Simple Poverty Scorecard® Poverty-Assessment Tool Afghanistan

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Abstract

The Simple Poverty Scorecard®-brand poverty-assessment tool uses ten low-cost indicators from Afghanistan's 2007/8 National Risk and Vulnerability Assessment to estimate the likelihood that a household has expenditure 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 Afghanistan to measure poverty rates, to track changes in poverty rates over time, and to segment clients for targeted services.

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Simple Poverty Scorecard® Poverty-Assessment Tool

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

Indicator	Value	Points	Score
1. How many household members are 16-years-old or younger?	A. Seven or more	0	
	B. Five or six	4	
	C. Four	9	
	D. Three	12	
	E. Two	17	
	F. One	23	
	G. None	29	
2. Can both the male head/spouse and the female head/spouse read and write?	A. No male head/spouse	0	
	B. No female head/spouse	5	
	C. No	5	
	D. Yes	11	
3. What type of dwelling best describes where the household lives?	A. Temporary shelter/shack, part of a shared house, separate apartment, shared apartment, tent, or other	0	
	B. Single-family house	3	
4. How many rooms (both exclusively yours and shared) does your household occupy (exclude corridors and balconies)?	A. One to four	0	
	C. Five or more	4	
5. Which main toilet facility does the household use?	A. None (open field, bush) or *sahrahi*, *dearan* (area inside or outside compound but not pit), or other	0	
	B. Open pit	5	
	C. Traditional covered latrine	6	
	D. Improved latrine, or flush latrine	11	
6. In the past 30 days, what has been the household's main source of cooking fuel?	A. Animal dung, scavenged material/trash, bushes (*ping*)/twigs, branches, or other	0	
	B. Crop residues, firewood, charcoal/coal, kerosene or oil, gas, or electricity	4	
7. How many stoves/gas cylinders does the household own?	A. None	0	
	B. One	1	
	C. Two or more	9	
8. Does the household own any sewing machines?	A. No	0	
	B. Yes	3	
9. Does the household own any motorcycles or cars?	A. No	0	
	B. Motorcycle only	12	
	C. Car (regardless of motorcycle)	22	
10. Did anyone in the household own or have access to any irrigated land in the most recent summer cultivation season, excluding a garden plot?	A. No	0	
	E. Yes	4	

Score:

Conversion of scores to poverty likelihoods

	Poverty likelihood (%)					
	National			USAID	Intl. 2005 PPP	
Score	100%	150%	200%	'Extreme'	$1.25	$2.50
0–4	100.0	100.0	100.0	100.0	100.0	100.0
5–9	68.8	90.2	96.7	44.4	22.2	79.0
10–14	66.1	89.5	96.5	39.2	19.5	82.8
15–19	59.5	89.1	97.2	35.2	13.6	79.9
20–24	51.3	85.5	96.4	28.8	10.7	72.5
25–29	43.5	81.1	93.2	20.0	6.8	68.6
30–34	31.9	74.5	90.4	13.6	3.6	57.3
35–39	24.6	66.9	87.3	7.9	1.8	46.9
40–44	15.2	58.0	82.8	4.5	0.5	35.8
45–49	11.4	47.9	73.4	4.2	0.5	26.2
50–54	6.0	37.2	68.4	2.6	0.9	19.3
55–59	2.7	26.1	61.3	0.5	0.0	12.9
60–64	0.9	21.0	50.4	0.5	0.0	7.1
65–69	0.0	14.3	37.1	0.0	0.0	6.0
70–74	3.0	14.3	29.2	0.0	0.0	6.7
75–79	0.0	1.4	5.1	0.0	0.0	1.4
80–84	0.0	0.0	9.5	0.0	0.0	0.0
85–89	0.0	0.0	15.2	0.0	0.0	0.0
90–94	0.0	0.0	0.0	0.0	0.0	0.0
95–100	0.0	0.0	0.0	0.0	0.0	0.0

Simple Poverty Scorecard® Poverty-Assessment Tool Afghanistan

1. Introduction

Pro-poor programs in Afghanistan can use the Simple Poverty Scorecard poverty-assessment tool as a low-cost way to estimate the likelihood that a household has expenditure below a given poverty line, to measure groups' poverty rates at a point in time, to track changes in groups' poverty rates over time, and to segment clients for targeted services.

The direct approach to poverty measurement via surveys is difficult and costly, asking households about a lengthy list of expenditure items. As a case in point, Afghanistan's 2007/8 National Risk and Vulnerability Assessment (NRVA) runs 75 pages and covers almost 100 expenditure items. The fieldwork plan calls for teams of two enumerators (male and female) to interview two households per day, spending 75 to 120 minutes with each. An example set of questions for an expenditure item are "How much rice was consumed in the last seven days? What was the source of this rice? How many days did you eat rice in the past seven days? Now then, how much wheat flour was used in the past seven days? . . ." Prices for expenditure items come from a parallel community survey.

In contrast, the indirect approach via the scorecard is simple, quick, and inexpensive. It uses ten verifiable indicators (such as "Does the household own any

sewing machines?" or "Which main toilet facility does your household use?") to get a score that is highly correlated with poverty status as measured by the exhaustive survey.

The scorecard differs from "proxy means tests" (Coady, Grosh, and Hoddinott, 2002) in that 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 these organizations are typically subjective and relative (such as participatory wealth ranking by skilled field agents) or blunt (such as rules based on land-ownership or housing quality). Measurements from these approaches may not be comparable across organizations, they may be costly, and their accuracy and precision are unknown.

Pro-poor organizations can use the scorecard to measure the share of their participants below a given poverty line, such as the Millennium Development Goals' \$1.25/day at 2005 purchase-power parity. USAID microenterprise partners can use it to report how many of its participants are among the poorest half of people below the national poverty line. Organizations can also use it to measure movement across a poverty line over time. In all these cases, the scorecard provides an expenditure-based, objective tool with known accuracy. While expenditure surveys are costly even for governments, some small, local organizations may be able to implement an inexpensive poverty-assessment tool that can serve for monitoring and targeting.

The statistical approach here aims to be understood by non-specialists. After all, if managers are to adopt the scorecard on their own and apply it to inform their decisions, 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 at the local level. This is not because they do not work, but because they are presented (when they are presented at all) as tables of regression coefficients incomprehensible to non-specialists (with cryptic indicator names such as "`LGHHSZ_2`", negative values, and many decimal places). Thanks to the predictive-modeling phenomenon known as the "flat maximum", simple poverty-assessment tools are usually about as accurate as complex ones.

The technical approach here is innovative in how it associates scores with poverty likelihoods, in how it derives formulas for standard errors, and in the extent of its accuracy tests. These simple tests are common in statistical practice and in for-profit credit-risk scoring, but they have rarely been applied to poverty-assessment tools.

The scorecard is based on the 2007/8 NRVA conducted by Afghanistan's Central Statistics Organization (CSO) and the Ministry of Rural Rehabilitation and Development (MRRD). Indicators are selected to be:

- Inexpensive to collect, easy to answer quickly, and simple to verify
- Associated with poverty
- Liable to change over time as poverty status changes

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 five to 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 expenditure below a given poverty line.

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

Third, the scorecard can estimate changes in the poverty rate for a group of households (or for two independent samples of households that are representative of the same population) between two points in time. This estimate is the change in the average poverty likelihood of the group(s) of households over time.

The scorecard can also be used for targeting. To help organizations choose an appropriate targeting cut-off 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 expenditure data and Afghanistan's national poverty line. Scores from this one scorecard are calibrated to poverty likelihoods for six poverty lines.

The scorecard is constructed and calibrated using half of the households in the 2007/8 NRVA, and its accuracy is validated on the other half.

While all three scoring estimators are *unbiased* (that is, they match the true value on average in repeated samples when applied to the same population from which the scorecard was built), they are—like all predictive models—biased to some extent when applied to a different population.[1]

Thus, while the indirect scoring approach is less costly than the direct survey approach, it is also biased. There is bias because scoring must assume that the relationship between indicators and poverty in any future application with any particular group will be the same as in the data used to build the scorecard. Of course, this unavoidable assumption holds only partly.

When applied to the validation sample with bootstrap samples of $n = 16{,}384$, the difference between scorecard estimates of groups' poverty rates and the true rates at a point in time for the national poverty line is +2.7 percentage points (Figure 9). Across all six lines, the average difference is +1.6 percentage points. These differences are due to sampling variation and not bias; the average of each difference would be zero if the entire 2007/8 NRVA were to be repeatedly redone and divided into sub-samples before repeating the entire process of construction and calibration.

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

[1] Important examples in practice include nationally representative samples after 2007/8 or non-nationally representative sub-groups (Tarozzi and Deaton, 2007).

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 is a summary.

2. Data and poverty lines

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

2.1 Data

The scorecard is based the 20,537 households with complete expenditure data in the 2007/8 NRVA surveyed by Afghanistan's CSO and MRRD from September 2007 to August 2008 (Asad 1386 to Sunbula 1387).

For the purposes of scoring, the households in the 2007/8 NRVA are randomly divided into two sub-samples (Figure 1):

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

2.2 Poverty rates and poverty lines

2.2.1 Rates

As a general definition, a *poverty rate* is the share of people in a group who live in households whose total household expenditure (divided by the number of household members) is below a given poverty line.

Beyond this general definition, there two special cases, *household-level poverty rates* and *person-level poverty rates*. With household-level rates, each household is

counted as if it had only one person, regardless of true household size, so all households are counted equally. With person-level rates (the "head-count index"), each household is weighted by the number of people in it, so larger households count more.

For example, consider a group of two households, the first with one member and the second with two members. Suppose further that the first household has per-capita expenditure above a poverty line (it is "non-poor") and that the second household has per-capita expenditure below a poverty line (it is "poor"). The household-level rate counts both households as if they had only one person and so gives a poverty rate of $1 \div (1 + 1) = 50$ percent. In contrast, the person-level rate weighs each household by the number of people in it and so gives a poverty rate of $2 \div (1 + 2) = 67$ percent.

Whether the household-level rate or the person-level rate is more relevant depends on the situation. If an organization's "participants" include all the people in a household, then the person-level rate is relevant. Governments, for example, are concerned with the well-being of people, regardless of how those people are arranged in households, so governments typically report person-level poverty rates.

If an organization has only one "participant" per household, however, then the household-level rate may be relevant. For example, if a microlender has only one borrower in a household, then it might prefer to report household-level poverty rates.

Figure 1 reports poverty lines and poverty rates for Afghanistan at both the household- and person-level for the country as a whole and for the construction/calibration and validation sub-samples used for scoring. Figure 2 reports

poverty line and poverty rates for Afghanistan as a whole and for the 14 regions for which poverty lines are defined.

The scorecard is constructed using the 2007/8 NRVA and household-level lines, scores are calibrated to household-level poverty likelihoods, and accuracy is measured for household-level rates. Person-level poverty rates can be estimated as the household-size-weighted average of the household-level poverty likelihoods. It is also possible to construct a scorecard based on person-level lines, calibrate scores to person-level likelihoods, and measure accuracy for person-level rates, but it is not done here.

2.2.2 Poverty lines

Icon Institute (2009) and CSO and World Bank (2011) document the derivation of Afghanistan's national poverty line. It begins with finding per-capita aggregate (food and non-food) household expenditure following Deaton and Zaidi (2002). Cost-of-living adjustments for food and non-food items are applied so that expenditure has units as of September to November 2007 (Asad to Aqrab 1386) in the central urban region. These adjust for a food-price spike that occurred during the survey and for the wide variation in expenditure and prices from summer to winter. Poverty lines are also adjusted for geographic variation in cost-of-living across 14 regions.

A food poverty line is derived with the cost-of-basic-needs method (Ravaillon, 1998) as the cost of 2,100 Calories from a basket of items consumed by households in the 20^{th} to 50^{th} percentiles of consumption for Afghanistan as a whole. The food line averages AFN22.68 per person per day. Icon Institute (2009) does not report poverty

rates for this line. CSO and World Bank (2011) reports rates based on comparing food expenditure to food lines, but it is more common to compare total expenditure to food lines. To avoid contradicting published numbers, this paper does not report food poverty rates, nor does it calibrate scores to the food line.

The non-food component of the national (food and non-food) line is defined for a given region as the median expenditure on non-food in the 2007/8 NRVA by the 10 percent of households in the region whose food expenditure is just under the food line and by the 10 percent of households in the region whose food expenditure is just above the food line. That is, the non-food component is the non-food expenditure by households whose food expenditure is close to the food line. The national poverty line is then the sum of the food line and the non-food component. On average for Afghanistan, the national line is AFN41.27/person/day (Figure 1), giving a household-level poverty rate of 32.8 percent and a person-level rate of 36.0 percent.

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

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

The USAID "extreme" line is defined as the median expenditure of people (not households) below the national line (U.S. Congress, 2004). This median line is defined for 14 geographic regions.

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

- 2005 PPP exchange rate for "individual consumption expenditure by households" (Sun and Swanson, 2009): AFN16.71 per $1.00
- Average all-Afghanistan consumer price index for 2005 of 114.46[2]
- Average all-Afghanistan CPI for Sept.–Nov. 2007 (Asad to Aqrab 1386) of 142.13[3]
- 14 regional national poverty lines (L_i, $i = 1, 2, \ldots 14$) from Figure 2
- Person-weighted average of the 14 regional national lines L_i: AFN41.27

Given this, the $1.25/day 2005 PPP line for region r in AFN as of Sept.–Nov. 2007 is (Sillers, 2006):

$$(\text{2005 PPP exchange rate}) \cdot \$1.25 \cdot \left(\frac{\text{CPI}_{\text{Sept.-Nov. 2007}}}{\text{CPI}_{\text{Ave. 2005}}} \right) \cdot \frac{L_r}{\left(\sum_{i=1}^{14} \frac{L_i}{14} \right)}.$$

For the example of the Central urban region, the national line is AFN63.63 per person per day (Figure 2), so the $1.25/day 2005 PPP line is:

$$16.71 \cdot \$1.25 \cdot \left(\frac{142.13}{114.46} \right) \cdot \left(\frac{63.63}{41.27} \right) = 39.99.$$

The average $1.25/day line across all 14 regions in Afghanistan is AFN25.94/person/day, for a household-level poverty rate of 5.5 percent and a person-level rate of 6.4 percent. The $2.50/day 2005 PPP line is twice the $1.25/day line.

[2] International Monetary Fund. (2006) "Islamic Republic of Afghanistan: Selected Issues and Statistical Appendix", `http://www.imf.org/external/pubs/ft/scr/2006/cr06114.pdf`, retrieved 5 August 2011.

[3] CSO. (2008) *National CPI Year Book*, Table 2.

3. Scorecard construction

For Afghanistan, about 100 potential indicators are initially prepared in the areas of:

- Family composition (such as household size)
- Education (such as literacy of the head and spouse)
- Employment (such as the number of household members working in agriculture)
- Housing (such as the type of toilet facility)
- Ownership of durable goods (such as sewing machines or motorcycles)
- Agriculture (such as owning or managing irrigated land)

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

The scorecard also aims to measure *changes* in poverty through time. This means that, when selecting indicators and holding other considerations constant, preference is given to more sensitive indicators. For example, the number of stoves/gas cylinders owned is probably more likely to change in response to changes in poverty than is the age of the male head/spouse.

The scorecard itself is built using the national poverty line and Logit regression with 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 accuracy is taken as "c", a measure of ability to rank by poverty status (SAS Institute Inc., 2004).

One of these one-indicator scorecards is then selected based on several factors (Schreiner *et al.*, 2004; Zeller, 2004). These include improvement in accuracy, likelihood of acceptance by users (determined by simplicity, cost of collection, and "face validity" in terms of experience, theory, and common sense), sensitivity to changes in poverty status, variety among indicators, and verifiability.

A series of two-indicator scorecards are then built, each based on the one-indicator scorecard selected from the first step, with a second candidate indicator added. The best two-indicator scorecard is then selected, again based on "c" and judgment. These steps are repeated until the scorecard has 10 indicators.

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

This algorithm is the Logit analogue to the common R^2-based stepwise least-squares regression. It differs from naïve stepwise in that the criteria for selecting indicators include not only statistical accuracy but also non-statistical factors. 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 Afghanistan. Evidence from India and Mexico (Schreiner, 2006 and 2005a), Sri Lanka (Narayan and Yoshida, 2005), and Jamaica (Grosh and Baker, 1995) suggests that segmenting scorecards by urban/rural

does not improve targeting accuracy much, although segmentation may improve the accuracy of estimates of poverty rates (Tarozzi and Deaton, 2007).

Compared with scorecards for most other countries, the indicators and points in the Afghanistan scorecard are less suited for separating households just below the national poverty line from households just above it. Reasons for this include:

- Odd data, perhaps due to the security situation in Afghanistan
- Sharp urban/rural divide, with most households being rural and more likely to be poor, and nomadic *Kuchi* households being the most likely to be poor
- Sharp divide between a large mass of relatively homogeneous and poorer households and a much smaller group of elite households
- Bunching of about one-third of all households with expenditure within about 20 percent of the poverty line
- Low levels of education, especially for females but also for males

For example, the second indicator "Can both the male head/spouse and the female head/spouse read and write?" mostly serves to identify two rare types of households with extreme poverty likelihoods. Both spouses are literate in five percent of households, and these households are unlikely to be poor. Two percent of households have no male head, and they are likely to be poor. This literacy indicator does not help to distinguish among the other 93 percent of households, the ones closest to the national poverty line.

The fourth indicator ("How many rooms does your household occupy?") also separates the elite from the masses while not helping much to distinguish between those just above or just below the poverty line. This is because less than one in five households have five or more rooms, and few of these households are near the poverty

line. The vast majority of households—including those closest to the poverty line—all get the same points for this indicator.

Likewise, points vary a lot for the seventh indicator ("How many stoves/gas cylinders does the household own?") only for the 21 percent of households who have two or more stoves/gas cylinders. For the remaining 79 percent, having a stove or a gas cylinder (or not) changes the total score by a single point.

Another example is the ninth indicator ("Does the household own any motorcycles or cars?"). More than four in five households do not own either one, and so most of the point variation happens among households who probably are far from the national poverty line and who would not be difficult to identify as non-poor even without this indicator.

To recap, these four indicators separate the elite from the masses, but the challenge is to separate the masses below the poverty line from the masses above it.

The other six indicators are more relevant, having a more even distribution of responses among households and having more variation in responses for households near the national poverty line. Nevertheless, many of the available 100 points have been assigned to the four "elite" indicators, leaving few points to allocate among the more relevant indicators. For example, 44 percent of households do not own a sewing machine, and 56 percent do, but owners get only 3 points. Likewise, 57 percent of households have no irrigated agricultural land, and 43 percent do, but those with irrigated land get only 4 points. Having a less-poor type of cooking arrangement or a

less-poor type of dwelling also implies just three or four points. This matters because scores are grouped into ranges (such as 0–4, 5–9, etc.) before conversion to poverty likelihoods, so a given response may not suffice to move a household from one range to the next, or may move it only one range. While this does not affect the unbiasedness of estimated poverty rates, it does reduce the granularity of poverty likelihoods and thus the fineness of targeting.

Unfortunately, there are no better alternative indicators in the 2007/8 NRVA. Either the responses are even more lop-sided, the points vary even less, or the pattern of points runs against common sense.

Nevertheless, the accuracy measures in this paper are correct, and the Afghanistan scorecard can still be useful. The low relevance of four indicators and the unusual lack of granularity in poverty likelihoods are not mortal flaws, but users should be aware of them. For example, bias (Figure 9) is unusually large and one-sided, but knowing this, users can simply subtract the bias from their estimates of poverty rates. Standard errors are slightly larger than for most other countries with scorecards, and targeting accuracy is slightly lower. The nature of the data and of Afghanistan itself is such that there are many people who are below the poverty line who—to the scorecard—look similar to many people who are above the line.

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 scoring is actually adopted and used in practice (Schreiner, 2005b). When scoring projects fail, the reason is not usually statistical inaccuracy but rather the failure of an organization to decide to do what is needed to integrate scoring in its processes and to learn to use it properly (Schreiner, 2002). After all, most reasonable scorecards have similar targeting accuracy, thanks to the empirical phenomenon known as the "flat maximum" (Falkenstein, 2008; 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 adopt it and use it properly. Of course, accuracy matters, but it is balanced against simplicity, ease-of-use, and "face validity". Programs are more likely to collect data, compute scores, and pay attention to the results if, in their view, scoring does not make a lot of "extra" work and if the whole process generally seems to make sense.

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

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

A field agent using the paper scorecard would:

- Record participant identifiers and household size
- Read each question from the scorecard
- Circle the response and its point value
- Write the point value in the far-right column
- Add up the points to get the total score
- Implement targeting policy (if any)
- Deliver the paper scorecard to a central office for filing or data entry

Of course, field agents must be trained. The quality of outputs depends on the quality of inputs. If organizations or field agents gather their own data and believe that they have an incentive to exaggerate poverty rates (for example, if funders or managers reward higher poverty rates), then it is wise to do on-going quality control via data review and audits (Matul and Kline, 2003).[4] Toohig (2008) and IRIS Center (2007a) are useful nuts-and-bolts guides for budgeting, training field agents and supervisors, logistics, sampling, interviewing, piloting, recording data, and controlling quality.

In particular, while collecting scorecard indicators is relatively easier than alternatives, it is still absolutely difficult. Field agents must be trained, and the terms

[4] If an organization does not want field agents to know the point values associated with indicators, then they can make a version of the scorecard that does not show the points and then apply the points later in a spreadsheet or database at the central office.

and concepts in the scorecard must be explicitly defined (see Appendix). For the example of Nigeria, Onwujekwe, Hanson, and Fox-Rushby (2006) found distressingly low inter-rater and test-retest correlations for indicators as seemingly simple and obvious as whether the household owns a car. At the same time, Grosh and Baker (1995) find that gross underreporting of assets does not affect targeting. For the first stage of targeting in a conditional cash-transfer program in Mexico, Martinelli and Parker (2007) find that "underreporting [of asset ownership] is widespread but not overwhelming, except for a few goods . . . [and] overreporting is common for a few goods, which implies that self-reporting may lead to the exclusion of deserving households" (pp. 24–25). Still, as is done in Mexico in the second stage of its targeting process, most false self-reports can be corrected by field agents who verify responses with a home visit, and this is suggested for the scorecard in Afghanistan.

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

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

In general, the sampling design should follow from the organization's goals for the exercise and from the questions that the analysis seeks to inform. Determining these goals and questions is the key to the entire process.

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

- Employees of the organization
- Third-party contractors

Responses, scores, and poverty likelihoods can be recorded:

- On paper in the field and then filed at an office
- On paper in the field and then keyed into a database or spreadsheet at an office
- On portable electronic devices in the field and downloaded to a database

Given a well-defined group that is relevant to a particular business question, the subjects to be scored can be:

- All participants in the group
- A representative sample of all participants in the group
- All participants in a representative sample of branches
- A representative sample of all participants in a representative sample of branches

If not determined by other factors, the number of participants to be scored can be derived from sample-size formulas (presented later) for a desired level of confidence and a desired confidence interval.

Frequency of application can be:

- At in-take of new clients only (precluding measuring change in poverty rates)
- As a once-off project for current participants (precluding measuring change)
- Once a year, or at some other fixed time interval (allowing measuring change)
- Each time a field agent visits a participant at home (allowing measuring change)

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

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

An example set of choices is illustrated by BRAC and ASA, two microlenders in Bangladesh who each have more than 7 million participants and who are applying the

Simple Poverty Scorecard tool for Bangadesh (Schreiner, 2013). Their design is that loan officers in a random sample of branches score all participants each time they visit a homestead (about once a year) as part of their standard due diligence prior to loan disbursement. Responses are recorded on paper in the field before being sent to a central office to be entered into a database. ASA's and BRAC's sampling plans cover 50,000–100,000 participants each (far more than the typical pro-poor organization would need).

5. Estimates of household poverty likelihoods

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

To get absolute units, scores must be converted to *poverty likelihoods*, that is, probabilities of being below a poverty line. This is done via simple look-up tables. For the example of the national line, scores of 25–29 have a poverty likelihood of 43.5 percent, and scores of 30–34 have a poverty likelihood of 31.9 percent (Figure 4).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 25–29 are associated with a poverty likelihood of 43.5 percent for the national line but 6.8 percent for the $1.25/day 2005 PPP line.[5]

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 construction/calibration subsample who have the score and who are below a given poverty line.

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

For the example of the national line (Figure 5), there are 16,017 (normalized) households in the calibration sub-sample with a score of 25–29, of whom 6,967 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 25–29 is then 43.5 percent, because 6,967 ÷ 16,017 = 43.5 percent.

To illustrate with the national line and a score of 30–34, there are 16,614 (normalized) households in the construction/calibration sample, of whom 5,305 (normalized) are below the line (Figure 5). Thus, the poverty likelihood for this score is 5,305 ÷ 16,614 = 31.9 percent.

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

Figure 6 shows, for all scores, the likelihood that expenditure falls in a range demarcated by two adjacent poverty lines. For example, the daily per-capita expenditure of a household with a score of 25–29 falls in the following ranges with probability (Figure 6):

- 6.8 percent below $1.25/day 2005 PPP
- 13.2 percent between $1.25/day 2005 PPP and the USAID "extreme" line
- 23.5 percent between the USAID "extreme" line and 100% of the national line
- 25.1 percent between 100% of the national line and $2.50/day 2005 PPP
- 12.6 percent between $2.50/day 2005 PPP and 150% of the national line
- 12.0 percent between 150% of the national line and 200% of the national line
- 6.8 percent above 200% of the national line

Even though the scorecard is constructed partly based on non-statistical criteria, the calibration process produces poverty likelihoods that are objective, that is, derived from survey data on expenditure and quantitative poverty lines. The poverty likelihoods

would be objective even if indicators and/or points were selected without any data at all. In fact, objective scorecards of proven accuracy are often constructed using only expert judgment (Fuller, 2006; Caire, 2004; Schreiner *et al.*, 2004). Of course, the scorecard here is constructed with both data and judgment. The fact that this paper acknowledges that some choices in scorecard construction—as in any statistical analysis—are informed by judgment in no way impugns the objectivity of the poverty likelihoods, as this depends on using data in score calibration, not on using data (and nothing else) in scorecard construction.

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

5.2 Accuracy of estimates of households' poverty likelihoods

If the relationships between indicators and poverty do not change and if the scorecard is applied to households that are representative of the same population from which the scorecard was 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 poverty likelihood. The scorecard also produces unbiased estimates of poverty rates at a point in time, as well as unbiased estimates of changes in poverty rates between two points in time.[6]

Of course, the relationship between indicators and poverty does change to some unknown extent with time and also across sub-groups in Afghanistan's population. Thus, the scorecard will generally be biased when applied after August 2008 (the last month of fieldwork for the 2007/8 NRVA) or when applied with non-nationally representative sub-groups.

How accurate are estimates of households' poverty likelihoods? To get a measurement of accuracy under the assumption that the scorecard is applied to a nationally representative sample in the period from September 2007 to August 2008, the scorecard is applied to 1,000 bootstrap samples of size $n = 16{,}384$ from the validation sub-sample. Bootstrapping entails (Efron and Tibshirani, 1993):

- Score each household in the validation sample
- Draw a new bootstrap sample *with replacement* from the validation sample
- For each score, compute the true poverty likelihood in the bootstrap sample, that is, the share of households with the score and expenditure below a poverty line
- For each score, record the difference between the estimated poverty likelihood (Figure 4) and the true poverty likelihood in the bootstrap sample
- Repeat the previous three steps 1,000 times

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

- For each score, report the average difference between estimated and true poverty likelihoods across the 1,000 bootstrap samples
- For each score, report the two-sided interval containing the central 900, 950, and 990 differences between estimated and true poverty likelihoods

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

For the national line, the average poverty likelihood across bootstrap samples for scores of 25–29 in the validation sample is too high by 5.1 percentage points. For scores of 30–34, the estimate is too high by 2.4 percentage points.[7]

The 90-percent confidence interval for the differences for scores of 25–29 is ±1.7 percentage points (Figure 7). This means that in 900 of 1,000 bootstraps, the difference between the estimate and the true value is between +3.4 and +6.8 percentage points (because +5.1 – 1.7 = +3.4, and +5.1 + 1.7 = +6.8). In 950 of 1,000 bootstraps (95 percent), the difference is +5.1 ±2.0 percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is +5.1 ±2.6 percentage points.

Figure 7 shows differences—sometimes large and almost always positive—between estimated poverty likelihoods and true values. This is because the validation sub-sample is a single sample that—thanks to sampling variation—differs in distribution from the construction/calibration sub-samples and from Afghanistan's

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

population. The consistently positive bias is due in part to the weaknesses of the indicators and points discussed in Section 3, and also in part to a higher household-level poverty rate in the construction/calibration sample than in the validation sample (33.1 versus 32.5 percent, Figure 1).

If estimates of groups' poverty rates are to be usefully accurate, then errors for individual households must largely balance out. This is generally the case, as discussed in the next section.

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 NRVA fieldwork in August 2008. That is, it may fit the data from the 2007/8 NRVA so closely that it captures not only some timeless patterns but also some random patterns that, due to sampling variation, show up only in the 2007/8 NRVA. Or the scorecard may be overfit in the sense that it is sensitive to small changes in the relationships between indicators and poverty over time or when applied to non-nationally representative samples.

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

Most errors in individual households' likelihoods, however, cancel out in the estimates of groups' poverty rates (see later sections). Furthermore, at least some of the differences in practice come from non-scorecard sources such as changes in the

relationships between indicators and poverty, changes in poverty lines, inconsistencies in data quality across time, and imperfections in cost-of-living adjustments across time and geography. These factors can be addressed only by improving data quantity and quality (which is beyond the scope of the scorecard) or by reducing overfitting (which likely has limited returns, given the scorecard's parsimony).

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

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

To illustrate, suppose a program samples three households on Jan. 1, 2012 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 51.3, 31.9 and 15.2 percent (national line, Figure 4). The group's estimated poverty rate is the households' average poverty likelihood of $(51.3 + 31.9 + 15.2) \div 3 = 32.8$ percent.[8]

6.1 Accuracy of estimated poverty rates at a point in time

For the Afghanistan scorecard applied to the validation sample with $n = 16{,}384$, the difference between the estimated poverty rate and the true rate at a point in time for the national line is +2.7 percentage points (Figure 9, summarizing Figure 8 across poverty lines). Across all six lines, estimates differ from true values on average by +1.6 percentage points. At least part of these differences is due to sampling variation in the validation sample and in the division of the 2007/8 NRVA into two sub-samples.

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

[8] The group's poverty rate is *not* the poverty likelihood associated with the average score. The average score of 30 has a poverty likelihood of 31.9, but the average of the three poverty likelihoods associated with each of the three scores is 32.8 percent.

estimate and the true value is within 0.6 percentage points of the average difference. In the specific case of the national line and the validation sample, 90 percent of all samples of n = 16,384 produce estimates that differ from the true value in the range of +2.7 – 0.6 = +2.1 to +2.7 + 0.6= +3.3 percentage points. This is because +2.7 is the average difference, and ±0.6 is its 90-percent confidence interval. The average difference is +2.7 because the average scorecard estimate is too high by 2.7 percentage points; the average estimated poverty rate for the validation sample is 35.2 percent, but the true value is 32.5 percent (Figure 1).

6.2 Formula for standard errors for estimates of poverty rates

How precise are the point-in-time estimates? Because they are averages of binary (0/1, or poor/non-poor) measures, the estimates (in "large" samples) have a Normal distribution and can be characterized by their average difference vis-à-vis true values, together with the standard error of the average difference.

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

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

z is from the Normal distribution and is $\begin{cases} 1.64 \text{ for confidence levels of 90 percent} \\ 1.96 \text{ for confidence levels of 95 percent} \\ 2.58 \text{ for confidence levels of 99 percent} \end{cases}$,

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

p is the proportion of households below the poverty line in the sample, and

n is the sample size.

For example, this implies that for a sample n of 16,384 with 90-percent confidence ($z = 1.64$) and a poverty rate p of 33.1 percent (the poverty rate in the construction/calibration sample in Figure 1 for the national line), the confidence interval c is $\pm z \cdot \sqrt{\frac{p \cdot (1-p)}{n}} = \pm 1.64 \cdot \sqrt{\frac{0.331 \cdot (1-0.331)}{16{,}384}} = \pm 0.603$ percentage points.

The scorecard, however, does not measure poverty directly, so this formula is not immediately applicable. To derive a formula for the Afghanistan scorecard, consider Figure 8, which reports empirical confidence intervals c for the differences for the scorecard applied to 1,000 bootstrap samples of various sample sizes from the validation

sample. For $n = 16{,}384$ and the national line, the 90-percent confidence interval is 0.590 percentage points.[9]

Thus, the 90-percent confidence interval with $n = 16{,}384$ is 0.590 percentage points for the Afghanistan scorecard and 0.603 percentage points for direct measurement. The ratio of the two intervals is $0.590 \div 0.603 = 0.98$.

Now consider the same case, but with $n = 8{,}192$. The confidence interval under direct measurement is $\pm 1.64 \cdot \sqrt{\frac{0.331 \cdot (1 - 0.331)}{8{,}192}} = \pm 0.853$ percentage points. The empirical confidence interval with the Afghanistan scorecard (Figure 8) is 0.780 percentage points. Thus for $n = 8{,}192$, the ratio of the two intervals is $0.780 \div 0.853 = 0.91$.

This ratio of 0.91 for $n = 8{,}182$ is not too far from the ratio of 0.98 for $n = 16{,}384$. Across all sample sizes of 256 or more in Figure 8, the average ratio turns out to be 0.95, implying that confidence intervals for indirect estimates of poverty rates via the Afghanistan scorecard and this poverty line are slightly narrower than confidence intervals for direct estimates via the 2007/8 NRVA. This 0.95 appears in Figure 9 as the "α factor" because if $\alpha = 0.95$, then the formula relating confidence intervals c and standard errors σ for the Afghanistan scorecard is $c = \pm z \cdot \alpha \cdot \sigma$. That is, formula for the standard error σ for point-in-time estimates of poverty rates via scoring is $\alpha \cdot \sqrt{\frac{p \cdot (1 - p)}{n}}$.

[9] Due to rounding, Figure 8 displays 0.6, not 0.590.

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, and vice versa if α is more than 1.00. The α factor is less than 1.00 for four of the six poverty lines in Figure 9.

The formula relating confidence intervals with standard errors for the scorecard can be rearranged to give a formula for determining sample size before measurement.[10] If $\hat{p}$ is the expected poverty rate before measurement, then the formula for sample size n based on the desired confidence level that corresponds to z and the desired confidence interval $\pm c$ is $n = \left(\frac{\alpha \cdot z}{c}\right)^2 \cdot \hat{p} \cdot (1 - \hat{p})$.

To illustrate how to use this, suppose $c = 0.04455$ and $z = 1.64$ (90-percent confidence). Then the formula gives $n = \left(\frac{0.95 \cdot 1.64}{0.04455}\right)^2 \cdot 0.331 \cdot (1 - 0.331) = 271$, not far from the sample size of 256 observed for these parameters in Figure 8 for the national line.

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

[10] IRIS Center (2007a and 2007b) says that a sample size of $n = 300$ is sufficient for USAID reporting. If a scorecard is as precise as direct measurement, if the expected (before measurement) poverty rate is 50 percent, and if the confidence level is 90 percent, then $n = 300$ implies a confidence interval of +/–2.2 percentage points. In fact, USAID has not specified confidence levels or intervals. Furthermore, the expected poverty rate may not be 50 percent, and the scorecard could be more or less precise than direct measurement.

In practice after the end of fieldwork for the NRVA in August 2008, an organization would select a poverty line (say, the national line), select a desired confidence level (say, 90 percent, or $z = 1.64$), select a desired confidence interval (say, ± 2.0 percentage points, or $c = 0.02$), make an assumption about $\hat{p}$ (perhaps based on a previous measurement such as the 32.8-percent national average in the 2007/8 NRVA in Figure 1), look up α (here, 0.95), assume that the scorecard will still work in the future and/or for non-nationally representative sub-groups,[11] and then compute the required sample size. In this illustration, $n = \left(\frac{0.95 \cdot 1.64}{0.02}\right)^2 \cdot 0.328 \cdot (1 - 0.328) = 1{,}338$.

[11] This paper reports accuracy for the scorecard applied to the validation sample, but it cannot test accuracy for later years or for other groups. Performance after August 2008 will resemble that in the 2007/8 NRVA with deterioration to the extent that the relationships between indicators and poverty status change over time.

7. Estimates of changes in group poverty rates over time

The change in a group's poverty rate between two points in time is estimated as the change in the average poverty likelihood of the households in the group. With data from only the 2007/8 NRVA, this paper cannot test estimates of change over time for Afghanistan, and it can only suggest approximate formulas for standard errors. Nevertheless, the relevant concepts are presented here because, in practice, pro-poor organizations can apply the scorecard to collect their own data and measure change through time.

7.1 Warning: Change is not impact

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

7.2 Calculating estimated changes in poverty rates over time

Consider the illustration begun in the previous section. On Jan. 1, 2012, a program samples three households who score 20, 30, and 40 and so have poverty likelihoods of 51.3, 31.9, and 15.2 percent (national line, Figure 4). The group's baseline estimated poverty rate is the households' average poverty likelihood of (51.3 + 31.9 + 15.2) ÷ 3 = 32.8 percent.

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

- Score a new, independent sample, measuring change by cohort across samples
- Score the same sample at follow-up as at baseline

By way of illustration, suppose that a year later on Jan. 1, 2013, the program samples three additional households who are in the same cohort as the three households originally sampled (or suppose that the program scores the same three original households a second time) and finds that their scores are 25, 35, and 45 (poverty likelihoods of 43.5, 24.6, and 11.4 percent, national line, Figure 4). Their average poverty likelihood at follow-up is now (43.5 + 24.6 + 11.4) ÷ 3 = 26.5 percent, an improvement of 32.8 – 26.5 = 6.3 percentage points.[12]

This suggests that about one in 16 participants in this hypothetical example crossed the poverty line in 2011.[13] Among those who started below the line, about one in five (6.3 ÷ 32.8 = 0.19 percent) on net ended up above the line.[14]

[12] Of course, such a huge reduction in poverty in one year would be miraculous, but this is just an example to show how the scorecard can be used to estimate change.
[13] This is a net figure; some people start above the line and end below it, and vice versa.

7.3 Accuracy for estimated change in two independent samples

With only the 2007/8 NRVA, it is not possible to measure the accuracy of scorecard estimates of changes in groups' poverty rates over time. In practice, of course, local pro-poor organizations can still apply the Afghanistan scorecard to estimate change. The rest of this section suggests approximate formulas for standard errors and sample sizes that may be used until there is additional data.

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

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

z, c, and p are defined as above, n is the sample size at both baseline and follow-up,[15] and α is the average (across a range of bootstrapped sample sizes) of the ratio of the observed confidence interval from a scorecard and the theoretical confidence interval under direct measurement.

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[14] The scorecard does not reveal the reasons for this change.

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

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

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

In countries for which this α has been measured (Schreiner, 2010, 2009a, 2009b, 2009c, 2009d, 2009e, and 2008b; Schreiner and Woller, 2010a and 2010b; and Chen and Schreiner, 2009a and 2009b), the simple average of α across poverty lines and years for a given country and then across countries is 1.19. This is as reasonable a figure as any to use for Afghanistan.

To illustrate the use of the formula above 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 ($c = 0.02$), the poverty line is the national line, $\alpha = 1.19$, and $\hat{p} = 0.328$ (from Figure 1). Then the baseline sample size is $n = 2 \cdot \left(\frac{1.19 \cdot 1.64}{0.02} \right)^2 \cdot 0.328 \cdot (1 - 0.328) =$ 4,198, and the follow-up sample size is also 4,198.

7.4 Accuracy for estimated change for one sample, scored twice

Analogous to previous derivations, the general formula relating the confidence interval 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:[16]

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

where z, c, and α are defined as usual, p_{12} is the share of all sampled households that move from below the poverty line to above it, and p_{21} is the share of all sampled households that move from above the line to below it.

The formula for standard errors 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 $\hat{p}_{12}$ and $\hat{p}_{21}$. Before measurement, it is reasonable to assume that the change in the poverty rate will be zero, which implies $\hat{p}_{12} = \hat{p}_{21} = \hat{p}_*$, giving:

$$n = 2 \cdot \left(\frac{\alpha \cdot z}{c} \right)^2 \cdot \hat{p}_* .$$

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

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

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

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

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

In Peru (the only other country for which there is an estimate, Schreiner 2009a), 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 ($c = 0.02$), the poverty line is the national line, and the sample will first be scored in 2012 and then again in 2015 (so $y = 3$). The before-baseline poverty rate is 32.8 percent ($p_{2007/8} = 0.328$, Figure 1), and suppose $\alpha = 1.30$. Then the baseline sample size is $n = 2 \cdot \left(\frac{1.30 \cdot 1.64}{0.02} \right)^2 \cdot \left\{ -0.02 + 0.016 \cdot 3 + 0.47 \cdot \left[0.328 \cdot (1 - 0.328) \right] \right\} = 2{,}991$. The same group of 2,991 households is 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* (expenditure below a poverty line). Poverty status is a fact that depends on whether expenditure 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.

Targeting is successful when households truly below a poverty line are targeted (*inclusion*) and when households truly above a poverty line are not targeted (*exclusion*). Of course, no scorecard is perfect, and targeting is unsuccessful when households truly below a poverty line are not targeted (*undercoverage*) or when households truly above a poverty line are targeted (*leakage*). Figure 10 depicts these four possible targeting outcomes. Targeting accuracy varies by the cut-off score; a higher cut-off has better inclusion (but greater leakage), while a lower cut-off has better exclusion (but higher undercoverage).

Programs should weigh these trade-offs when setting a targeting 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).

For all possible cut-offs, Figure 11 shows the distribution of households by targeting outcome. For an example cut-off of 25–29, outcomes for the national line in the validation sample are:

- Inclusion: 21.6 percent are below the line and correctly targeted
- Undercoverage: 10.9 percent are below the line and mistakenly not targeted
- Leakage: 21.0 percent are above the line and mistakenly targeted
- Exclusion: 46.5 percent are above the line and correctly not targeted

Increasing the cut-off to 30–34 improves inclusion and undercoverage but worsens leakage and exclusion:

- Inclusion: 26.8 percent are below the line and correctly targeted
- Undercoverage: 5.7 percent are below the line and mistakenly not targeted
- Leakage: 32.4 percent are above the line and mistakenly targeted
- Exclusion: 35.1 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 the total net benefit for a given cut-off is:

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

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

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

The most difficult step is assigning benefits and costs to targeting outcomes. A program that uses targeting—with or without scoring—should thoughtfully consider

how it values successful inclusion and exclusion versus errors of undercoverage and leakage. It is healthy to go through a process of thinking explicitly and intentionally about how possible targeting outcomes are valued.

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

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

Figure 11 shows "Total Accuracy" for all cut-offs for the Afghanistan scorecard. For the national line in the validation sample, total net benefit is greatest (70.8) for a cut-off of 24 or less, with about two in three households in Afghanistan correctly classified.

"Total Accuracy" weighs successful inclusion of households below the line the same as successful exclusion of households above the line. If a program valued inclusion more (say, twice as much) than exclusion, it could reflect this by setting the benefit for inclusion to 2 and the benefit for exclusion to 1. Then the chosen cut-off would maximize (2 x Households correctly included) + (1 x Households correctly excluded).[17]

[17] Figure 10 also reports "BPAC", the Balanced Poverty Accuracy Criteria adopted by USAID for certifying poverty-assessment tools. IRIS Center (2005) says that BPAC considers accuracy in terms of estimated poverty rates and in terms of targeting inclusion. BPAC = (Inclusion – |Undercoverage – Leakage|) x [100 ÷ (Inclusion + Undercoverage)].

As an alternative to assigning benefits and costs to targeting outcomes and then choosing a cut-off to maximize total net benefits, a program could set a cut-off to achieve a desired poverty rate among targeted households. The third column of Figure 12 ("% targeted who are poor") shows, for the Afghanistan scorecard applied to the validation sample, the expected poverty rate among households who score at or below a given cut-off. For the example of the national line, targeting households who score 29 or less would target 42.6 percent of all households (second column) and produce a poverty rate among those targeted of 50.7 percent (third column).

Figure 12 also reports two other measures of targeting accuracy. The first is a version of coverage ("% of poor who are targeted"). For the example of the national line in the validation sample and a cut-off of 29 or less, 66.4 percent of all poor households are covered.

The final targeting measure in Figure 12 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For the national line in the validation sample and a cut-off of 29 or less, covering 1.0 poor households means leaking to 1 non-poor household.

9. Conclusion

Pro-poor programs in Afghanistan can use the low-cost scorecard to segment clients for targeted services as well as to estimate:

- The likelihood that a household has expenditure below a given poverty line
- The poverty rate of a population at a point in time
- The change in the poverty rate of a population between two points in time

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

The scorecard is built with half of the data from Afghanistan's 2007/8 NRVA, tested on the other half of the 2007/8 NRVA, and calibrated to six poverty lines.

Accuracy and precision are reported for estimates of households' poverty likelihoods, groups' poverty rates at a point in time, and changes in groups' poverty rates over time. Of course, the scorecard's estimates of changes are not the same as estimates of program impact. Targeting accuracy is also reported.

When the scorecard is applied to the validation sample with $n = 16{,}384$, the average difference between estimates and true poverty rates for groups of households at a point in time across all six poverty lines is +1.6 percentage points. For $n = 16{,}384$ and 90-percent confidence, the precision of these differences is ±0.6 percentage points or better.

If a program wants to use the scorecard for targeting, then this paper provides the information needed to select 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 here focuses on transparency and ease-of-use. After all, a perfectly accurate scorecard is worthless if programs feel so daunted by its complexity or its cost that they do not even try to use it. For this reason, the scorecard uses ten indicators that are inexpensive to collect and that are straightforward to verify. Points are all zeros or positive integers, and scores range from 0 to 100. Scores are related to poverty likelihoods via simple look-up tables, and targeting cut-offs are likewise simple to apply. The design attempts to facilitate adoption by helping managers to understand and to trust scoring and by allowing non-specialists to generate scores quickly in the field.

In summary, the scorecard is a low-cost way for pro-poor programs in Afghanistan to estimate poverty rates, track changes in poverty rates over time, and target services. The same approach can be applied in any country with similar data from a national income or expenditure survey.

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Appendix:

Guide to Interpretation of Scorecard Indicators

The following comes from:

Central Statistics Office. (2007) *2007/8 NRVA Enumerator's Manual*, Kabul.

General notes about enumeration:

According to p. 16 of the *Manual*, "The questionnaire has been produced in English, Dari and Pashto. . . . In some regions where the language of the household is neither Dari nor Pashto, the enumerator will use the questionnaire to translate to the local language, which must be spoken by the enumerator. The questionnaire should always be administered in a language that the survey household members understand fluently."

According to p. 17 of the *Manual*, "The questions should be asked using the exact same words as in the questionnaire. The questions have been carefully worded to ensure that the desired concept is being asked. Study the questions so that you can ask them in a consistent and natural manner. If this is not done, the responses to the same question across households may not be comparable."

All the indicators in the scorecard are derived from items in the part of the 2007/8 NRVA survey instrument that is administered to males (the "male questionnaire"). Based on p. 18 of the *Manual*, this means that a male enumerator will ask the scorecard questions to the "head of the household. . . . A possible exception . . . is in the case of a female household head, or a household where the male household head is away and the head female will answer in his place. In some households, this female will allow the interview to take place [with a male enumerator] with the male and female enumerator both present, but in other cases, the female may not feel comfortable to admit [a] male enumerator, so [a] female enumerator may be required to administer [the scorecard] to the head female alone."

According to p. 21 of the *Manual*: "The initial respondent to this module should be the household head, if available. If he or she is not available, the most senior member of the household present should respond to the module."

According to p. 18 of the *Manual*, "The setting of the questionnaire administration should be relatively private. Some of the questions being asked are of a personal and private nature. You should respect the desire of the respondents for privacy.

"Any other persons not connected . . . to the household should not be present when you are administering the household questionnaire. If any such individuals are present when you begin your interviews, you must politely request them to leave in order to respect the privacy of the survey household. If they cannot leave at that time, you should schedule the interview for a later time, when greater privacy can be assured."

According to p. 18 of the *Manual*: "As a general point, if you encounter a different or unusual case . . . and are not sure what to do, write all of the details down. After you leave the survey household, check this manual for guidance. If the solution cannot be found in this manual, you should discuss with your supervisor."

According to p. 20 of the *Manual*: "In conducting an interview, if it is clear that the respondent has understood the question you have asked, you must accept whatever response the respondent provides you. Probe questions can be used to make sure the respondent understands the key element of the question being asked. However, you must never second-guess the respondent or make the assumption that you have a better understanding of the condition of the individual or household than the respondent does. The function of the enumerator is not to verify that the information provided is correct. The analysts . . . are interested in what the respondent actually says.

"It is always possible that the respondent will lie to you or provide inaccurate information, but you, as the enumerator, should not make any judgments on the information provided. This is a problem for the analyst to take care of and not the enumerator.

"There are exceptions, of course. If the respondent says that she has no livestock and there are chickens pecking at your feet or goats tied up nearby, you should inquire about these animals. However, you should not probe excessively after seeking initial clarification from the respondent. In any case, you should never go outside of the household to get information on the household. This is beyond the scope of your work."

"Ultimately, assessing whether the answers provided are 'wrong' or 'right' should not apply to you in administering the household questionnaire. The questionnaire is being administered to the survey household members because we rightly expect that they will be able to provide the best information about their own living conditions."

1. How many household members are 16-years-old or younger?

According to pp. 14–17 of the *Manual*, "a *household* may be either a person living alone or a group of people, either related or unrelated, who live together as a single unit in the sense that they have common housekeeping arrangements (that is, share or are supported by a common budget). A standard definition of a *household* is "a group of people who live together, pool their money, and eat at least one meal together each day". In most cases, someone who does not live with the household during the survey period is not a current member of the household.

"It is important to recognize that members of a household need not necessarily be related by blood or by marriage. On the other hand, not all those who are related and are living in the same compound or dwelling are necessarily members of the same household. Two brothers who live in the same dwelling with their own wives and children may or may not form a common housekeeping arrangement. If they do not, they should be considered separate households.

"One should make a distinction between *family* and *household*. The first reflects social relationships, blood descent, and marriage. The second is used here to identify an economic unit. While families and households are often the same, this is not necessarily the case. You must be cautious and use the criteria provided on household membership to determine which individuals make up a particular household.

"In the case of men with more than one wife and extended family systems, household members can be distributed over two or more dwellings. If these dwelling units are in the same compound or nearby, . . . the residents of these separate dwelling units should be treated as one household. . . .

"Having identified a social unit that shares a common housekeeping arrangement—that is, a household—it then becomes necessary to determine who is and who is not a member of that household. We use information on how many months during the past 12 months a potential household member has been away from the household. Those individuals who have been absent from the household for more than 9 months during the past 12 months—that is, have been resident in the household for less than 3 of the past 12 months—should not be considered household members.

"However, there are several exceptions to this rule:

- The individual whom household members commonly regard as the head of household should always be included as a household member, even if he or she has been absent from the household for more than 9 of the past 12 months
- Young infants less than 3-months-old
- New spouses who have recently come into the household and are now residing with the household
- Household members residing in an institution elsewhere, but still dependent on the household. This principally includes boarding-school students. However, it does not include military personnel, prisoners, or other individuals who are not primarily dependent on the household for their welfare

"It is important to highlight that non-relatives who are resident in the household for more than three months and are included in a common household keeping arrangement under the head of household are to be considered household members. However, servants, other hired workers, and lodgers (individuals who pay to reside in the dwelling of the household) should not be considered to be household members if they have their own household elsewhere which they head or upon which they are dependent.

"You should be very careful when dealing with this rather complex task of determining who should be included and who should not be included as a member of a survey household. You must carefully check the rules laid out here. The rules should enable you to handle the vast majority of household situations that you encounter, but not all. If you are unsure whether an individual should be included in a survey household, discuss the problem with your supervisor."

According to p. 23 of the *Manual*, "For children 6 years and under, the female enumerator will be verifying with immunization cards and with the mother the age of the children. . . . To verify the actual age of a child 6–16 years, check EPI card first, if not available, then check the preserved diary and other documents (if any) where the child's date of birth might be recorded. If no such document is available, using the list below, mention a historical national event (e.g., withdrawal of Russian force, capture of Kabul by Taliban, etc.) or any devastating calamity (viz. drought, severe cold), or any special day or occasion like Eid day, the month of Ramadan, etc. to help specifying the month and year of the birth date of the child. If age could not be verified and identified through these methods then:

- Compare age with that of the neighboring children of similar age (using birth date)
- Use the interval between the youngest child and its elder sibling, i.e., after how many months or years of the birth of the previous child the youngest one was born
- Identify and use the time interval between the birth of the first child and marriage of the parents
- Ask the number of years the child has attended school and how big he or she was when starting school

"The respondent may mention the date of birth using the English or Dari calendar. The interviewer should record the age accordingly."

The *Manual* provides a list of historical national events, devastating calamities, and special days to help figure out people's ages, but it is available only in the Dari and Pashto versions of the *Manual*.

2. Can both the male head/spouse and the female head/spouse read and write?

According to p. 15 of the *Manual*, "the *head of household* is the person commonly regarded by the household members as their head. The head would usually be the main income earner and decision maker for the household, but you should accept the decision of the household members as to who is their head. There must be one and only one head in the household. If more than one individual in a potential household claims headship, or if individuals within a potential household give conflicting statements as to who is the head of household, then it is very likely that you are dealing with two or more households, rather than one. In such cases, it is extremely important that you apply the criteria provided to delimit membership in the household."

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

- The household head, if the head is a man
- The spouse of the household head, if the head is a woman
- Non existent, if neither of the previous two criteria are met

In the same way, for the purposes of the scorecard, the *female head/spouse* is defined as:

- The household head, if the head is a woman
- The spouse of the household head, if the head is a man
- Non existent, if neither of the previous two criteria are met

3. What type of dwelling best describes where the household lives?

The *Manual* seems to imply—but does not explicitly state—that if the household has more than one dwelling, then the question applies to the first/main dwelling.

According to p. 24 of the *Manual*, "You must keep the present household status in mind when answering this question. If three brothers and their families are sharing a house and are three separate households by our definition (i.e., they do not pool their resources, and eat from the 'same pot'), then this household that you are interviewing would record 'Part of shared house'. If the three brothers and their families live as one household, then the answer would be "Single-family house".

4. How many rooms (both exclusively yours and shared) does your household occupy (exclude corridors and balconies)?

According to p. 25 of the *Manual*, "Record the number of rooms the household occupies:

- If a room is divided by fabric, folding screens, cartons, plastic or other temporary material, the room is considered as one room
- Minor rooms in the dwelling should be excluded from the room count. These include toilets, corridors, and balconies
- However, you should include all other rooms, including rooms that are usually unoccupied, such as those that are reserved for guests

The *Manual* seems to imply—but does not explicitly state—that if the household has more than one dwelling, then the question applies to the first/main dwelling.

The male questionnaire (p. 5) notes that if the household is Kuchi, then the enumerator should count the number of rooms/tents.

5. Which main toilet facility does the household use?

According to p. 25 of the *Manual*, "In some households females and males and/or children may use latrines of different types. The interviewer should probe to determine the main toilet used by the household."

The *Manual* seems to imply—but does not explicitly state—that if the household has more than one dwelling, then the question applies to the first/main dwelling.

6. In the past 30 days, what has been the household's main source of cooking fuel?

The *Manual* provides no additional information about this indicator.

7. How many stoves/gas cylinders does the household own?

According to p. 27 of the *Manual*, "We are interested in the number of *working* (not broken or not functioning) assets, for appliances or electronic items."

8. Does the household own any sewing machines?

According to p. 27 of the *Manual*, "We are interested in the number of *working* (not broken or not functioning) assets, for appliances or electronic items."

9. Does the household own any motorcycles or cars?

The *Manual* provides no additional information about this indicator.

10. Did anyone in the household own or have access to any irrigated land in the most recent summer cultivation season, excluding a garden plot?

According to p, 27 of the *Manual*, the indicator "asks for irrigated land owned or managed. . . . Note that the irrigated land owned does not have to be land that was cultivated in this year."

Figure 1: Sample sizes, poverty lines, and poverty rates for all of Afghanistan, for the construction/calibration sample, and for the validation sample, by poverty line, and by household-level/person-level

		% with expenditure below a poverty line					
		National			USAID	Intl. 2005 PPP	
Sub-sample	**# households**	**100%**	**150%**	**200%**	**'Extreme'**	**$1.25**	**$2.50**
Poverty line (AFN/person/day)	20,537	41.27	61.90	82.54	33.41	25.94	51.87
All Afghanistan poverty rates (%)							
Household level	20,537	32.8	69.0	86.0	16.1	5.5	53.9
Person level	20,537	36.0	72.7	88.6	17.9	6.4	57.7
Construction and calibration: Selecting indicators and points, and associating scores with likelihoods							
Household level	10,339	33.1	69.1	86.3	16.1	5.6	53.5
Person level	10,339	35.6	72.5	88.2	17.9	6.3	57.7
Validation: Measuring accuracy							
Household level	10,198	32.5	69.0	85.8	16.0	5.4	54.2
Person level	10,198	36.4	72.9	88.9	18.0	6.4	57.6

Source: 2007/8 NRVA

Poverty lines in AFN in average constant terms for Sept. to Nov. 2007 (Asad to Aqrab 1386).

Figure 2: Poverty lines and poverty rates at the household level and person level by region

	Poverty line (AFN/person/day) and poverty rate (%)					
	National			USAID	Intl. 2005 PPP	
Region	**100%**	**150%**	**200%**	**'Extreme'**	**$1.25**	**$2.50**
All Afghanistan						
Poverty line	41.27	61.90	82.54	33.41	25.94	51.87
Household-level poverty rate	32.8	69.0	86.0	16.1	5.5	53.9
Person-level poverty rate	36.0	72.7	88.6	17.9	6.4	57.7
Central urban (Kabul, Kapisa, Parwan, Wardak, Logar, Panj Sher)						
Poverty line	63.63	95.45	127.26	53.33	39.99	79.98
Household-level poverty rate	21.2	57.7	78.0	10.6	1.7	39.9
Person-level poverty rate	24.5	63.2	81.7	12.2	2.1	45.2
Central rural (Kabul, Kapisa, Parwan, Wardak, Logar, Panj Sher)						
Poverty line	39.80	59.70	79.60	33.03	25.01	50.03
Household-level poverty rate	33.5	70.7	88.1	16.6	3.3	56.1
Person-level poverty rate	35.7	74.2	90.7	17.8	3.6	59.4
South rural (Ghazni, Paktika, Paktya, Khost)						
Poverty line	37.02	55.54	74.05	30.02	23.27	46.54
Household-level poverty rate	41.1	76.3	90.8	20.3	7.8	62.0
Person-level poverty rate	43.7	78.7	92.6	21.8	8.4	64.7
East urban (Nangarhar, Kunarha, Laghman, Nuristan)						
Poverty line	54.45	81.67	108.89	43.00	34.22	68.43
Household-level poverty rate	27.9	68.5	86.2	13.5	4.1	50.1
Person-level poverty rate	30.7	72.0	87.0	15.1	5.0	52.7
East rural (Nangarhar, Kunarha, Laghman, Nuristan)						
Poverty line	34.86	52.28	69.71	25.70	21.91	43.81
Household-level poverty rate	43.4	74.3	89.4	20.5	8.5	62.3
Person-level poverty rate	46.2	77.4	91.6	23.1	10.1	65.8
Northeast urban (Badakhshtan, Takhar, Baghlan, Kunduz)						
Poverty line	46.92	70.37	93.83	38.56	29.48	58.97
Household-level poverty rate	25.7	60.2	79.1	13.1	2.3	43.7
Person-level poverty rate	28.3	64.3	82.5	14.2	2.8	47.8

Source: 2007/8 NRVA

Poverty lines in AFN in average constant terms for Sept. to Nov. 2007 (Asad to Aqrab 1386).

Figure 2 (cont.): Poverty lines and poverty rates at the household level and person level by region

	Poverty line (AFN/person/day) and poverty rate (%)					
	National			USAID	Intl. 2005 PPP	
Region	100%	150%	200%	'Extreme'	$1.25	$2.50
Northeast rural (Badakhshtan, Takhar, Baghlan, Kunduz)						
Poverty line	34.45	51.67	68.89	25.35	21.65	43.30
Household-level poverty rate	36.3	65.9	83.2	18.2	11.6	53.1
Person-level poverty rate	38.1	69.3	86.3	13.0	12.1	55.9
North urban (Samangan, Balkh, Jawzjan, Sar-I-Poul, Faryab)						
Poverty line	53.27	79.90	106.54	38.13	33.48	66.95
Household-level poverty rate	50.1	79.3	90.3	23.9	16.5	71.6
Person-level poverty rate	52.9	81.0	91.7	26.4	19.0	74.0
North rural (Samangan, Balkh, Jawzjan, Sar-I-Poul, Faryab)						
Poverty line	36.23	54.35	72.46	29.01	22.77	45.54
Household-level poverty rate	33.8	71.5	87.2	16.7	5.8	55.2
Person-level poverty rate	36.7	75.8	88.6	18.3	6.6	58.5
West urban (Badghis, Herat, Farah)						
Poverty line	49.55	74.33	99.11	39.36	31.14	62.28
Household-level poverty rate	26.4	60.0	81.2	12.2	3.1	46.3
Person-level poverty rate	30.6	64.1	82.9	15.3	3.4	50.1
West rural (Badghis, Herat, Farah)						
Poverty line	35.13	52.69	70.26	28.86	22.08	44.15
Household-level poverty rate	32.1	71.4	86.8	15.4	4.1	56.3
Person-level poverty rate	36.3	74.4	88.9	18.1	5.6	60.1
Southwest urban (Nimroz, Helmand, Kandahar, Zabul, Uruzgan)						
Poverty line	54.40	81.60	108.81	44.51	34.19	68.38
Household-level poverty rate	21.4	56.3	83.8	10.9	3.8	39.0
Person-level poverty rate	24.4	61.6	88.5	12.0	4.1	43.8
Southwest rural (Nimroz, Helmand, Kandahar, Zabul, Uruzgan)						
Poverty line	44.59	66.89	89.18	39.34	28.02	56.05
Household-level poverty rate	20.2	66.6	86.6	9.8	0.7	46.2
Person-level poverty rate	22.3	71.2	89.7	11.1	0.7	49.9
West Central rural (Ghor, Bamyan, Daikundi)						
Poverty line	32.99	49.49	65.99	26.22	20.74	41.47
Household-level poverty rate	41.5	74.5	89.3	20.1	5.2	63.2
Person-level poverty rate	44.9	78.0	90.6	22.4	6.1	66.4

Source: 2007/8 NRVA

Poverty lines in AFN in average constant terms for Sept. to Nov. 2007 (Asad to Aqrab 1386).

Figure 3: Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
4,529	How many household members are 17-years-old or younger? (Seven or more; Five or six; Four; Three; Two; One; None)
4,515	How many household members are 18-years-old or younger? (Seven or more; Five or six; Four; Three; Two; One; None)
4,455	How many household members are 16-years-old or younger? (Seven or more; Five or six; Four; Three; Two; One; None)
4,331	How many household members are 15-years-old or younger? (Seven or more; Five or six; Four; Three; Two; One; None)
4,185	How many household members are 14-years-old or younger? (Six or more; Five; Four; Three; Two; One; None)
4,053	How many household members are 13-years-old or younger? (Six or more; Five; Four; Three; Two; One; None)
3,850	How many household members are 12-years-old or younger? (Six or more; Five; Four; Three; Two; One; None)
3,666	How many household members are there? (Eleven or more; Ten; Nine; Eight; Seven; Six; Five; Four or less)
3,595	Does the household own any motorcycles or cars? (No; Motorcycle only; Car (regardless of motorcycle))
3,592	How many household members are 11-years-old or younger? (Five or more; Four; Three; Two; One; None)
3,169	How many stoves/gas cylinders does the household own? (None; One; Two or more)
3,145	Which main toilet facility does the household use? (None (open field, bush) or *sahrahi*, *dearan* (area inside or outside compound but not pit), or other; Open pit; Traditional covered latrine; Improved latrine, or flush latrine)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
2,534	Are all household members ages 7 to 11 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No members in this age range)
2,399	Are all household members ages 7 to 12 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No members in this age range)
2,386	Are all household members ages 7 to 13 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No members in this age range)
2,276	Are all household members ages 7 to 15 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No members in this age range)
2,266	Are all household members ages 7 to 14 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No members in this age range)
2,260	Are all household members ages 7 to 16 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No members in this age range)
2,215	Are all household members ages 7 to 17 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No members in this age range)
2,208	What is the major construction material of the floor of the dwelling in the main living area of the family? (No floor (tent); Dirt/earth; Concrete/tile, wood, or other)
2,179	Does the household own any TVs and VCR/DVDs? (None; TV only, or VCR/DVD only; TV and VCR/DVD)
1,958	Does the household own any bicycles or motorcycles? (None; Bicycle only; Motorcycle (regardless of bicycle))
1,866	Are all household members ages 7 to 18 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No members in this age range)
1,851	Does the household own any cars? (No; Yes)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
1,804	Are all male household members ages 7 to 14 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No male members in this age range)
1,791	How many household members are 6-years-old or younger? (Three or more; Two; One; None)
1,785	Does the household own any TVs? (No; Yes)
1,770	Are all male household members ages 7 to 15 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No male members in this age range)
1,733	Does the household own any motorcycles? (No; Yes)
1,728	Does the household own any irons? (No; Yes)
1,702	Are all male household members ages 7 to 13 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No male members in this age range)
1,676	Are all male household members ages 7 to 16 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No male members in this age range)
1,635	Do you have any document that shows ownership of this dwelling? (No, does not know, refuses to answer, or has a document other than *qawala-urfee* (sale document) or a deed (registered); Yes, *qawala-urfee* (sale document), or yes, deed (registered))
1,628	Are all male household members ages 7 to 17 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No male members in this age range)
1,627	In the past 30 days, what has been the household's main source of cooking fuel? (Animal dung, scavenged material/trash, bushes (ping)/twigs, branches, or other; Crop residues, firewood, charcoal/coal, kerosene or oil, gas, or electricity)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
1,603	Are all male household members ages 7 to 18 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No male members in this age range)
1,574	Has your household had electricity at any time in the past 30 days from the electric grid, a government generator, personal generator (engine or hydro), community generator (engine or hydro), solar, wind, or batteries? (Solar, wind, or batteries; None; Community generator (hydro); Personal generator (hydro), or community generator (engine); Government generator, or grid; Personal generator (engine))
1,521	Does the household own any VCRs/DVDs? (No; Yes)
1,517	Are all male household members ages 7 to 12 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No male members in this age range)
1,491	What is the major construction material of the exterior walls of the dwelling in the main living area of the family? (No wall (tent), or other; Mud bricks/mud; Fired brick/stone, concrete, wood, tin/metal, or prefabricated)
1,398	Does the household own any sewing machines? (No; Yes)
1,389	Are all female household members ages 7 to 17 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No female members in this age range)
1,350	Are all female household members ages 7 to 16 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No female members in this age range)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
1,328	Are all female household members ages 7 to 15 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No female members in this age range)
1,299	Are all male household members ages 7 to 11 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No male members in this age range)
1,296	Are all female household members ages 7 to 14 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No female members in this age range)
1,271	Is your toilet facility located within the compound of your household? (Yes; No)
1,258	What kind of kitchen/cooking facilities does this dwelling have? (Cooking done in the open, or other; Kitchen is part of another room within dwelling (or part of tent area); Kitchen is separate room in dwelling; Cooking room separate outside of dwelling)
1,242	Are all female household members ages 7 to 13 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No female members in this age range)
1,220	Are all female household members ages 7 to 12 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No female members in this age range)
1,210	Are all female household members ages 7 to 18 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No female members in this age range)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
1,097	In the past 30 days, what has been the household's main source of lighting? (None, oil lamp, candles, batteries, gas, firewood, or other; Generator; Electricity from grid)
1,084	What is the highest level and year of school attended by the male head/spouse? (No male head/spouse; Never attended school or cannot read and write; Primary 1 to secondary 2; Secondary 3 to high school 3; Teacher's college 1 or higher)
1,054	If any household members owned or managed agricultural land or a garden plot in the most recent summer cultivation season, does any member of the household own any livestock, including poultry, at the present time? (No agricultural land nor garden plots, but has some livestock; Agricultural land (apart from garden plots) is owned or accessed, and there is some livestock; Only garden plot, and no livestock; No agricultural land nor garden plots, and no livestock; Agricultural land (apart from garden plots) is owned or accessed, but there is no livestock; Only garden plot, but has some livestock)
1,053	Are all female household members ages 7 to 11 currently enrolled in school (or if school is not in session, were they all enrolled in the most recent school session)? (No; Yes; No female members in this age range)
960	If any household members owned or managed agricultural land or a garden plot in the most recent summer cultivation season, does any member of the household own any cattle (meat and dairy), oxen, yaks, horses, donkeys, or camels at the present time? (No agricultural land nor garden plots, but has some cattle or other large animals; Agricultural land (apart from garden plots) is owned or accessed, and there is some cattle or other large animals; No agricultural land nor garden plots, and no cattle or other large animals; Only garden plot, but has some cattle or other large animals; Agricultural land (apart from garden plots) is owned or accessed, but there is no cattle or other large animals; Only garden plot, and no cattle or other large animals)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
915	What is the main source of heating for this house in winter? (No heating in house, straw, bushes/twigs, manure, scavenged materials/trash, *chem*, or other; Kerosene/diesel/petrol, or firewood; Charcoal, or coal; Electricity, or gas)
796	Can both the male head/spouse and the female head/spouse read and write? (No male head/spouse; No, or no female head/spouse; Yes)
783	What is the highest level and year of school attended by the female head/spouse? (Never attended school or cannot read and write, primary 1, 2, or 3; No female head/spouse; Primary 4 or higher)
779	What type of job was the main job of the female head/spouse in the last 30 days? (Unpaid family worker, or day laborer; Self-employed (sharecroppers, own-account farmers, independent professionals, selling, handcrafts, other private); Does not work; No female head/spouse; Salaried worker (private or public sector), or employer)
752	What is the major construction material of the roof of the dwelling in the main living area of the family? (No roof (tent); Wood; Asphalt tiles, concrete, tin/metal, bricks, or other)
746	In what sector of the economy is the main job of the female head/spouse (the one she spent the most hours doing in the last 30 days)? (Agriculture/livestock, mining and quarrying, road construction, construction, manufacturing, transportation and communications, wholesale trade, retail trade, or health care; Does not work; Education, other services, or public administration/government; No female head/spouse)
686	Did any household members own or manage irrigated or rain-fed agricultural land or a garden plot in the most recent summer cultivation season? (Rain-fed agricultural land only, or garden plot and rain-fed agricultural land, but no irrigated agricultural land; No; Irrigated agricultural land only, or rain-fed agricultural land and irrigated agricultural land, but no garden plot, or garden plot, rain-fed agricultural land, and irrigated agricultural land; Garden plot only; Garden plot and irrigated agricultural land, but no rain-fed agricultural land)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
667	How many cattle (meat and dairy), oxen, yaks, horses, donkeys, or camels are owned by members of the household at the present time? (None; One; Two; Three; Four or more)
664	Can the female head/spouse read and write? (No; No female head/spouse; Yes)
661	How many household members in their main job work in agriculture or livestock? (Three or more; Two; One; None)
652	If any household members owned or managed agricultural land or a garden plot in the most recent summer cultivation season, does any member of the household own any sheep or goats at the present time? (No agricultural land nor garden plots, but has some sheep or goats; Agricultural land (apart from garden plots) is owned or accessed, and there is some sheep or goats; Agricultural land (apart from garden plots) is owned or accessed, but there is no sheep or goats; No agricultural land nor garden plots, and no sheep or goats; Only garden plot, and no sheep or goats, or only garden plot, but has some sheep or goats)
622	In what sector of the economy is the main job of the male head/spouse (the one he spent the most hours doing in the last 30 days)? (No male head/spouse; Agriculture/livestock, mining and quarrying, or road construction; Health care, education, or other services; Construction, or manufacturing; Does not work; Retail trade; Public administration/government; Transportation and communications, or wholesale trade)
586	In the last 30 days, did the female head/spouse do any work? (Yes; No; No female head/spouse)
576	Does the household own any radios? (No; Yes)
545	How many rooms (both exclusively yours and shared) does your household occupy (exclude corridors and balconies)? (One to four; Five or more)
528	Areany household members in their main job unpaid family workers? (Yesl No)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
504	Access to this dwelling is through . . . ? (Footpath; Unpaved road; Paved road)
487	If any household members owned or managed agricultural land (excluding garden plots) in the most recent summer cultivation season, was any of it irrigated? (Agricultural land (apart from garden plots) is owned or accessed, but none irrigated; No agricultural land (apart from garden plots) is owned or accessed; Agricultural land (apart from garden plots) is owned or accessed, and some is irrigated)
421	If any household members owned or managed agricultural land or a garden plot in the most recent summer cultivation season, does any member of the household own any chickens, turkeys, ducks, or geese at the present time? (No agricultural land nor garden plots, but has some chickens, turkeys, ducks, or geese; Agricultural land (apart from garden plots) is owned or accessed, and there is some chickens, turkeys, ducks, or geese; Agricultural land (apart from garden plots) is owned or accessed, but there is no chickens, turkeys, ducks, or geese; No agricultural land nor garden plots, and no chickens, turkeys, ducks, or geese; Only garden plot, and no chickens, turkeys, ducks, or geese, or only garden plot, but has some chickens, turkeys, ducks, or geese)
421	Can the male head/spouse read and write? (No male head/spouse; No; Yes)
413	How many household members did any work? (Four or more; Three; Two; One; None)
336	Are any household members in their main job day laborers? (Yes; No)
315	How did you acquire this current dwelling or what is your occupancy status? (Caretaker, relative or friend of owner, squatter, or other; Purchased dwelling; Inherited dwelling or given by family; Constructed dwelling; Own—given free or charity; Mortgaged, used by mortgagee, or tenant (renting))
301	How many household members can read and write? (None; One; Two; Three; Four or more)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
270	If any household members owned or managed agricultural land or a garden plot in the most recent summer cultivation season, what was the main source of ploughing for crop-farming? (Agricultural land (apart from garden plots) is owned or accessed and cultivated mechanically/tractor; Agricultural land (apart from garden plots) is owned or accessed and cultivated manually; No agricultural land nor garden plots; Only garden plot; Agricultural land (apart from garden plots) is owned or accessed and cultivated with animal traction)
266	When was this dwelling built? (Five to less-than ten years ago; Ten to less-than twenty years ago; Not relevant (tent), or does not know; Twenty to less-than thirty years ago; Less than five years ago; Thirty years or more)
257	If any household members owned or managed agricultural land (excluding garden plots) in the most recent summer cultivation season, was any of it rain-fed? (Agricultural land (apart from garden plots) is owned or accessed, and some is rain-fed; No agricultural land (apart from garden plots) is owned or accessed; Agricultural land (apart from garden plots) is owned or accessed, but none rain-fed)
218	Do you or any of your household members own or manage agricultural land or a garden plot? (Yes, only cultivate; No; Yes, both own and cultivate; Yes, only owned)
194	Are any household members in their main job salaried workers (public or private sector)? (No; Yes)
188	Does the household own any bicycles? (No; Yes)
141	How many female household members can read and write? (None; One; Two or more)
140	Did any household members own or have access to a garden plot in the most recent summer cultivation season? (No; Yes)
124	How many male household members can read and write? (None; One; Two; Three or more)
121	Did anyone in the household own or have access to any irrigated land in the most recent summer cultivation season, excluding a garden plot? (No; Yes)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
103	What type of dwelling does the household live in? (Temporary shelter/shack, part of a shared house, separate apartment, shared apartment, tent, or other; Single-family house)
89	What is the present marital status or engagement status of the male head/spouse? (No male head/spouse; Married, or divorced or separated; Widower, or never married (regardless of engagement status))
52	Is the toilet facility shared with other households? (Yes; No)
39	What is the present marital status or engagement status of the female head/spouse? (No male head/spouse; Married, divorced or separated, widower, or never-married (regardless of engagement status))
24	What type of job was the main job of the male head/spouse in the last 30 days? (No male head/spouse; Does not work; Day laborer, self-employed (sharecroppers, own-account farmers, independent professionals, selling, handcrafts, other private), salaried worker (private or public sector), employer, or unpaid family worker)
23	In the last 30 days, did the male head/spouse do any work? (No male head/spouse; No; Yes)
9	Are any of these rooms shared with another household? (Yes; No)
5	How many household members in their main job are employers or are self-employed? (None; One; Two or more)

Source: 2007/8 NRVA and the national poverty line

Tables for the National Poverty Line

(and Tables Pertaining to All Six Poverty Lines)

Figure 4 (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	68.8
10–14	66.1
15–19	59.5
20–24	51.3
25–29	43.5
30–34	31.9
35–39	24.6
40–44	15.2
45–49	11.4
50–54	6.0
55–59	2.7
60–64	0.9
65–69	0.0
70–74	3.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

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

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	14	÷	14	=	100.0
5–9	836	÷	1,216	=	68.8
10–14	2,316	÷	3,506	=	66.1
15–19	5,233	÷	8,799	=	59.5
20–24	6,693	÷	13,057	=	51.3
25–29	6,967	÷	16,017	=	43.5
30–34	5,305	÷	16,614	=	31.9
35–39	3,147	÷	12,820	=	24.6
40–44	1,496	÷	9,820	=	15.2
45–49	799	÷	6,989	=	11.4
50–54	278	÷	4,606	=	6.0
55–59	72	÷	2,631	=	2.7
60–64	16	÷	1,887	=	0.9
65–69	0	÷	1,061	=	0.0
70–74	15	÷	492	=	3.0
75–79	0	÷	207	=	0.0
80–84	0	÷	201	=	0.0
85–89	0	÷	33	=	0.0
90–94	0	÷	29	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 6: Distribution of household poverty likelihoods across expenditure ranges demarcated by poverty lines

	Likelihood (%) of expenditure/person/day falling in ranges demarcated by poverty lines						
	<$1.25/day	**=>$1.25/day and <USAID**	**=>USAID and <100% Natl.**	**=>100% Natl. and <$2.50/day**	**=>$2.50/day and <150% Natl.**	**=>150% Natl. and <200% Natl.**	**=>200% Natl.**
Score	**<AFN25.94**	**=>AFN25.94 and <AFN33.41**	**=>AFN33.41 and <AFN41.27**	**=>AFN41.27 and <AFN51.87**	**=>AFN51.87 and <AFN61.90**	**=>AFN61.90 and <AFN82.54**	**=>AFN82.54**
0–4	100.0	0.0	0.0	0.0	0.0	0.0	0.0
5–9	22.2	22.2	24.4	10.2	11.2	6.5	3.3
10–14	19.5	19.8	26.9	16.8	6.6	7.0	3.5
15–19	13.6	21.5	24.3	20.4	9.1	8.1	2.8
20–24	10.7	18.1	22.5	21.2	13.1	10.8	3.6
25–29	6.8	13.2	23.5	25.1	12.6	12.0	6.8
30–34	3.6	10.0	18.3	25.3	17.3	15.9	9.6
35–39	1.8	6.1	16.7	22.4	20.0	20.4	12.7
40–44	0.5	4.0	10.7	20.6	22.2	24.7	17.3
45–49	0.5	3.7	7.2	14.7	21.8	25.5	26.6
50–54	0.9	1.7	3.5	13.3	17.9	31.2	31.6
55–59	0.0	0.5	2.2	10.1	13.3	35.2	38.7
60–64	0.0	0.5	0.4	6.3	13.9	29.4	49.7
65–69	0.0	0.0	0.0	6.0	8.3	22.8	62.9
70–74	0.0	0.0	3.0	3.6	7.7	14.9	70.8
75–79	0.0	0.0	0.0	1.4	0.0	3.6	95.0
80–84	0.0	0.0	0.0	0.0	0.0	9.5	90.6
85–89	0.0	0.0	0.0	0.0	0.0	15.2	84.8
90–94	0.0	0.0	0.0	0.0	0.0	0.0	100.0
95–100	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Figure 7 (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	+5.4	5.3	6.4	8.4
10–14	+3.4	3.7	4.2	5.4
15–19	+4.3	2.3	2.7	3.6
20–24	+3.3	1.9	2.3	2.8
25–29	+5.1	1.7	2.0	2.6
30–34	+2.4	1.6	1.8	2.4
35–39	+2.2	1.6	1.9	2.5
40–44	+1.0	1.6	1.8	2.5
45–49	+2.8	1.5	1.8	2.2
50–54	+0.9	1.3	1.5	2.0
55–59	+0.6	1.2	1.4	1.9
60–64	–2.5	2.4	2.7	3.4
65–69	+0.0	0.0	0.0	0.0
70–74	+2.4	1.0	1.1	1.3
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 (National line): Differences and precision of differences 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	–1.9	67.5	72.1	80.0
4	+2.2	36.3	43.7	54.8
8	+2.4	25.5	29.3	38.6
16	+2.0	18.2	21.8	29.3
32	+2.1	12.7	15.1	19.2
64	+2.4	9.2	11.0	14.4
128	+2.5	6.6	8.0	10.5
256	+2.5	4.5	5.5	7.1
512	+2.7	3.3	3.9	5.3
1,024	+2.7	2.2	2.6	3.9
2,048	+2.7	1.6	1.9	2.6
4,096	+2.7	1.2	1.4	1.9
8,192	+2.7	0.8	0.9	1.2
16,384	+2.7	0.6	0.7	0.8

Figure 9 (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, scorecard applied to the validation sample

	Poverty line					
	National			USAID	Intl. 2005 PPP	
	100%	150%	200%	'Extreme'	$1.25	$2.50
Estimate minus true value						
Scorecard applied to validation sample	+2.7	+1.8	+1.3	+1.3	+0.9	+1.3
Precision of difference						
Scorecard applied to validation sample	0.6	0.6	0.5	0.5	0.2	0.6
α factor for standard errors						
Scorecard applied to validation sample	0.95	1.02	1.06	0.95	0.86	0.99
Precision is measured as 90-percent confidence intervals in units of ± percentage points.						
Differences and precision estimated from 1,000 bootstraps of size n = 16,384.						
α is estimated from 1,000 bootstrap samples of n = 256, 512, 1,024, 2,048, 4,096, 8,192, and 16,384.						

Figure 10 (All 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** Under poverty line Correctly Targeted	**Undercoverage** Under poverty line Mistakenly Non-targeted
Above poverty line	**Leakage** Above poverty line Mistakenly Targeted	**Exclusion** Above poverty line Correctly Non-targeted

Figure 11 (National line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.0	32.5	0.0	67.5	67.5	–99.9
5–9	0.8	31.7	0.4	67.1	67.9	–93.8
10–14	3.1	29.4	1.7	65.8	68.9	–76.0
15–19	8.3	24.2	5.3	62.2	70.5	–33.0
20–24	14.9	17.6	11.7	55.8	70.8	+27.7
25–29	21.6	10.9	21.0	46.5	68.1	+35.4
30–34	26.8	5.7	32.4	35.1	61.9	+0.4
35–39	29.9	2.6	42.1	25.4	55.3	–29.5
40–44	31.4	1.1	50.4	17.1	48.5	–55.1
45–49	32.1	0.4	56.7	10.8	42.9	–74.5
50–54	32.4	0.1	61.1	6.4	38.8	–87.8
55–59	32.5	0.0	63.6	3.9	36.3	–95.7
60–64	32.5	0.0	65.5	2.0	34.5	–101.4
65–69	32.5	0.0	66.5	1.0	33.5	–104.7
70–74	32.5	0.0	67.0	0.5	33.0	–106.2
75–79	32.5	0.0	67.2	0.3	32.8	–106.8
80–84	32.5	0.0	67.4	0.1	32.6	–107.4
85–89	32.5	0.0	67.5	0.0	32.5	–107.5
90–94	32.5	0.0	67.5	0.0	32.5	–107.6
95–100	32.5	0.0	67.5	0.0	32.5	–107.6

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

Figure 12 (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 (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.0	100.0	0.0	Only poor targeted
5–9	1.2	64.6	2.4	1.8:1
10–14	4.7	64.9	9.4	1.8:1
15–19	13.5	61.0	25.4	1.6:1
20–24	26.6	56.2	45.9	1.3:1
25–29	42.6	50.7	66.4	1.0:1
30–34	59.2	45.3	82.5	0.8:1
35–39	72.0	41.5	92.1	0.7:1
40–44	81.9	38.4	96.7	0.6:1
45–49	88.9	36.1	98.8	0.6:1
50–54	93.5	34.7	99.7	0.5:1
55–59	96.1	33.8	99.9	0.5:1
60–64	98.0	33.2	100.0	0.5:1
65–69	99.0	32.8	100.0	0.5:1
70–74	99.5	32.7	100.0	0.5:1
75–79	99.7	32.6	100.0	0.5:1
80–84	99.9	32.5	100.0	0.5:1
85–89	100.0	32.5	100.0	0.5:1
90–94	100.0	32.5	100.0	0.5:1
95–100	100.0	32.5	100.0	0.5:1

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	90.2
10–14	89.5
15–19	89.1
20–24	85.5
25–29	81.1
30–34	74.5
35–39	66.9
40–44	58.0
45–49	47.9
50–54	37.2
55–59	26.1
60–64	21.0
65–69	14.3
70–74	14.3
75–79	1.4
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 7 (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	+1.4	3.8	4.5	5.9
10–14	+1.9	2.6	3.0	4.1
15–19	+2.9	1.7	1.9	2.6
20–24	+1.5	1.4	1.8	2.4
25–29	+1.2	1.3	1.6	2.2
30–34	–0.3	1.5	1.8	2.2
35–39	+1.4	1.9	2.3	2.9
40–44	+2.6	2.4	2.8	3.6
45–49	+5.7	2.7	3.1	4.1
50–54	–2.2	3.3	3.8	5.1
55–59	+3.4	3.4	4.0	5.0
60–64	+8.4	3.4	4.1	5.4
65–69	+5.6	3.3	3.9	5.0
70–74	+8.2	3.5	4.2	5.1
75–79	–3.1	4.8	5.5	7.1
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 (150% of the national line): Differences and precision of differences 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	66.6	71.5	81.6
4	+2.4	36.9	43.2	54.8
8	+2.1	26.1	30.8	40.1
16	+2.0	18.7	22.6	29.6
32	+2.0	14.4	16.6	20.6
64	+1.9	9.5	11.6	15.6
128	+1.9	6.5	7.8	11.0
256	+1.8	4.8	5.6	7.4
512	+1.8	3.3	3.9	5.4
1,024	+1.9	2.5	2.9	3.6
2,048	+1.8	1.7	2.1	2.6
4,096	+1.8	1.2	1.4	1.9
8,192	+1.8	0.8	1.0	1.3
16,384	+1.8	0.6	0.7	0.9

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

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.0	68.9	0.0	31.0	31.1	–100.0
5–9	1.1	67.8	0.1	30.9	32.0	–96.6
10–14	4.2	64.7	0.5	30.6	34.8	–87.0
15–19	12.0	57.0	1.6	29.5	41.4	–63.0
20–24	23.1	45.8	3.5	27.6	50.7	–27.9
25–29	36.1	32.8	6.5	24.6	60.7	+14.2
30–34	48.7	20.3	10.5	20.5	69.2	+56.5
35–39	57.3	11.7	14.8	16.3	73.6	+78.6
40–44	62.9	6.0	19.0	12.1	75.0	+72.5
45–49	66.0	3.0	22.9	8.2	74.2	+66.8
50–54	67.8	1.1	25.6	5.4	73.3	+62.9
55–59	68.5	0.4	27.6	3.5	72.0	+60.0
60–64	68.8	0.2	29.2	1.8	70.6	+57.6
65–69	68.9	0.1	30.2	0.9	69.8	+56.3
70–74	68.9	0.0	30.6	0.5	69.4	+55.6
75–79	69.0	0.0	30.8	0.3	69.2	+55.3
80–84	69.0	0.0	31.0	0.1	69.0	+55.1
85–89	69.0	0.0	31.0	0.0	69.0	+55.0
90–94	69.0	0.0	31.0	0.0	69.0	+55.0
95–100	69.0	0.0	31.0	0.0	69.0	+55.0

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

Figure 12 (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 (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.0	100.0	0.0	Only poor targeted
5–9	1.2	89.6	1.6	8.6:1
10–14	4.7	89.6	6.2	8.6:1
15–19	13.5	88.4	17.3	7.6:1
20–24	26.6	87.0	33.5	6.7:1
25–29	42.6	84.8	52.4	5.6:1
30–34	59.2	82.2	70.6	4.6:1
35–39	72.0	79.5	83.1	3.9:1
40–44	81.9	76.8	91.2	3.3:1
45–49	88.9	74.3	95.7	2.9:1
50–54	93.5	72.6	98.4	2.6:1
55–59	96.1	71.3	99.4	2.5:1
60–64	98.0	70.2	99.7	2.4:1
65–69	99.0	69.6	99.9	2.3:1
70–74	99.5	69.3	100.0	2.3:1
75–79	99.7	69.1	100.0	2.2:1
80–84	99.9	69.0	100.0	2.2:1
85–89	100.0	69.0	100.0	2.2:1
90–94	100.0	69.0	100.0	2.2:1
95–100	100.0	69.0	100.0	2.2:1

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	96.7
10–14	96.5
15–19	97.2
20–24	96.4
25–29	93.2
30–34	90.4
35–39	87.3
40–44	82.8
45–49	73.4
50–54	68.4
55–59	61.3
60–64	50.4
65–69	37.1
70–74	29.2
75–79	5.1
80–84	9.5
85–89	15.2
90–94	0.0
95–100	0.0

Figure 7 (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	+0.3	2.4	2.7	4.0
10–14	–0.5	1.2	1.4	1.8
15–19	+1.6	1.0	1.1	1.5
20–24	+2.5	0.9	1.1	1.4
25–29	–0.2	0.9	1.0	1.3
30–34	–0.2	1.0	1.2	1.6
35–39	+3.4	1.5	1.7	2.4
40–44	+3.6	1.9	2.3	2.8
45–49	–1.7	2.2	2.7	3.6
50–54	–6.3	4.5	4.6	5.3
55–59	+9.3	4.2	5.1	6.5
60–64	+5.6	5.1	6.2	8.3
65–69	+10.6	5.5	6.3	8.2
70–74	+3.2	7.9	9.3	12.2
75–79	–7.6	9.4	11.3	15.1
80–84	+5.2	4.8	5.6	7.1
85–89	+15.2	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 (200% of the national line): Differences and precision of differences 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	59.5	64.6	80.0
4	+1.9	26.8	32.4	46.6
8	+1.9	20.4	23.4	29.1
16	+1.9	14.6	17.2	22.2
32	+1.5	10.8	12.6	16.8
64	+1.4	7.7	8.7	11.2
128	+1.4	5.3	6.2	8.2
256	+1.3	3.8	4.6	5.7
512	+1.3	2.6	3.0	4.0
1,024	+1.3	1.9	2.3	3.1
2,048	+1.3	1.3	1.6	2.2
4,096	+1.3	0.9	1.1	1.5
8,192	+1.3	0.7	0.8	1.0
16,384	+1.3	0.5	0.6	0.8

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

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.0	85.8	0.0	14.2	14.2	–100.0
5–9	1.2	84.6	0.0	14.1	15.3	–97.2
10–14	4.6	81.2	0.1	14.0	18.6	–89.1
15–19	13.0	72.8	0.5	13.7	26.7	–69.0
20–24	25.4	60.5	1.2	12.9	38.3	–39.5
25–29	40.4	45.5	2.3	11.9	52.3	–3.3
30–34	55.5	30.3	3.7	10.4	65.9	+33.6
35–39	66.4	19.5	5.7	8.5	74.9	+61.3
40–44	74.3	11.5	7.6	6.6	80.9	+81.9
45–49	79.6	6.3	9.3	4.9	84.4	+89.2
50–54	83.0	2.9	10.5	3.7	86.6	+87.8
55–59	84.5	1.4	11.6	2.5	87.0	+86.4
60–64	85.3	0.5	12.7	1.5	86.8	+85.2
65–69	85.6	0.2	13.4	0.8	86.4	+84.4
70–74	85.8	0.0	13.7	0.4	86.2	+84.0
75–79	85.8	0.0	13.9	0.3	86.1	+83.8
80–84	85.8	0.0	14.1	0.1	85.9	+83.6
85–89	85.8	0.0	14.1	0.0	85.9	+83.5
90–94	85.8	0.0	14.2	0.0	85.8	+83.5
95–100	85.8	0.0	14.2	0.0	85.8	+83.5

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

Figure 12 (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 (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.0	100.0	0.0	Only poor targeted
5–9	1.2	97.0	1.4	32.2:1
10–14	4.7	97.0	5.4	32.1:1
15–19	13.5	96.3	15.2	26.1:1
20–24	26.6	95.4	29.5	20.5:1
25–29	42.6	94.7	47.0	17.9:1
30–34	59.2	93.7	64.6	14.8:1
35–39	72.0	92.1	77.3	11.7:1
40–44	81.9	90.7	86.6	9.8:1
45–49	88.9	89.5	92.7	8.6:1
50–54	93.5	88.8	96.7	7.9:1
55–59	96.1	87.9	98.4	7.3:1
60–64	98.0	87.0	99.4	6.7:1
65–69	99.0	86.5	99.8	6.4:1
70–74	99.5	86.2	100.0	6.2:1
75–79	99.7	86.0	100.0	6.2:1
80–84	99.9	85.9	100.0	6.1:1
85–89	100.0	85.9	100.0	6.1:1
90–94	100.0	85.8	100.0	6.1:1
95–100	100.0	85.8	100.0	6.1:1

Tables for the USAID "Extreme" Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	44.4
10–14	39.2
15–19	35.2
20–24	28.8
25–29	20.0
30–34	13.6
35–39	7.9
40–44	4.5
45–49	4.2
50–54	2.6
55–59	0.5
60–64	0.5
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 7 (USAID "extreme" line): 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	+2.6	5.5	6.8	9.3
10–14	–0.5	3.5	4.0	5.6
15–19	+3.2	2.1	2.5	3.2
20–24	+3.2	1.6	1.9	2.6
25–29	+1.0	1.3	1.6	2.1
30–34	+2.7	1.0	1.2	1.6
35–39	–0.6	1.0	1.2	1.6
40–44	–0.0	0.9	1.0	1.3
45–49	+0.9	1.0	1.2	1.5
50–54	+1.2	0.7	0.8	1.1
55–59	–1.3	1.3	1.4	1.8
60–64	+0.5	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 (USAID "extreme" line): Differences and precision of differences 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	57.6	62.8	69.9
4	+0.7	27.7	33.4	44.2
8	+1.1	20.6	24.4	31.3
16	+0.8	14.3	17.2	22.3
32	+1.0	9.6	11.3	14.1
64	+1.1	6.9	8.5	11.2
128	+1.2	5.1	6.2	8.0
256	+1.2	3.6	4.2	5.2
512	+1.3	2.5	3.0	3.8
1,024	+1.3	1.8	2.2	2.8
2,048	+1.3	1.2	1.5	1.9
4,096	+1.3	0.9	1.1	1.4
8,192	+1.3	0.6	0.7	1.0
16,384	+1.3	0.5	0.5	0.7

Figure 11 (USAID "extreme" line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.0	16.0	0.0	84.0	84.0	–99.8
5–9	0.5	15.5	0.7	83.3	83.8	–89.0
10–14	2.0	14.0	2.7	81.3	83.3	–57.8
15–19	5.1	10.9	8.4	75.5	80.7	+16.3
20–24	8.7	7.3	17.9	66.1	74.8	–11.5
25–29	12.0	4.1	30.6	53.3	65.3	–91.1
30–34	14.0	2.1	45.3	38.7	52.7	–182.4
35–39	15.1	0.9	56.9	27.1	42.2	–255.0
40–44	15.7	0.4	66.2	17.8	33.5	–313.0
45–49	15.9	0.1	73.0	11.0	26.9	–355.1
50–54	16.0	0.0	77.5	6.5	22.5	–383.4
55–59	16.0	0.0	80.1	3.9	19.9	–399.5
60–64	16.0	0.0	81.9	2.0	18.1	–411.3
65–69	16.0	0.0	83.0	1.0	17.0	–417.9
70–74	16.0	0.0	83.5	0.5	16.5	–421.0
75–79	16.0	0.0	83.7	0.3	16.3	–422.3
80–84	16.0	0.0	83.9	0.1	16.1	–423.5
85–89	16.0	0.0	83.9	0.0	16.1	–423.7
90–94	16.0	0.0	84.0	0.0	16.0	–423.9
95–100	16.0	0.0	84.0	0.0	16.0	–423.9

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

Figure 12 (USAID "extreme" 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 (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.0	100.0	0.1	Only poor targeted
5–9	1.2	43.8	3.4	0.8:1
10–14	4.7	42.9	12.7	0.8:1
15–19	13.5	37.7	31.9	0.6:1
20–24	26.6	32.8	54.4	0.5:1
25–29	42.6	28.1	74.7	0.4:1
30–34	59.2	23.6	87.1	0.3:1
35–39	72.0	21.0	94.5	0.3:1
40–44	81.9	19.1	97.8	0.2:1
45–49	88.9	17.9	99.2	0.2:1
50–54	93.5	17.1	99.7	0.2:1
55–59	96.1	16.7	100.0	0.2:1
60–64	98.0	16.4	100.0	0.2:1
65–69	99.0	16.2	100.0	0.2:1
70–74	99.5	16.1	100.0	0.2:1
75–79	99.7	16.1	100.0	0.2:1
80–84	99.9	16.0	100.0	0.2:1
85–89	100.0	16.0	100.0	0.2:1
90–94	100.0	16.0	100.0	0.2:1
95–100	100.0	16.0	100.0	0.2:1

Tables for the $1.25/day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	22.2
10–14	19.5
15–19	13.6
20–24	10.7
25–29	6.8
30–34	3.6
35–39	1.8
40–44	0.5
45–49	0.5
50–54	0.9
55–59	0.0
60–64	0.0
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 7 ($1.25/day line): 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	4.7	5.6	7.1
10–14	+2.3	2.7	3.3	4.3
15–19	–1.1	1.6	1.9	2.6
20–24	+2.4	0.9	1.1	1.5
25–29	+2.5	0.6	0.8	1.0
30–34	+1.4	0.4	0.5	0.7
35–39	+0.0	0.5	0.5	0.7
40–44	+0.1	0.2	0.3	0.3
45–49	–0.2	0.5	0.6	0.8
50–54	+0.5	0.4	0.4	0.6
55–59	–0.1	0.2	0.2	0.3
60–64	+0.0	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 ($1.25/day line): Differences and precision of differences 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	–0.0	47.1	54.4	59.3
4	+0.8	15.2	18.9	27.7
8	+0.9	10.8	12.7	18.5
16	+0.9	7.6	8.9	10.8
32	+1.0	5.4	6.5	8.3
64	+0.8	4.1	4.7	5.9
128	+0.8	2.9	3.4	4.6
256	+0.9	2.0	2.4	3.0
512	+0.9	1.4	1.6	2.1
1,024	+0.9	1.0	1.2	1.5
2,048	+0.9	0.7	0.8	1.1
4,096	+0.9	0.5	0.6	0.8
8,192	+0.9	0.4	0.4	0.6
16,384	+0.9	0.2	0.3	0.4

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

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.0	5.4	0.0	94.6	94.6	–99.5
5–9	0.3	5.1	0.9	93.7	94.0	–71.7
10–14	1.0	4.4	3.8	90.8	91.8	+5.4
15–19	2.4	3.0	11.1	83.4	85.8	–105.6
20–24	3.7	1.7	22.9	71.7	75.4	–322.5
25–29	4.5	0.9	38.1	56.5	61.1	–602.8
30–34	5.0	0.4	54.2	40.4	45.4	–900.7
35–39	5.3	0.1	66.7	27.8	33.1	–1,132.4
40–44	5.4	0.1	76.5	18.1	23.4	–1,312.6
45–49	5.4	0.0	83.5	11.1	16.5	–1,441.0
50–54	5.4	0.0	88.0	6.5	11.9	–1,525.7
55–59	5.4	0.0	90.7	3.9	9.3	–1,574.2
60–64	5.4	0.0	92.6	2.0	7.4	–1,609.0
65–69	5.4	0.0	93.6	1.0	6.4	–1,628.6
70–74	5.4	0.0	94.1	0.5	5.9	–1,637.7
75–79	5.4	0.0	94.3	0.3	5.7	–1,641.6
80–84	5.4	0.0	94.5	0.1	5.5	–1,645.3
85–89	5.4	0.0	94.6	0.0	5.4	–1,645.9
90–94	5.4	0.0	94.6	0.0	5.4	–1,646.4
95–100	5.4	0.0	94.6	0.0	5.4	–1,646.4

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

Figure 12 ($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 (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.0	100.0	0.3	Only poor targeted
5–9	1.2	24.7	5.6	0.3:1
10–14	4.7	20.5	18.0	0.3:1
15–19	13.5	17.7	44.3	0.2:1
20–24	26.6	14.0	68.5	0.2:1
25–29	42.6	10.7	83.9	0.1:1
30–34	59.2	8.5	92.8	0.1:1
35–39	72.0	7.3	97.8	0.1:1
40–44	81.9	6.5	98.9	0.1:1
45–49	88.9	6.1	99.6	0.1:1
50–54	93.5	5.8	99.9	0.1:1
55–59	96.1	5.6	100.0	0.1:1
60–64	98.0	5.5	100.0	0.1:1
65–69	99.0	5.5	100.0	0.1:1
70–74	99.5	5.4	100.0	0.1:1
75–79	99.7	5.4	100.0	0.1:1
80–84	99.9	5.4	100.0	0.1:1
85–89	100.0	5.4	100.0	0.1:1
90–94	100.0	5.4	100.0	0.1:1
95–100	100.0	5.4	100.0	0.1:1

Tables for the $2.50/day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	79.0
10–14	82.8
15–19	79.9
20–24	72.5
25–29	68.6
30–34	57.3
35–39	46.9
40–44	35.8
45–49	26.2
50–54	19.3
55–59	12.9
60–64	7.1
65–69	6.0
70–74	6.7
75–79	1.4
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 7 ($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	–0.6	4.6	5.7	7.4
10–14	+2.3	3.1	3.6	4.8
15–19	+5.6	2.0	2.4	3.4
20–24	+0.8	1.7	2.1	2.7
25–29	+4.0	1.6	2.0	2.6
30–34	+0.1	1.8	2.3	2.8
35–39	–1.1	1.9	2.3	2.9
40–44	–1.0	2.2	2.5	3.5
45–49	+3.9	2.1	2.5	3.2
50–54	–0.3	2.6	3.1	4.2
55–59	+2.1	2.5	3.1	4.0
60–64	+0.1	2.8	3.4	4.4
65–69	+0.2	2.8	3.3	4.2
70–74	+3.4	2.4	2.8	3.6
75–79	–1.1	3.3	3.8	4.8
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 ($2.50/day line): Differences and precision of differences 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	68.3	76.9	83.4
4	+2.0	39.6	46.7	58.4
8	+1.6	28.3	33.0	41.1
16	+1.3	19.5	23.9	31.5
32	+1.0	14.7	17.7	22.8
64	+1.2	10.3	12.1	16.4
128	+1.3	7.1	8.3	11.3
256	+1.3	5.0	6.0	7.8
512	+1.4	3.6	4.3	5.5
1,024	+1.4	2.6	3.0	3.8
2,048	+1.4	1.8	2.1	2.8
4,096	+1.4	1.3	1.6	2.1
8,192	+1.3	0.9	1.1	1.4
16,384	+1.3	0.6	0.7	1.0

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

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.0	54.2	0.0	45.8	45.8	–99.9
5–9	1.0	53.2	0.2	45.6	46.6	–95.9
10–14	3.9	50.3	0.8	45.0	48.9	–84.1
15–19	10.7	43.5	2.8	43.0	53.7	–55.2
20–24	20.4	33.8	6.2	39.6	59.9	–13.4
25–29	31.0	23.2	11.6	34.2	65.3	+35.9
30–34	40.8	13.4	18.5	27.3	68.1	+65.9
35–39	47.2	7.0	24.9	20.9	68.1	+54.1
40–44	51.0	3.2	30.9	14.9	65.9	+43.0
45–49	52.7	1.5	36.1	9.7	62.4	+33.3
50–54	53.7	0.5	39.8	6.0	59.7	+26.6
55–59	54.0	0.2	42.1	3.7	57.7	+22.3
60–64	54.1	0.1	43.9	1.9	56.0	+19.0
65–69	54.2	0.0	44.9	0.9	55.1	+17.2
70–74	54.2	0.0	45.3	0.5	54.7	+16.4
75–79	54.2	0.0	45.5	0.3	54.5	+16.0
80–84	54.2	0.0	45.7	0.1	54.3	+15.6
85–89	54.2	0.0	45.8	0.0	54.2	+15.6
90–94	54.2	0.0	45.8	0.0	54.2	+15.5
95–100	54.2	0.0	45.8	0.0	54.2	+15.5

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

Figure 12 ($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 (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.0	100.0	0.0	Only poor targeted
5–9	1.2	80.5	1.8	4.1:1
10–14	4.7	82.4	7.2	4.7:1
15–19	13.5	79.2	19.8	3.8:1
20–24	26.6	76.6	37.6	3.3:1
25–29	42.6	72.8	57.3	2.7:1
30–34	59.2	68.8	75.2	2.2:1
35–39	72.0	65.5	87.1	1.9:1
40–44	81.9	62.3	94.1	1.7:1
45–49	88.9	59.3	97.3	1.5:1
50–54	93.5	57.4	99.0	1.3:1
55–59	96.1	56.2	99.6	1.3:1
60–64	98.0	55.2	99.8	1.2:1
65–69	99.0	54.7	99.9	1.2:1
70–74	99.5	54.4	100.0	1.2:1
75–79	99.7	54.3	100.0	1.2:1
80–84	99.9	54.2	100.0	1.2:1
85–89	100.0	54.2	100.0	1.2:1
90–94	100.0	54.2	100.0	1.2:1
95–100	100.0	54.2	100.0	1.2:1