land, and has goats or sheep; Does not farm nor has uncultivated land)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
784	Does any member of this household practice any agricultural activity such as crop, livestock, or fish farming, or own land that is not cultivated? If so, does the household own any sprayers, wheelbarrows, or sickles? (Farms or has uncultivated land, but no sprayers, wheelbarrows, or sickles; Farms or has uncultivated land, and has sprayers, wheelbarrows, or sickles; Does not farm nor has uncultivated land)
775	How many members does the household have? (Ten or more; Eight or nine; Seven; Six; Five; Four; Three; One or two)
771	Are all household members ages 6 to 14 presently in school? (No; Yes; No members ages 6 to 14)
768	Are all household members ages 6 to 12 presently in school? (No; Yes; No members ages 6 to 12)
767	Does any member of this household practice an agricultural activity such as crop, livestock, or fish farming, or does a member of this household own land that was not cultivated? If so, does your household own now any cutlasses? (Farms or has uncultivated land, but no cutlasses; Farms or has uncultivated land, and has cutlasses; Does not farm nor has uncultivated land)
763	Are all household members ages 6 to 11 presently in school? (No; Yes; No members ages 6 to 11)
761	Are all household members ages 6 to 17 presently in school? (No; Yes; No members ages 6 to 17)
752	Does any member of this household practice an agricultural activity such as crop, livestock, or fish farming, or does a member of this household own land that was not cultivated? If so, does your household own now any sprayers? (Farms or has uncultivated land, but no sprayers; Farms or has uncultivated land, and has sprayers; Does not farm nor has uncultivated land)
748	In their main job (main occupation in the last 7 days or most recent job), how many household members had their main activity in the sector of agriculture? (Three or more; Two; One; None)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
748	Does any member of this household practice an agricultural activity such as crop, livestock, or fish farming, or does a member of this household own land that was not cultivated? If so, does your household own now any sickles? (Farms or has uncultivated land, but no sickles; Farms or has uncultivated land, and has sickles; Does not farm nor has uncultivated land)
716	In their main job (main occupation in the last 7 days or most recent job), how many household members in their primary activity were skilled agricultural, forestry, and fishery workers? (Three or more; Two; One; None)
696	During the past 7 days, how many household members worked on a farm owned or rented by a member of the household, either in cultivating crops or in other farming tasks, or have you cared for livestock belonging to yourself or a member of your household? (Three or more; Two; One; None)
695	Does your household own a generator? (No; Yes)
683	In what sector is the main activity of the male head/spouse (main occupation in the last 7 days or most recent job)? (Does not work; No male head/spouse; Agriculture, or mining; Other)
678	In their main job (main occupation in the last 7 days or most recent job), how many household members in their primary activity were skilled agricultural, forestry, and fishery workers or in elementary occupations? (Three or more; Two; One; None)
678	Does your household own furniture (chairs, tables, or 3/4 piece sofa set)? (No; Yes)
676	How many mobile phones does the household own? (None; One; Two; Three or more)
675	Are all household members ages 6 to 18 presently in school? (No; Yes; No members ages 6 to 18)
661	What is your main source of cooking fuel? (Collected firewood, or grass; Purchased firewood, kerosene, PHCN electricity, generator, gas, coal, or other)
588	How many household member are 6-years-old or younger? (Three or more; Two; One; None)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
585	What was the primary activity of the male head/spouse in his main job (main occupation in the last 7 days or most recent job)? (Skilled agricultural, forestry, and fishery workers; Does not work; Elementary occupations; No male head/spouse; Other)
540	What was the primary activity of the female head/spouse in her main job (main occupation in the last 7 days or most recent job)? (Skilled agricultural, forestry, and fishery workers; Does not work; Elementary occupations; Craft and related trades workers, plant and machine operators and assemblers, or armed forces; No female head/spouse; Professionals and teachers, technicians and associate professionals, clerks; sales and service workers; and managers, executives, senior officials, and legislators)
506	In the dry season, what is your main source of drinking water? (River/stream, lake/reservoir, or other; Unprotected well/spring, or rain water; Protected well/spring; Pipe-borne untreated water, or bore hole/hand pump; Pipe-borne treated water; Tanker/truck/vendor, sachet water, or bottled water)
506	In their main job (main occupation in the last 7 days or most recent job), how many household members had their main activity in some sector other than agriculture? (None; One; Two; Three or more)
502	During the past 7 days, has the female head/spouse worked for someone who is not a member of your household, worked on a farm owned or rented by a member of your household, cared for livestock belonging to a member of your household, or worked on her own account or in a business enterprise belonging to a someone in your household? (Does farm work and is not self-employed nor works for a wage; Does not work; Self-employed and does not work for a wage (regardless of farm work); No female head/spouse; Works for a wage (regardless of farm work or self-employment))
493	During the past 7 days, has the male head/spouse worked for someone who is not a member of your household, worked on a farm owned or rented by a member of your household, cared for livestock belonging to a member of your household, or worked on his own account or in a business enterprise belonging to a someone in your household? (Does not work; No male head/spouse; Does farm work and is not self-employed nor works for a wage; Works for a wage (regardless of farm work or self-employment); Self-employed and does not work for a wage (regardless of farm work))

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
462	Does your household own furniture (table)? (No; Yes)
454	Can the female head/spouse read and write in any language? (No; Yes; No female head/spouse)
454	What kind of refuse disposal facilities does your household use? (None; Disposal within compound; Unauthorized refuse heap, or other; Government bin or shed; Household bin collected by government; Household bin collected by private agency)
449	How many mats does your household own? (None; One; Two; Three or more)
435	In the wet season, what is you main source of drinking water? (Rain water, unprotected well/spring, lake/reservoir, river/stream, or other; Protected well/spring; Pipe-borne untreated water, or bore hole/hand pump; Pipe-borne treated water, tanker/truck/vendor, sachet water, or bottled water)
423	Does your household own furniture (3/4 piece sofa set)? (No; Yes)
399	What is the marital status of the female head/spouse? (Married (polygamous), or divorced; Married (monogamous); Widowed; No female head/spouse; Informal union, separated, or never-married)
392	In what sector is the main activity of the female head/spouse (main occupation in the last 7 days or most recent job)? (Agriculture, or mining; Does not work; Buying and selling; No female head/spouse; Other)
357	Can the male head/spouse read and write in any language? (No male head/spouse; No; Yes)
349	What is the marital status of the male head/spouse? (Married (polygamous); Widowed; Married (monogamous); No male head/spouse; Never-married, separated, divorced, or informal union)
334	Does the household own a motorbike or a car or other vehicle? (No; Only motorbike; Car (regardless of motorbike))
334	Does your household own a car or other vehicles? (No; Yes)
320	The roof of the main dwelling is predominantly made of what material? (Grass, clay tiles, asbestos or plastic sheets, others; Concrete, zinc, or iron sheets)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
319	During the past 7 days, did any household members work for someone who is not a member of the household, for example, an enterprise, company, the government, or any other individual? (No; Yes)
309	In their main job (main occupation in the last 7 days or most recent job), did any household members in their primary activity work as managers, executives, senior officials, legislators, professionals, teachers, technicians, associate professionals, or clerks? (No; Yes)
239	During the past 7 days, how many household members worked for someone who is not a member of your household, worked on a farm owned or rented by a member of your household, cared for livestock belonging to a member of your household, or worked on his/her own account or in a business enterprise belonging to a someone in your household? (None; One; Two; Three; Four or more)
171	What is the structure of household headship? (Both male and female heads/spouses; Female head/spouse only; Male head/spouse only)
158	During the past 7 days, has the male or female head/spouse worked in something other than agriculture on his/her own account or in a business enterprise belonging to him/her or someone in the household, for example, as a trader, shop-keeper, barber, dressmaker, carpenter, or taxi-driver? (No; Yes)
136	How many mattresses does the household own? (None; One; Two; Three or more)
135	Does your household own furniture (chairs)? (No; Yes)
121	In their main job (main occupation in the last 7 days or most recent job), how many household members in their primary activity were not skilled agricultural, forestry, and fishery workers nor in elementary occupations? (None; One; Two; Three; Four or more)
99	During the past 7 days, did any household members work on their own account or in a business enterprise belonging to someone in your household, for example, as a trader, shop-keeper, barber, dressmaker, carpenter, or taxi-driver? (No; Yes)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
83	Does your household own a bicycle? (No; Yes)
70	Does your household own a radio, or a cassette recorder or a hi-fi (sound system)? (None; Only radio; Cassette or hi-fi (regardless of radio))
67	How many separate rooms do the members of the household occupy (do not count bathrooms, toilets, storerooms, or garage)? (One; Two; Three; Four; Five or more)
57	Does your household own a cassette recorder or a hi-fi (sound system)? (No; Yes)
49	Does your household own a sewing machine? (No; Yes)
32	How many beds does your household own? (None; One; Two; Three; Four or more)
12	Does your household own a radio? (No; Yes)
1	Does your household own a motorbike? (No; Yes)

Source: 2012/13 General Household Panel Survey

Tables for
100% of the National Poverty Line

(and Tables Pertaining to All Poverty Lines)

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	87.9
15–19	82.1
20–24	75.9
25–29	69.6
30–34	53.4
35–39	40.1
40–44	30.6
45–49	20.9
50–54	13.4
55–59	5.0
60–64	3.8
65–69	2.7
70–74	2.6
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

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

Score	Households in range and < poverty line		All households in range		Poverty likelihood (%)
0–4	0	÷	0	=	100.0
5–9	89	÷	89	=	100.0
10–14	331	÷	376	=	87.9
15–19	1,101	÷	1,340	=	82.1
20–24	2,741	÷	3,612	=	75.9
25–29	4,459	÷	6,409	=	69.6
30–34	4,764	÷	8,927	=	53.4
35–39	3,944	÷	9,837	=	40.1
40–44	3,389	÷	11,063	=	30.6
45–49	2,227	÷	10,636	=	20.9
50–54	1,555	÷	11,585	=	13.4
55–59	472	÷	9,431	=	5.0
60–64	325	÷	8,448	=	3.8
65–69	226	÷	8,292	=	2.7
70–74	105	÷	4,023	=	2.6
75–79	0	÷	3,304	=	0.0
80–84	0	÷	1,296	=	0.0
85–89	0	÷	784	=	0.0
90–94	0	÷	391	=	0.0
95–100	0	÷	157	=	0.0

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

Figure 6 (100% of the national line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	+24.6	18.8	22.7	28.6
10–14	+44.0	13.2	15.2	20.8
15–19	+17.1	6.6	7.7	11.0
20–24	–6.6	4.7	4.8	5.2
25–29	+2.4	2.8	3.3	4.5
30–34	0.0	2.5	2.9	3.8
35–39	+2.4	2.4	2.9	4.0
40–44	–2.2	2.1	2.4	3.1
45–49	+0.5	2.0	2.3	3.2
50–54	+1.7	1.4	1.7	2.3
55–59	–4.2	2.9	3.1	3.3
60–64	+0.8	0.8	1.0	1.4
65–69	–0.1	0.9	1.0	1.4
70–74	+2.6	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 7 (100% of the national line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.3	66.2	78.1	88.6
4	0.0	30.7	39.8	52.9
8	+0.3	23.6	28.7	36.5
16	0.0	16.5	19.7	26.5
32	+0.1	11.0	13.8	17.4
64	+0.1	7.7	9.2	12.9
128	+0.3	5.4	6.5	9.2
256	+0.2	3.8	4.6	6.3
512	+0.3	2.6	3.4	4.6
1,024	+0.2	2.0	2.4	3.2
2,048	+0.2	1.4	1.7	2.4
4,096	+0.2	1.0	1.2	1.6
8,192	+0.2	0.7	0.8	1.2
16,384	+0.2	0.5	0.6	0.7

Figure 8 (All poverty lines): Differences, precision of differences, and the α factor for bootstrapped estimates of poverty rates for groups of households at a point in time (n = 16,384), scorecard applied to the validation sample

	Poverty line											
	National				Poorest 1/2	2005 PPP					2011 PPP	
	Food	100%	150%	200%	< 100% natl.	$1.25	$2.00	$2.50	$4.00	$5.00	$1.90	$3.10
Estimate minus true value	–0.2	+0.2	–0.1	+1.8	–0.5	+0.3	–0.2	+1.7	+1.1	+0.7	–0.1	+0.6
Precision of difference	0.3	0.5	0.6	0.6	0.4	0.5	0.6	0.6	0.6	0.4	0.4	0.6
α factor for precision	0.89	0.86	0.97	1.02	0.94	0.86	0.97	1.03	1.19	1.18	0.90	0.96

Results pertain to the 2012/13 scorecard applied to the validation sample.

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 bootstraps with n = 16,384.

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

Figure 9 (All poverty lines): Possible types of outcomes from targeting by poverty score

True poverty status	Targeting segment: Targeted	Targeting segment: Non-targeted
Below poverty line	**Inclusion** Below poverty line correctly targeted	**Undercoverage** Below poverty line mistakenly non-targeted
Above poverty line	**Leakage** Above poverty line mistakenly targeted	**Exclusion** Above poverty line correctly non-targeted

Figure 10 (100% of the national line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	25.6	0.0	74.4	74.4	–100.0
≤9	0.1	25.5	0.0	74.4	74.4	–99.4
≤14	0.3	25.3	0.1	74.3	74.6	–96.9
≤19	1.4	24.3	0.5	73.9	75.3	–87.7
≤24	4.3	21.3	1.1	73.3	77.6	–62.1
≤29	8.6	17.0	3.2	71.2	79.8	–20.1
≤34	13.4	12.2	7.3	67.1	80.5	+33.5
≤39	17.2	8.4	13.4	61.0	78.2	+47.7
≤44	20.7	4.9	20.9	53.5	74.2	+18.2
≤49	22.8	2.8	29.5	44.9	67.8	–15.1
≤54	24.3	1.3	39.6	34.8	59.1	–54.5
≤59	25.1	0.5	48.2	26.2	51.3	–88.2
≤64	25.4	0.2	56.4	18.0	43.4	–120.2
≤69	25.6	0.0	64.4	10.0	35.6	–151.7
≤74	25.6	0.0	68.5	5.9	31.5	–167.4
≤79	25.6	0.0	71.8	2.6	28.2	–180.3
≤84	25.6	0.0	73.1	1.3	26.9	–185.4
≤89	25.6	0.0	73.8	0.5	26.2	–188.5
≤94	25.6	0.0	74.2	0.2	25.8	–190.0
≤100	25.6	0.0	74.4	0.0	25.6	–190.6

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

Figure 11 (100% of the national line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	72.3	0.3	2.6:1
≤14	0.5	72.9	1.3	2.7:1
≤19	1.8	74.8	5.3	3.0:1
≤24	5.4	79.2	16.7	3.8:1
≤29	11.8	73.0	33.7	2.7:1
≤34	20.8	64.7	52.4	1.8:1
≤39	30.6	56.2	67.2	1.3:1
≤44	41.7	49.7	80.9	1.0:1
≤49	52.3	43.7	89.2	0.8:1
≤54	63.9	38.1	94.9	0.6:1
≤59	73.3	34.3	98.1	0.5:1
≤64	81.8	31.0	99.1	0.5:1
≤69	90.0	28.4	100.0	0.4:1
≤74	94.1	27.2	100.0	0.4:1
≤79	97.4	26.3	100.0	0.4:1
≤84	98.7	25.9	100.0	0.4:1
≤89	99.5	25.7	100.0	0.3:1
≤94	99.8	25.6	100.0	0.3:1
≤100	100.0	25.6	100.0	0.3:1

Tables for
Food Poverty Line

Figure 4 (Food 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	92.7
5–9	92.7
10–14	55.5
15–19	51.9
20–24	44.2
25–29	28.8
30–34	19.2
35–39	12.7
40–44	6.0
45–49	4.4
50–54	1.9
55–59	1.1
60–64	0.2
65–69	0.2
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 6 (Food line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	+22.3	19.6	24.5	32.6
10–14	+25.8	9.9	11.7	16.8
15–19	+11.6	6.6	8.1	10.4
20–24	+1.6	3.5	4.3	6.0
25–29	–5.2	4.0	4.2	4.8
30–34	+1.8	1.9	2.2	3.1
35–39	+1.3	1.6	1.8	2.4
40–44	–1.8	1.6	1.7	1.9
45–49	–0.7	1.2	1.4	1.9
50–54	+0.2	0.5	0.6	0.8
55–59	–1.2	1.0	1.0	1.2
60–64	+0.2	0.1	0.1	0.1
65–69	–0.4	0.4	0.5	0.5
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 7 (Food line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.8	54.8	69.1	75.4
4	–0.1	20.3	25.8	37.5
8	–0.1	14.7	17.9	28.4
16	–0.2	10.3	12.5	17.3
32	–0.1	7.2	9.0	11.4
64	–0.2	5.3	6.4	8.0
128	–0.1	3.7	4.2	5.7
256	–0.1	2.6	3.0	4.3
512	–0.1	1.9	2.2	3.1
1,024	–0.1	1.3	1.5	1.9
2,048	–0.2	0.9	1.1	1.3
4,096	–0.2	0.6	0.8	1.0
8,192	–0.2	0.4	0.5	0.7
16,384	–0.2	0.3	0.4	0.5

Figure 10 (Food line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	9.0	0.0	91.0	91.0	–100.0
≤9	0.1	8.9	0.0	91.0	91.0	–98.4
≤14	0.3	8.7	0.2	90.8	91.1	–91.8
≤19	0.9	8.1	0.9	90.1	91.0	–69.8
≤24	2.5	6.5	3.0	88.0	90.5	–12.6
≤29	4.4	4.6	7.4	83.6	88.0	+17.5
≤34	6.0	3.0	14.8	76.2	82.2	–63.9
≤39	7.1	1.9	23.5	67.5	74.7	–160.7
≤44	8.0	1.0	33.6	57.4	65.4	–273.4
≤49	8.5	0.5	43.8	47.2	55.7	–386.3
≤54	8.8	0.2	55.1	35.9	44.7	–512.2
≤59	8.9	0.1	64.4	26.6	35.5	–615.2
≤64	8.9	0.1	72.8	18.2	27.1	–708.9
≤69	9.0	0.0	81.0	10.0	19.0	–800.4
≤74	9.0	0.0	85.1	5.9	14.9	–845.0
≤79	9.0	0.0	88.4	2.6	11.6	–881.8
≤84	9.0	0.0	89.7	1.3	10.3	–896.2
≤89	9.0	0.0	90.5	0.5	9.5	–904.9
≤94	9.0	0.0	90.8	0.2	9.2	–909.2
≤100	9.0	0.0	91.0	0.0	9.0	–911.0

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

Figure 11 (Food line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	92.7	0.0	12.7:1
≤9	0.1	63.6	0.6	1.7:1
≤14	0.5	58.8	3.0	1.4:1
≤19	1.8	50.7	10.2	1.0:1
≤24	5.4	45.3	27.2	0.8:1
≤29	11.8	37.2	48.8	0.6:1
≤34	20.8	28.9	66.6	0.4:1
≤39	30.6	23.3	79.2	0.3:1
≤44	41.7	19.3	89.3	0.2:1
≤49	52.3	16.3	94.6	0.2:1
≤54	63.9	13.7	97.4	0.2:1
≤59	73.3	12.2	99.2	0.1:1
≤64	81.8	10.9	99.3	0.1:1
≤69	90.0	10.0	100.0	0.1:1
≤74	94.1	9.6	100.0	0.1:1
≤79	97.4	9.2	100.0	0.1:1
≤84	98.7	9.1	100.0	0.1:1
≤89	99.5	9.1	100.0	0.1:1
≤94	99.8	9.0	100.0	0.1:1
≤100	100.0	9.0	100.0	0.1:1

Tables for
150% of the National Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	98.5
15–19	98.5
20–24	95.8
25–29	92.8
30–34	84.1
35–39	75.4
40–44	61.2
45–49	55.6
50–54	43.1
55–59	32.0
60–64	25.9
65–69	14.2
70–74	9.3
75–79	2.7
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (150% of the national line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	0.0	0.0	0.0	0.0
10–14	–1.5	0.8	0.8	0.8
15–19	+10.7	5.1	6.1	8.4
20–24	–0.5	1.2	1.5	1.8
25–29	+5.4	2.3	2.8	3.7
30–34	+0.1	2.0	2.4	3.2
35–39	–2.3	2.1	2.3	3.0
40–44	–11.7	6.8	6.9	7.4
45–49	–0.1	2.4	2.8	3.7
50–54	+1.6	2.4	2.8	3.7
55–59	+1.6	2.2	2.7	3.5
60–64	+2.3	2.2	2.5	3.5
65–69	0.0	1.7	2.1	2.9
70–74	+6.0	1.2	1.4	1.9
75–79	–1.2	1.4	1.7	2.3
80–84	–0.3	0.3	0.4	0.5
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 7 (150% of the national line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–1.4	64.6	80.6	91.7
4	–0.7	38.5	45.0	56.2
8	–0.7	27.9	33.8	45.1
16	–0.9	20.7	24.2	29.4
32	–0.6	14.5	16.7	22.0
64	–0.4	10.0	11.9	15.6
128	–0.2	7.0	8.4	10.9
256	–0.2	5.0	5.9	7.5
512	–0.1	3.5	4.2	5.5
1,024	0.0	2.5	3.0	4.0
2,048	–0.1	1.9	2.2	2.9
4,096	–0.1	1.3	1.5	2.0
8,192	–0.1	0.9	1.1	1.4
16,384	–0.1	0.6	0.7	0.9

Figure 10 (150% of the national line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	50.0	0.0	50.0	50.0	–100.0
≤9	0.1	50.0	0.0	50.0	50.0	–99.6
≤14	0.5	49.6	0.0	50.0	50.4	–98.1
≤19	1.7	48.3	0.1	49.9	51.6	–93.0
≤24	5.2	44.9	0.2	49.7	54.9	–78.8
≤29	10.9	39.1	0.9	49.0	60.0	–54.6
≤34	18.5	31.5	2.2	47.7	66.3	–21.5
≤39	25.9	24.1	4.7	45.3	71.2	+12.9
≤44	33.5	16.6	8.2	41.8	75.2	+50.1
≤49	39.1	11.0	13.2	36.7	75.8	+73.6
≤54	43.7	6.3	20.1	29.8	73.5	+59.7
≤59	46.7	3.3	26.6	23.4	70.1	+46.9
≤64	48.5	1.6	33.3	16.7	65.2	+33.5
≤69	49.7	0.3	40.3	9.6	59.4	+19.5
≤74	49.9	0.1	44.2	5.8	55.7	+11.8
≤79	50.0	0.0	47.3	2.6	52.7	+5.4
≤84	50.0	0.0	48.6	1.3	51.4	+2.9
≤89	50.0	0.0	49.4	0.5	50.6	+1.3
≤94	50.0	0.0	49.8	0.2	50.2	+0.5
≤100	50.0	0.0	50.0	0.0	50.0	+0.2

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

Figure 11 (150% of the national line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.2	Only poor targeted
≤14	0.5	100.0	0.9	Only poor targeted
≤19	1.8	95.0	3.4	19.1:1
≤24	5.4	95.6	10.3	21.8:1
≤29	11.8	92.3	21.8	12.0:1
≤34	20.8	89.3	37.0	8.4:1
≤39	30.6	84.8	51.8	5.6:1
≤44	41.7	80.4	66.9	4.1:1
≤49	52.3	74.7	78.0	3.0:1
≤54	63.9	68.5	87.4	2.2:1
≤59	73.3	63.7	93.4	1.8:1
≤64	81.8	59.3	96.9	1.5:1
≤69	90.0	55.2	99.4	1.2:1
≤74	94.1	53.1	99.7	1.1:1
≤79	97.4	51.4	100.0	1.1:1
≤84	98.7	50.7	100.0	1.0:1
≤89	99.5	50.3	100.0	1.0:1
≤94	99.8	50.1	100.0	1.0:1
≤100	100.0	50.0	100.0	1.0:1

Tables for
200% of the National Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	100.0
20–24	97.7
25–29	96.8
30–34	93.8
35–39	90.9
40–44	81.2
45–49	78.8
50–54	66.4
55–59	54.4
60–64	49.4
65–69	35.4
70–74	22.4
75–79	7.9
80–84	4.5
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (200% of the national line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	0.0	0.0	0.0	0.0
10–14	0.0	0.0	0.0	0.0
15–19	+11.7	5.1	6.0	8.2
20–24	–1.5	1.0	1.0	1.1
25–29	–0.1	1.0	1.2	1.5
30–34	–0.6	1.4	1.6	2.0
35–39	–1.3	1.2	1.5	2.0
40–44	–7.7	4.6	4.6	4.9
45–49	+3.2	2.1	2.6	3.4
50–54	–1.0	2.1	2.6	3.1
55–59	–1.3	2.5	3.0	4.2
60–64	+8.5	2.4	3.0	4.0
65–69	+11.6	2.1	2.5	3.2
70–74	+7.3	2.4	2.9	3.7
75–79	–2.0	2.2	2.6	3.7
80–84	+1.5	2.0	2.3	2.9
85–89	0.0	0.0	0.0	0.0
90–94	0.0	0.0	0.0	0.0
95–100	–4.4	4.9	5.5	7.2

Figure 7 (200% of the national line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.6	64.7	72.9	87.2
4	+1.0	37.9	43.1	55.1
8	+1.1	28.4	32.5	40.6
16	+1.1	19.9	23.2	30.5
32	+1.3	14.3	16.6	22.5
64	+1.3	10.0	11.7	15.6
128	+1.4	7.2	8.3	11.0
256	+1.6	4.9	5.9	8.5
512	+1.7	3.5	4.3	5.7
1,024	+1.8	2.6	3.1	3.8
2,048	+1.8	1.9	2.3	3.0
4,096	+1.8	1.3	1.6	2.0
8,192	+1.8	0.9	1.0	1.4
16,384	+1.8	0.6	0.7	1.1

Figure 10 (200% of the national line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	66.4	0.0	33.6	33.6	–100.0
≤9	0.1	66.3	0.0	33.6	33.7	–99.7
≤14	0.5	65.9	0.0	33.6	34.1	–98.6
≤19	1.7	64.6	0.1	33.5	35.3	–94.7
≤24	5.3	61.1	0.1	33.5	38.8	–83.8
≤29	11.5	54.9	0.3	33.3	44.8	–64.8
≤34	20.0	46.4	0.7	32.9	52.9	–38.6
≤39	29.0	37.3	1.5	32.1	61.1	–10.2
≤44	38.7	27.7	3.0	30.7	69.4	+21.1
≤49	46.8	19.6	5.5	28.1	74.9	+49.2
≤54	54.2	12.1	9.6	24.0	78.2	+77.9
≤59	59.5	6.9	13.8	19.8	79.3	+79.2
≤64	62.9	3.5	18.8	14.8	77.7	+71.6
≤69	65.2	1.1	24.8	8.8	74.0	+62.6
≤74	65.9	0.4	28.1	5.5	71.4	+57.6
≤79	66.3	0.1	31.1	2.6	68.9	+53.2
≤84	66.4	0.0	32.3	1.3	67.7	+51.3
≤89	66.4	0.0	33.1	0.5	66.9	+50.2
≤94	66.4	0.0	33.5	0.1	66.5	+49.6
≤100	66.4	0.0	33.6	0.0	66.4	+49.3

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

Figure 11 (200% of the national line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.1	Only poor targeted
≤14	0.5	100.0	0.7	Only poor targeted
≤19	1.8	95.8	2.6	22.9:1
≤24	5.4	97.9	8.0	47.5:1
≤29	11.8	97.3	17.3	36.6:1
≤34	20.8	96.5	30.2	27.4:1
≤39	30.6	94.9	43.8	18.8:1
≤44	41.7	92.9	58.3	13.1:1
≤49	52.3	89.5	70.5	8.5:1
≤54	63.9	84.9	81.7	5.6:1
≤59	73.3	81.1	89.6	4.3:1
≤64	81.8	77.0	94.8	3.3:1
≤69	90.0	72.4	98.3	2.6:1
≤74	94.1	70.1	99.3	2.3:1
≤79	97.4	68.1	99.9	2.1:1
≤84	98.7	67.3	100.0	2.1:1
≤89	99.5	66.7	100.0	2.0:1
≤94	99.8	66.5	100.0	2.0:1
≤100	100.0	66.4	100.0	2.0:1

Tables for
the Line that Marks the Poorest Half of People
below 100% of the National Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	96.3
5–9	96.3
10–14	67.0
15–19	60.1
20–24	50.4
25–29	37.6
30–34	27.1
35–39	18.5
40–44	10.2
45–49	8.3
50–54	5.2
55–59	2.0
60–64	0.3
65–69	0.3
70–74	0.3
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (Poorest half below 100% of the national line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	+25.9	19.6	24.5	32.6
10–14	+35.0	10.4	12.4	16.9
15–19	+15.6	6.6	8.0	10.5
20–24	+1.1	3.6	4.3	5.6
25–29	+0.5	2.8	3.2	4.4
30–34	–0.7	2.2	2.7	3.7
35–39	–0.6	2.1	2.6	3.1
40–44	–2.6	2.0	2.1	2.4
45–49	+0.8	1.3	1.6	2.1
50–54	+1.2	0.9	1.0	1.4
55–59	–3.8	2.6	2.8	3.0
60–64	–0.1	0.3	0.3	0.5
65–69	–2.0	1.4	1.5	1.7
70–74	+0.3	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 7 (Poorest half below 100% of the national line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.6	59.6	64.2	79.1
4	–0.3	24.9	31.7	44.2
8	–0.3	18.5	22.2	32.8
16	–0.6	12.8	16.2	21.9
32	–0.3	9.0	10.6	14.3
64	–0.5	6.7	7.8	11.1
128	–0.5	4.5	5.3	7.1
256	–0.5	3.2	3.8	5.3
512	–0.4	2.3	2.7	3.9
1,024	–0.5	1.6	1.9	2.4
2,048	–0.5	1.1	1.3	1.7
4,096	–0.5	0.8	1.0	1.2
8,192	–0.5	0.6	0.7	0.9
16,384	–0.5	0.4	0.5	0.6

Figure 10 (Poorest half below 100% of the national line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	12.3	0.0	87.6	87.6	–100.0
≤9	0.1	12.3	0.0	87.6	87.6	–98.8
≤14	0.3	12.0	0.2	87.4	87.7	–93.9
≤19	1.0	11.3	0.8	86.8	87.8	–77.2
≤24	2.8	9.5	2.6	85.0	87.8	–33.6
≤29	5.0	7.3	6.8	80.8	85.8	+36.6
≤34	7.4	5.0	13.4	74.2	81.6	–8.5
≤39	9.1	3.2	21.5	66.1	75.2	–74.3
≤44	10.5	1.8	31.1	56.5	67.0	–152.4
≤49	11.3	1.0	41.0	46.6	57.9	–232.6
≤54	11.7	0.6	52.1	35.5	47.3	–322.8
≤59	12.1	0.2	61.1	26.5	38.6	–396.2
≤64	12.2	0.1	69.5	18.1	30.3	–464.4
≤69	12.3	0.0	77.6	10.0	22.3	–530.6
≤74	12.3	0.0	81.7	5.9	18.2	–563.3
≤79	12.3	0.0	85.0	2.6	14.9	–590.1
≤84	12.3	0.0	86.3	1.3	13.6	–600.7
≤89	12.3	0.0	87.0	0.5	12.9	–607.0
≤94	12.3	0.0	87.4	0.2	12.5	–610.2
≤100	12.3	0.0	87.6	0.0	12.3	–611.5

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

Figure 11 (Poorest half below 100% of the national line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	96.3	0.0	26.0:1
≤9	0.1	63.6	0.5	1.7:1
≤14	0.5	61.9	2.3	1.6:1
≤19	1.8	55.7	8.2	1.3:1
≤24	5.4	51.4	22.6	1.1:1
≤29	11.8	42.5	40.8	0.7:1
≤34	20.8	35.5	59.8	0.5:1
≤39	30.6	29.7	73.7	0.4:1
≤44	41.7	25.3	85.5	0.3:1
≤49	52.3	21.6	91.6	0.3:1
≤54	63.9	18.4	95.2	0.2:1
≤59	73.3	16.5	98.4	0.2:1
≤64	81.8	14.9	98.8	0.2:1
≤69	90.0	13.7	100.0	0.2:1
≤74	94.1	13.1	100.0	0.2:1
≤79	97.4	12.6	100.0	0.1:1
≤84	98.7	12.5	100.0	0.1:1
≤89	99.5	12.4	100.0	0.1:1
≤94	99.8	12.3	100.0	0.1:1
≤100	100.0	12.3	100.0	0.1:1

Tables for
the $1.25/day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	81.0
15–19	77.7
20–24	74.1
25–29	63.1
30–34	48.8
35–39	35.8
40–44	25.8
45–49	16.8
50–54	11.1
55–59	4.6
60–64	2.9
65–69	2.5
70–74	2.5
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($1.25/day line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	+29.6	19.6	24.5	32.6
10–14	+48.9	10.3	12.5	16.9
15–19	+12.9	6.6	7.7	10.9
20–24	–4.3	3.6	3.8	4.4
25–29	+3.8	2.9	3.6	4.7
30–34	–1.1	2.5	2.9	3.9
35–39	+2.9	2.3	2.7	3.6
40–44	–0.7	1.9	2.2	2.9
45–49	+0.8	1.8	2.1	3.1
50–54	+1.0	1.4	1.7	2.3
55–59	–4.4	3.0	3.2	3.5
60–64	+0.1	0.8	1.0	1.3
65–69	+0.1	0.8	1.0	1.4
70–74	+2.5	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 7 ($1.25/day line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.5	61.5	76.0	86.6
4	+0.2	29.5	36.4	51.7
8	+0.4	22.7	27.3	36.3
16	+0.2	15.7	19.0	24.7
32	+0.2	10.9	12.9	16.5
64	+0.1	7.6	9.2	12.4
128	+0.3	5.2	6.2	8.7
256	+0.3	3.7	4.5	6.1
512	+0.3	2.6	3.2	4.3
1,024	+0.3	1.9	2.3	3.1
2,048	+0.2	1.4	1.7	2.2
4,096	+0.3	0.9	1.1	1.4
8,192	+0.3	0.7	0.8	1.0
16,384	+0.3	0.5	0.6	0.8

Figure 10 ($1.25/day line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	22.8	0.0	77.2	77.2	–100.0
≤9	0.1	22.7	0.0	77.2	77.3	–99.4
≤14	0.3	22.5	0.2	77.1	77.4	–96.7
≤19	1.3	21.5	0.5	76.7	78.0	–86.4
≤24	4.1	18.7	1.3	75.9	80.0	–58.3
≤29	7.9	14.8	3.9	73.4	81.3	–13.1
≤34	12.3	10.5	8.4	68.8	81.1	+45.3
≤39	15.7	7.1	14.9	62.3	78.0	+34.5
≤44	18.6	4.2	23.1	54.2	72.8	–1.3
≤49	20.4	2.4	31.9	45.3	65.7	–40.2
≤54	21.6	1.2	42.3	35.0	56.6	–85.8
≤59	22.4	0.4	50.9	26.3	48.7	–123.9
≤64	22.6	0.2	59.2	18.1	40.7	–160.0
≤69	22.8	0.0	67.3	10.0	32.7	–195.7
≤74	22.8	0.0	71.3	5.9	28.7	–213.4
≤79	22.8	0.0	74.6	2.6	25.4	–227.9
≤84	22.8	0.0	75.9	1.3	24.1	–233.6
≤89	22.8	0.0	76.7	0.5	23.3	–237.1
≤94	22.8	0.0	77.1	0.2	22.9	–238.8
≤100	22.8	0.0	77.2	0.0	22.8	–239.5

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

Figure 11 ($1.25/day line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	63.6	0.2	1.7:1
≤14	0.5	62.4	1.3	1.7:1
≤19	1.8	71.6	5.7	2.5:1
≤24	5.4	75.3	17.9	3.1:1
≤29	11.8	67.1	34.9	2.0:1
≤34	20.8	59.3	54.1	1.5:1
≤39	30.6	51.3	68.9	1.1:1
≤44	41.7	44.7	81.7	0.8:1
≤49	52.3	39.0	89.6	0.6:1
≤54	63.9	33.8	94.9	0.5:1
≤59	73.3	30.5	98.3	0.4:1
≤64	81.8	27.6	99.3	0.4:1
≤69	90.0	25.3	100.0	0.3:1
≤74	94.1	24.2	100.0	0.3:1
≤79	97.4	23.4	100.0	0.3:1
≤84	98.7	23.1	100.0	0.3:1
≤89	99.5	22.9	100.0	0.3:1
≤94	99.8	22.8	100.0	0.3:1
≤100	100.0	22.8	100.0	0.3:1

Tables for
the $2.00/day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	98.5
15–19	98.5
20–24	96.1
25–29	92.9
30–34	85.0
35–39	76.6
40–44	62.4
45–49	56.7
50–54	43.5
55–59	32.5
60–64	26.5
65–69	14.3
70–74	9.5
75–79	2.7
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($2.00/day line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	0.0	0.0	0.0	0.0
10–14	–1.5	0.8	0.8	0.8
15–19	+10.7	5.1	6.1	8.4
20–24	–0.7	1.1	1.3	1.8
25–29	+5.1	2.2	2.7	3.6
30–34	+0.2	2.0	2.4	3.2
35–39	–1.9	1.9	2.2	3.0
40–44	–11.1	6.5	6.6	7.0
45–49	+0.1	2.4	2.9	3.7
50–54	+0.8	2.4	2.8	3.6
55–59	+1.0	2.2	2.7	3.6
60–64	+2.8	2.2	2.5	3.5
65–69	–0.5	1.7	2.1	2.8
70–74	+6.2	1.2	1.4	1.9
75–79	–1.2	1.4	1.7	2.3
80–84	–0.3	0.3	0.4	0.5
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 7 ($2.00/day line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–1.3	65.0	81.2	91.7
4	–0.7	38.0	44.0	55.7
8	–0.8	28.1	33.9	45.2
16	–1.0	20.6	24.1	29.7
32	–0.7	14.6	16.8	21.8
64	–0.5	10.3	11.9	16.0
128	–0.3	7.0	8.5	11.2
256	–0.3	5.0	6.0	7.2
512	–0.1	3.5	4.2	5.4
1,024	–0.1	2.6	2.9	4.1
2,048	–0.1	1.8	2.2	2.9
4,096	–0.2	1.3	1.4	2.0
8,192	–0.2	0.9	1.1	1.4
16,384	–0.2	0.6	0.7	0.9

Figure 10 ($2.00/day line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	50.8	0.0	49.2	49.2	–100.0
≤9	0.1	50.7	0.0	49.2	49.3	–99.7
≤14	0.5	50.4	0.0	49.2	49.6	–98.2
≤19	1.7	49.1	0.1	49.1	50.8	–93.1
≤24	5.2	45.6	0.2	49.0	54.2	–79.1
≤29	11.0	39.9	0.9	48.3	59.3	–55.2
≤34	18.7	32.1	2.1	47.1	65.8	–22.4
≤39	26.2	24.6	4.4	44.8	71.0	+11.7
≤44	33.8	17.0	7.8	41.3	75.1	+48.5
≤49	39.5	11.3	12.8	36.4	75.9	+74.9
≤54	44.3	6.5	19.6	29.6	73.9	+61.5
≤59	47.4	3.4	25.9	23.3	70.7	+49.0
≤64	49.2	1.6	32.6	16.6	65.8	+35.9
≤69	50.5	0.3	39.5	9.6	60.2	+22.2
≤74	50.7	0.1	43.4	5.8	56.5	+14.6
≤79	50.8	0.0	46.6	2.6	53.4	+8.4
≤84	50.8	0.0	47.8	1.3	52.2	+5.9
≤89	50.8	0.0	48.6	0.5	51.4	+4.3
≤94	50.8	0.0	49.0	0.2	51.0	+3.5
≤100	50.8	0.0	49.2	0.0	50.8	+3.2

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

Figure 11 ($2.00/day line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.2	Only poor targeted
≤14	0.5	100.0	0.9	Only poor targeted
≤19	1.8	95.0	3.4	19.1:1
≤24	5.4	96.0	10.2	23.9:1
≤29	11.8	92.7	21.6	12.7:1
≤34	20.8	90.0	36.8	9.0:1
≤39	30.6	85.7	51.6	6.0:1
≤44	41.7	81.2	66.5	4.3:1
≤49	52.3	75.6	77.8	3.1:1
≤54	63.9	69.4	87.2	2.3:1
≤59	73.3	64.7	93.3	1.8:1
≤64	81.8	60.2	96.8	1.5:1
≤69	90.0	56.1	99.4	1.3:1
≤74	94.1	53.9	99.7	1.2:1
≤79	97.4	52.2	100.0	1.1:1
≤84	98.7	51.5	100.0	1.1:1
≤89	99.5	51.1	100.0	1.0:1
≤94	99.8	50.9	100.0	1.0:1
≤100	100.0	50.8	100.0	1.0:1

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	100.0
10–14	100.0
15–19	100.0
20–24	97.5
25–29	96.4
30–34	92.5
35–39	87.5
40–44	78.5
45–49	75.5
50–54	63.0
55–59	49.2
60–64	44.9
65–69	32.1
70–74	19.1
75–79	7.1
80–84	3.5
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($2.50/day line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	0.0	0.0	0.0	0.0
10–14	0.0	0.0	0.0	0.0
15–19	+11.7	5.1	6.0	8.2
20–24	–1.7	1.1	1.1	1.2
25–29	0.0	1.0	1.2	1.6
30–34	–0.6	1.5	1.7	2.2
35–39	–1.0	1.5	1.8	2.4
40–44	–7.1	4.3	4.5	4.7
45–49	+3.0	2.2	2.6	3.3
50–54	+0.3	2.2	2.6	3.1
55–59	–2.9	2.7	3.2	4.0
60–64	+7.6	2.4	3.0	3.8
65–69	+11.2	2.0	2.4	2.9
70–74	+5.0	2.4	2.8	3.6
75–79	+0.3	1.7	2.1	2.8
80–84	+0.5	2.0	2.3	2.9
85–89	0.0	0.0	0.0	0.0
90–94	0.0	0.0	0.0	0.0
95–100	–4.4	4.9	5.5	7.2

Figure 7 ($2.50/day line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.8	65.3	77.7	88.6
4	+0.5	37.8	43.5	55.8
8	+1.0	28.9	32.9	42.1
16	+0.9	20.5	23.9	29.1
32	+1.1	14.4	17.3	22.3
64	+1.1	10.4	12.1	15.3
128	+1.4	7.2	8.8	11.0
256	+1.5	5.1	6.0	8.2
512	+1.6	3.5	4.2	5.4
1,024	+1.7	2.5	3.0	3.9
2,048	+1.7	1.9	2.2	3.0
4,096	+1.7	1.3	1.5	2.0
8,192	+1.7	0.9	1.0	1.4
16,384	+1.7	0.6	0.7	1.0

Figure 10 ($2.50/day line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	63.4	0.0	36.6	36.6	–100.0
≤9	0.1	63.3	0.0	36.6	36.7	–99.7
≤14	0.5	62.9	0.0	36.6	37.1	–98.5
≤19	1.7	61.7	0.1	36.5	38.3	–94.4
≤24	5.3	58.1	0.1	36.5	41.8	–83.1
≤29	11.5	51.9	0.4	36.2	47.7	–63.3
≤34	19.8	43.6	0.9	35.7	55.5	–36.0
≤39	28.5	34.9	2.1	34.5	63.0	–6.8
≤44	37.8	25.6	3.9	32.7	70.5	+25.3
≤49	45.5	17.8	6.7	29.9	75.4	+54.4
≤54	52.5	10.9	11.4	25.2	77.7	+82.0
≤59	57.3	6.0	16.0	20.7	78.0	+74.8
≤64	60.4	3.0	21.4	15.3	75.6	+66.3
≤69	62.4	1.0	27.6	9.0	71.4	+56.4
≤74	63.0	0.4	31.0	5.6	68.6	+51.0
≤79	63.3	0.1	34.0	2.6	65.9	+46.3
≤84	63.4	0.0	35.3	1.3	64.7	+44.3
≤89	63.4	0.0	36.1	0.5	63.9	+43.1
≤94	63.4	0.0	36.5	0.1	63.5	+42.4
≤100	63.4	0.0	36.6	0.0	63.4	+42.2

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

Figure 11 ($2.50/day line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.1	Only poor targeted
≤14	0.5	100.0	0.7	Only poor targeted
≤19	1.8	95.8	2.7	22.9:1
≤24	5.4	97.9	8.4	47.5:1
≤29	11.8	96.9	18.1	30.8:1
≤34	20.8	95.5	31.3	21.2:1
≤39	30.6	93.2	45.0	13.6:1
≤44	41.7	90.7	59.6	9.7:1
≤49	52.3	87.1	71.9	6.8:1
≤54	63.9	82.2	82.8	4.6:1
≤59	73.3	78.2	90.5	3.6:1
≤64	81.8	73.9	95.3	2.8:1
≤69	90.0	69.3	98.5	2.3:1
≤74	94.1	67.0	99.4	2.0:1
≤79	97.4	65.0	99.9	1.9:1
≤84	98.7	64.2	100.0	1.8:1
≤89	99.5	63.7	100.0	1.8:1
≤94	99.8	63.5	100.0	1.7:1
≤100	100.0	63.4	100.0	1.7:1

Tables for
the $4.00/day 2005 PPP Poverty Line

Figure 4 ($4.00/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	100.0
20–24	99.7
25–29	99.6
30–34	99.2
35–39	98.5
40–44	96.5
45–49	95.3
50–54	90.2
55–59	84.3
60–64	82.3
65–69	70.0
70–74	55.3
75–79	43.2
80–84	22.5
85–89	11.7
90–94	1.5
95–100	0.0

Figure 6 ($4.00/day line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	0.0	0.0	0.0	0.0
10–14	0.0	0.0	0.0	0.0
15–19	0.0	0.0	0.0	0.0
20–24	–0.3	0.2	0.2	0.2
25–29	–0.3	0.2	0.2	0.2
30–34	–0.4	0.3	0.4	0.4
35–39	–1.0	0.6	0.6	0.6
40–44	–2.0	1.2	1.2	1.3
45–49	+3.7	1.4	1.7	2.2
50–54	+2.6	1.6	1.9	2.5
55–59	–6.3	3.7	3.8	4.1
60–64	+2.7	2.0	2.3	2.9
65–69	+8.1	2.5	3.1	4.2
70–74	+2.0	3.6	4.4	5.8
75–79	+3.4	4.6	5.5	7.2
80–84	+4.8	4.8	5.6	7.2
85–89	–7.4	6.8	7.4	9.2
90–94	+1.5	0.0	0.0	0.0
95–100	–7.3	7.2	8.1	9.8

Figure 7 ($4.00/day line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.2	50.0	64.5	76.0
4	+1.1	31.2	38.2	51.2
8	+0.6	22.7	27.2	37.4
16	+0.6	16.4	19.5	26.2
32	+0.8	11.6	13.8	18.1
64	+0.9	8.2	9.4	12.7
128	+0.9	5.5	6.6	8.3
256	+1.1	4.2	5.0	6.2
512	+1.1	3.0	3.5	4.8
1,024	+1.1	2.2	2.6	3.5
2,048	+1.1	1.6	1.9	2.4
4,096	+1.1	1.1	1.3	1.8
8,192	+1.1	0.8	0.9	1.2
16,384	+1.1	0.6	0.7	0.9

Figure 10 ($4.00/day line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	85.1	0.0	14.9	14.9	–100.0
≤9	0.1	85.0	0.0	14.9	15.0	–99.8
≤14	0.5	84.6	0.0	14.9	15.4	–98.9
≤19	1.8	83.3	0.0	14.9	16.7	–95.8
≤24	5.4	79.7	0.0	14.9	20.3	–87.3
≤29	11.8	73.3	0.0	14.9	26.7	–72.2
≤34	20.7	64.4	0.1	14.8	35.5	–51.3
≤39	30.4	54.7	0.2	14.7	45.2	–28.3
≤44	41.3	43.8	0.4	14.5	55.8	–2.6
≤49	51.2	33.9	1.1	13.8	65.0	+21.6
≤54	61.4	23.7	2.5	12.4	73.8	+47.2
≤59	69.6	15.5	3.7	11.2	80.7	+67.9
≤64	76.1	9.0	5.7	9.2	85.3	+85.5
≤69	81.2	3.9	8.8	6.1	87.3	+89.6
≤74	83.4	1.7	10.7	4.2	87.6	+87.4
≤79	84.6	0.4	12.7	2.2	86.8	+85.0
≤84	84.9	0.2	13.8	1.1	86.0	+83.8
≤89	85.1	0.0	14.4	0.5	85.6	+83.1
≤94	85.1	0.0	14.8	0.1	85.2	+82.6
≤100	85.1	0.0	14.9	0.0	85.1	+82.5

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

Figure 11 ($4.00/day line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.1	Only poor targeted
≤14	0.5	100.0	0.5	Only poor targeted
≤19	1.8	100.0	2.1	Only poor targeted
≤24	5.4	100.0	6.4	Only poor targeted
≤29	11.8	99.9	13.9	705.9:1
≤34	20.8	99.7	24.3	313.5:1
≤39	30.6	99.5	35.8	180.9:1
≤44	41.7	99.0	48.5	103.7:1
≤49	52.3	97.9	60.1	45.8:1
≤54	63.9	96.1	72.1	24.7:1
≤59	73.3	94.9	81.8	18.6:1
≤64	81.8	93.1	89.4	13.4:1
≤69	90.0	90.2	95.5	9.2:1
≤74	94.1	88.6	98.0	7.8:1
≤79	97.4	86.9	99.5	6.7:1
≤84	98.7	86.0	99.8	6.2:1
≤89	99.5	85.5	100.0	5.9:1
≤94	99.8	85.2	100.0	5.8:1
≤100	100.0	85.1	100.0	5.7:1

Tables for
the $5.00/day 2005 PPP Poverty Line

Figure 4 ($5.00/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	100.0
20–24	99.8
25–29	99.8
30–34	99.8
35–39	99.2
40–44	98.3
45–49	98.1
50–54	96.6
55–59	91.6
60–64	87.7
65–69	83.2
70–74	73.6
75–79	59.9
80–84	43.1
85–89	26.9
90–94	19.0
95–100	13.4

Figure 6 ($5.00/day line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	0.0	0.0	0.0	0.0
10–14	0.0	0.0	0.0	0.0
15–19	0.0	0.0	0.0	0.0
20–24	–0.2	0.1	0.1	0.1
25–29	–0.2	0.1	0.1	0.1
30–34	–0.2	0.1	0.1	0.1
35–39	–0.6	0.4	0.4	0.4
40–44	–1.1	0.6	0.7	0.7
45–49	+4.1	1.4	1.6	2.1
50–54	+0.9	1.1	1.3	1.6
55–59	–4.0	2.4	2.5	2.7
60–64	–3.2	2.2	2.3	2.6
65–69	+1.9	1.9	2.2	2.8
70–74	+6.8	3.5	4.0	5.5
75–79	+8.9	4.6	5.4	7.1
80–84	+14.2	5.5	6.6	8.8
85–89	–9.0	8.4	9.2	12.7
90–94	+19.0	0.0	0.0	0.0
95–100	+6.1	6.3	7.4	9.8

Figure 7 ($5.00/day line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+1.0	45.2	54.8	72.5
4	+1.0	25.5	32.0	42.2
8	+0.4	18.6	22.3	32.3
16	+0.4	12.8	14.9	21.9
32	+0.6	9.1	11.0	14.5
64	+0.6	6.8	7.8	10.5
128	+0.6	4.8	5.7	7.3
256	+0.7	3.6	4.1	5.2
512	+0.7	2.4	2.8	3.8
1,024	+0.7	1.8	2.2	2.6
2,048	+0.7	1.2	1.5	2.0
4,096	+0.7	0.9	1.0	1.4
8,192	+0.7	0.6	0.7	0.9
16,384	+0.7	0.4	0.5	0.7

Figure 10 ($5.00/day line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	90.9	0.0	9.1	9.1	–100.0
≤9	0.1	90.8	0.0	9.1	9.2	–99.8
≤14	0.5	90.4	0.0	9.1	9.6	–99.0
≤19	1.8	89.0	0.0	9.1	11.0	–96.0
≤24	5.4	85.4	0.0	9.1	14.6	–88.1
≤29	11.8	79.0	0.0	9.1	21.0	–74.0
≤34	20.8	70.1	0.0	9.1	29.9	–54.3
≤39	30.6	60.3	0.0	9.1	39.7	–32.7
≤44	41.5	49.3	0.1	9.0	50.5	–8.5
≤49	51.7	39.1	0.5	8.6	60.3	+14.5
≤54	62.8	28.0	1.1	8.1	70.9	+39.5
≤59	71.7	19.2	1.6	7.5	79.2	+59.6
≤64	79.1	11.8	2.6	6.5	85.6	+77.0
≤69	85.6	5.2	4.4	4.7	90.4	+93.4
≤74	88.4	2.5	5.7	3.4	91.8	+93.7
≤79	90.1	0.7	7.2	1.9	92.0	+92.0
≤84	90.5	0.3	8.1	1.0	91.6	+91.1
≤89	90.8	0.0	8.6	0.5	91.4	+90.5
≤94	90.8	0.0	9.0	0.1	91.0	+90.1
≤100	90.9	0.0	9.1	0.0	90.9	+89.9

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

Figure 11 ($5.00/day line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.1	Only poor targeted
≤14	0.5	100.0	0.5	Only poor targeted
≤19	1.8	100.0	2.0	Only poor targeted
≤24	5.4	100.0	6.0	Only poor targeted
≤29	11.8	100.0	13.0	Only poor targeted
≤34	20.8	100.0	22.8	Only poor targeted
≤39	30.6	99.9	33.6	799.6:1
≤44	41.7	99.7	45.7	286.8:1
≤49	52.3	99.0	56.9	94.4:1
≤54	63.9	98.4	69.1	59.8:1
≤59	73.3	97.8	78.9	43.6:1
≤64	81.8	96.8	87.1	29.9:1
≤69	90.0	95.1	94.3	19.4:1
≤74	94.1	93.9	97.3	15.5:1
≤79	97.4	92.6	99.2	12.4:1
≤84	98.7	91.8	99.7	11.2:1
≤89	99.5	91.3	100.0	10.5:1
≤94	99.8	91.0	100.0	10.1:1
≤100	100.0	90.9	100.0	9.9:1

Tables for
the $1.90/day 2011 PPP Poverty Line

Figure 4 ($1.90/day 2011 PPP line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	96.3
5–9	96.3
10–14	75.7
15–19	71.4
20–24	62.5
25–29	48.0
30–34	36.8
35–39	25.9
40–44	15.4
45–49	10.6
50–54	7.9
55–59	2.9
60–64	0.5
65–69	0.5
70–74	0.5
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($1.90/day 2011 PPP line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	+25.9	19.6	24.5	32.6
10–14	+43.7	10.4	12.4	16.9
15–19	+13.7	7.0	8.3	10.8
20–24	+1.1	3.6	4.3	5.6
25–29	+3.2	2.8	3.2	4.5
30–34	–1.4	2.4	2.9	3.8
35–39	0.0	2.2	2.6	3.5
40–44	–1.5	1.6	1.8	2.5
45–49	+1.4	1.4	1.7	2.1
50–54	+1.4	1.2	1.4	1.8
55–59	–3.2	2.3	2.5	2.7
60–64	–0.1	0.3	0.4	0.5
65–69	–1.8	1.3	1.4	1.6
70–74	+0.5	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 7 ($1.90/day 2011 PPP line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.3	66.3	69.4	84.2
4	0.0	27.2	33.3	45.0
8	+0.1	19.9	24.9	33.2
16	–0.2	14.1	17.2	24.4
32	0.0	9.9	11.8	15.7
64	–0.1	7.0	8.3	11.7
128	0.0	4.7	5.6	7.4
256	0.0	3.4	4.1	5.4
512	0.0	2.4	3.0	3.6
1,024	0.0	1.7	2.0	2.7
2,048	–0.1	1.2	1.5	2.1
4,096	–0.1	0.8	1.1	1.3
8,192	0.0	0.6	0.7	1.0
16,384	–0.1	0.4	0.5	0.7

Figure 10 ($1.90/day 2011 PPP line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	16.6	0.0	83.4	83.4	–100.0
≤9	0.1	16.6	0.0	83.3	83.4	–99.1
≤14	0.3	16.3	0.2	83.2	83.5	–95.5
≤19	1.2	15.5	0.6	82.7	83.9	–82.1
≤24	3.4	13.2	2.0	81.4	84.8	–46.9
≤29	6.4	10.2	5.5	77.9	84.3	+9.5
≤34	9.6	7.0	11.1	72.2	81.9	+33.0
≤39	12.2	4.5	18.4	64.9	77.1	–10.9
≤44	14.1	2.5	27.5	55.8	70.0	–65.7
≤49	15.2	1.4	37.0	46.3	61.6	–122.9
≤54	15.9	0.7	47.9	35.5	51.4	–188.4
≤59	16.4	0.2	56.9	26.5	42.9	–242.4
≤64	16.5	0.1	65.3	18.1	34.6	–292.8
≤69	16.6	0.0	73.4	10.0	26.6	–341.8
≤74	16.6	0.0	77.4	5.9	22.6	–366.0
≤79	16.6	0.0	80.8	2.6	19.2	–385.9
≤84	16.6	0.0	82.0	1.3	18.0	–393.7
≤89	16.6	0.0	82.8	0.5	17.2	–398.4
≤94	16.6	0.0	83.2	0.2	16.8	–400.8
≤100	16.6	0.0	83.4	0.0	16.6	–401.7

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

Figure 11 ($1.90/day 2011 PPP line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	96.3	0.0	26.0:1
≤9	0.1	63.6	0.3	1.7:1
≤14	0.5	61.9	1.7	1.6:1
≤19	1.8	64.7	7.0	1.8:1
≤24	5.4	63.0	20.5	1.7:1
≤29	11.8	53.9	38.4	1.2:1
≤34	20.8	46.4	57.9	0.9:1
≤39	30.6	39.7	73.1	0.7:1
≤44	41.7	33.9	84.9	0.5:1
≤49	52.3	29.1	91.7	0.4:1
≤54	63.9	25.0	95.9	0.3:1
≤59	73.3	22.4	98.6	0.3:1
≤64	81.8	20.2	99.1	0.3:1
≤69	90.0	18.5	100.0	0.2:1
≤74	94.1	17.7	100.0	0.2:1
≤79	97.4	17.1	100.0	0.2:1
≤84	98.7	16.8	100.0	0.2:1
≤89	99.5	16.7	100.0	0.2:1
≤94	99.8	16.6	100.0	0.2:1
≤100	100.0	16.6	100.0	0.2:1

Tables for
the $3.10/day 2011 PPP Poverty Line

Figure 4 ($3.10/day 2011 PPP line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	95.4
15–19	95.3
20–24	92.0
25–29	87.5
30–34	76.4
35–39	65.8
40–44	50.7
45–49	42.5
50–54	32.0
55–59	20.4
60–64	15.4
65–69	7.8
70–74	4.8
75–79	1.8
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($3.10/day 2011 PPP line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	+24.6	18.8	22.7	28.6
10–14	–4.6	2.3	2.3	2.3
15–19	+8.7	5.3	6.1	8.3
20–24	–3.7	2.5	2.6	2.7
25–29	+4.6	2.4	2.9	4.1
30–34	+2.5	2.4	2.8	3.5
35–39	–0.5	2.3	2.8	3.5
40–44	–5.0	3.6	3.8	4.1
45–49	+4.3	2.4	2.8	3.7
50–54	+0.8	2.4	2.8	3.6
55–59	+0.6	1.9	2.2	3.0
60–64	–1.1	1.9	2.3	3.2
65–69	–0.6	1.4	1.7	2.1
70–74	+4.6	0.2	0.2	0.3
75–79	+1.8	0.0	0.0	0.0
80–84	–0.3	0.3	0.4	0.5
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 7 ($3.10/day 2011 PPP line): Differences and confidence intervals for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–1.7	66.9	75.3	89.9
4	+0.2	39.7	46.1	58.3
8	+0.4	27.3	33.3	42.6
16	+0.1	19.9	23.6	30.1
32	+0.2	14.4	17.0	20.7
64	+0.1	10.0	11.4	15.5
128	+0.4	6.9	8.2	10.9
256	+0.5	4.9	6.0	7.5
512	+0.6	3.4	4.2	5.6
1,024	+0.6	2.5	2.9	3.8
2,048	+0.5	1.8	2.1	2.8
4,096	+0.5	1.2	1.5	1.9
8,192	+0.6	0.9	1.0	1.4
16,384	+0.6	0.6	0.7	0.9

Figure 10 ($3.10/day 2011 PPP line): Households by targeting classification and score, along with the "Hit Rate" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	41.1	0.0	58.9	58.9	–100.0
≤9	0.1	41.1	0.0	58.9	58.9	–99.6
≤14	0.4	40.7	0.0	58.9	59.3	–97.8
≤19	1.7	39.5	0.1	58.7	60.4	–91.6
≤24	5.1	36.0	0.3	58.5	63.6	–74.5
≤29	10.5	30.6	1.3	57.6	68.1	–45.7
≤34	17.4	23.7	3.4	55.5	72.9	–7.3
≤39	23.8	17.4	6.8	52.0	75.8	+32.2
≤44	29.7	11.4	11.9	47.0	76.7	+71.0
≤49	33.8	7.4	18.5	40.4	74.1	+54.9
≤54	37.2	3.9	26.6	32.2	69.5	+35.2
≤59	39.3	1.9	34.0	24.8	64.1	+17.2
≤64	40.4	0.7	41.3	17.6	58.0	–0.5
≤69	41.1	0.0	49.0	9.9	51.0	–19.1
≤74	41.1	0.0	53.0	5.9	47.0	–28.8
≤79	41.1	0.0	56.3	2.6	43.7	–36.8
≤84	41.1	0.0	57.5	1.3	42.5	–40.0
≤89	41.1	0.0	58.3	0.5	41.7	–41.9
≤94	41.1	0.0	58.7	0.2	41.3	–42.8
≤100	41.1	0.0	58.9	0.0	41.1	–43.2

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

Figure 11 ($3.10/day 2011 PPP line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successfully targeted (included) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	72.3	0.2	2.6:1
≤14	0.5	94.7	1.1	18.0:1
≤19	1.8	92.1	4.0	11.7:1
≤24	5.4	93.9	12.4	15.3:1
≤29	11.8	88.8	25.6	8.0:1
≤34	20.8	83.8	42.3	5.2:1
≤39	30.6	77.7	57.8	3.5:1
≤44	41.7	71.4	72.3	2.5:1
≤49	52.3	64.6	82.1	1.8:1
≤54	63.9	58.3	90.5	1.4:1
≤59	73.3	53.6	95.5	1.2:1
≤64	81.8	49.4	98.3	1.0:1
≤69	90.0	45.6	99.9	0.8:1
≤74	94.1	43.7	100.0	0.8:1
≤79	97.4	42.2	100.0	0.7:1
≤84	98.7	41.7	100.0	0.7:1
≤89	99.5	41.3	100.0	0.7:1
≤94	99.8	41.2	100.0	0.7:1
≤100	100.0	41.1	100.0	0.7:1