A Simple Poverty Scorecard for Syria

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This document and related tools are at `http://www.microfinance.com/#Syria`.

Abstract

This paper uses Syria's 2006/7 Household Income and Expenditure Survey to construct an easy-to-use scorecard that estimates the likelihood that a household has expenditure below a given poverty line. The scorecard uses ten simple indicators that field workers can quickly collect and verify. Poverty scores can be computed on paper in the field in five to ten minutes. The scorecard's accuracy and precision are reported for a range of poverty lines. The poverty scorecard is a practical way for pro-poor programs in Syria to measure poverty rates, to track changes in poverty rates over time, and to target services.

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Figure 1: Simple poverty scorecard for Syria

Entity	**Name**	**ID**	**Date** (DD/MM/YY)	
Member:			Joined:	
Loan officer:			Today:	
Branch:			Household size:	

Indicator	Value	Points	Score
1. How many members does the household have?	A. Eight or more	0	
	B. Seven	4	
	C. Six	8	
	D. Five	13	
	E. Four	19	
	F. Three	24	
	G. One or two	31	
2. What type of residence does the household live in?	A. Arabic house, or other	0	
	B. Villa, or apartment	3	
3. How many rooms does the residence have?	A. One	0	
	B. Two or three	9	
	C. Four	12	
	D. Five or more	15	
4. Does the household have both a refrigerator and a freezer?	A. No	0	
	B. Yes	9	
5. Does the household have an automatic washing machine?	A. No	0	
	B. Yes	4	
6. How many complete bedroom sets does the household have?	A. None	0	
	B. One	3	
	C. Two	5	
7. Does the household have a chandelier?	A. No	0	
	B. Yes	5	
8. How many fans does the household have?	A. None	0	
	B. One	3	
	C. Two	8	
	D. Three or more	9	
9. Does the household own a motorcycle or car?	A. None	0	
	B. Motorcycle only	6	
	C. Car (regardless of motorcycle)	12	
10. What is the place of work of the male head/spouse in his main profession?	A. Farm, or does not work	0	
	B. No male head/spouse	2	
	C. Enterprise, or at home	5	
	D. Other	7	

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

Figure 1: Simple poverty scorecard for Syria (no points)

Entity	**Name**	**ID**	**Date** (DD/MM/YY)	
Member:			Joined:	
Loan officer:			Today:	
Branch:			Household size:	

Indicator	Value
1. How many members does the household have?	A. Eight or more B. Seven C. Six D. Five E. Four F. Three G. One or two
2. What type of residence does the household live in?	A. Arabic house, or other B. Villa, or apartment
3. How many rooms does the residence have?	A. One B. Two or three C. Four D. Five or more
4. Does the household have both a refrigerator and a freezer?	A. No B. Yes
5. Does the household have an automatic washing machine?	A. No B. Yes
6. How many complete bedroom sets does the household have?	A. None B. One C. Two
7. Does the household have a chandelier?	A. No B. Yes
8. How many fans does the household have?	A. None B. One C. Two D. Three or more
9. Does the household own a motorcycle or car?	A. None B. Motorcycle only C. Car (regardless of motorcycle)
10. What is the place of work of the male head/spouse in his main profession?	A. Farm, or does not work B. No male head/spouse C. Enterprise, or at home D. Other

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A Simple Poverty Scorecard for Syria

1. Introduction

This paper presents an easy-to-use poverty scorecard that pro-poor programs in Syria can use to estimate the likelihood that a household has expenditure below a given poverty line. This poverty likelihood can then be used to monitor groups' poverty rates at a point in time, to track changes in groups' poverty rates between two points in time, and to target services to households.

The direct approach to poverty measurement via surveys is difficult and costly. For example, Syria's 2006/7 Household Income and Expenditure Survey (HIES) runs more than 20 pages and requires collection of daily expenditures in multiple visits. The expenditure module covers more than 500 items.

In contrast, the indirect approach via poverty scoring is simple, quick, and inexpensive. It uses ten verifiable indicators (such as "How many rooms does the residence have?" and "How many fans does the household have?") to get a score that is highly correlated with poverty status as measured by expenditure from the lengthy survey.

The poverty scorecard here 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 local organizations are typically subjective and relative

(such as participatory wealth ranking) or blunt (such as rules based on land-ownership or housing quality). These approaches may be costly, their results are not comparable across organizations, and their accuracy and precision are unknown.

Poverty scorecards can serve several purposes. For example, a local pro-poor organization can use scoring to measure the share of its participants with expenditure below a poverty line such as the Millennium Development Goals' $1.25/day at 2005 purchase-power parity (PPP). Or USAID microenterprise partners can use the scorecard to report how many of their participants are among the poorest half of people below the national poverty line. An organization could also use the scorecard to measure movement across a poverty line over time (for example, Daley-Harris, 2009). For all these uses, the poverty scorecard is an expenditure-based, objective tool with known accuracy. While expenditure surveys are costly even for governments, many local pro-poor organizations can implement an inexpensive scorecard.

The statistical approach here aims to be understood by non-specialists. After all, if managers are to adopt poverty scoring on their own and apply it to inform their decisions, they must first trust that it works. Transparency and simplicity build trust. Getting "buy-in" matters; proxy means tests and regressions on the "determinants of poverty" have been around for three decades, but they are rarely used to inform decisions by local pro-poor organizations. This is not because these tools do not work, but because they often have complex indicators and are presented (when they are presented at all) as tables of regression coefficients incomprehensible to non-specialists

(with indicator names such as "LGHHSZ_2", negative points, and points with many decimal places). Thanks to the predictive-modeling phenomenon known as the "flat maximum", simple scorecards are often about as accurate as complex ones.

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

The scorecard (Figure 1) is based on the 2006/7 HIES conducted by Syria's Central Bureau of Statistics. Indicators for the scorecard are selected to be:

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

All points in the scorecard are zeroes or positive 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.

Poverty scoring can be used to estimate three basic quantities. First, it can estimate a particular household's "poverty likelihood", that is, the probability that the household has per-capita expenditure below a given poverty line.

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

Third, poverty scoring can estimate changes in the poverty rate for a given group of households (or for two independent representative samples of households from 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.

Poverty scoring can also be used for targeting services to poorer households. To help managers select an appropriate targeting cut-off, 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 Syria's upper national poverty line. Scores from this scorecard are calibrated to poverty likelihoods for seven poverty lines.

The scorecard is constructed and calibrated using two sub-samples from the 2006/7 HIES, and its accuracy is validated on a third sub-sample. While all three scoring estimators are unbiased when applied to the population from which they are derived (that is, they match the true value on average in repeated samples from the same population from which the scorecard is 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 in practice. (The direct survey approach is unbiased by definition.) There is bias because scoring must assume that the future relationships

[1] Important examples of "different populations" are nationally representative samples at another point in time or non-representative sub-groups (Tarozzi and Deaton, 2007).

between indicators and poverty will be the same as in the data used to build the scorecard. It must also assume that these relationships will be the same in all sub-groups as in the population as a whole.[2] Of course, these assumptions—ubiquitous and inevitable in predictive modeling—hold only partly.

When applied to the validation sample for Syria with the upper national poverty line and $n = 16{,}384$, the difference between scorecard estimates of groups' poverty rates and the true rates at a point in time is +1.1 percentage points. Across all seven lines, the average absolute difference is 0.5 percentage points, and the maximum absolute difference is 1.1 percentage points.

Because the validation sample is representative of the same population as the data that is used to construct the scorecard and because all the data come from the same time period, the scorecard estimators are unbiased and these observed differences are due to sampling variation; the average difference would be zero if the 2006/7 HIES were to be repeatedly redrawn and divided into sub-samples before repeating the entire scorecard-building and accuracy-testing process.

For $n = 16{,}384$, the 90-percent confidence intervals for these estimates are +/– 0.5 percentage points or less. For $n = 1{,}024$, these intervals are +/–2.3 percentage points or less.

[2] Bias may also result from changes over time in the quality of data, from changes in the real value of poverty lines, from imperfect adjustment of poverty lines to account for differences in cost-of-living, or from sampling variation across surveys.

Section 2 below documents data, poverty lines, and poverty rates for Syria. Sections 3 and 4 describe scorecard construction and offer practical guidelines for implementation. 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, and Section 8 covers targeting. The final section is a summary.

2. Data and poverty lines

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

2.1 Data

The scorecard is based on data from the 12,009 households in the 2006/7 HIES. This is the most recent national expenditure survey for Syria. For scoring, the data are further divided into three sub-samples (Figure 2):

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

2.2 Poverty rates and poverty lines

2.2.1 Rates

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

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 for the group 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 for the group of $2 \div (1 + 2) = 67$ percent.

Which 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 their 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 is relevant. For example, if a microlender has only one borrower in a household, then it might want to report household-level poverty rates.

The poverty scorecard here is constructed using Syria's 2006/7 HIES and household-level lines. Scores are calibrated to household-level poverty likelihoods, and

accuracy is measured for household-level rates. This use of the household level reflects the belief that it is the most relevant for most pro-poor organizations.

Person-level poverty rates can be estimated by taking a household-size-weighted average of the household-level poverty likelihoods. It is also possible to construct a scorecard based on person-level lines, to calibrate scores to person-level likelihoods, and to measure accuracy for person-level rates, but it is not done here.

2.2.2 Poverty lines

Figure 2 shows seven poverty lines for Syria and reports poverty rates (for both households and people) for Syria as a whole. Figure 2 also shows household-level poverty rates for the three sub-samples used in scorecard construction, calibration, and validation. Figure 3 shows poverty lines and poverty rates both for Syria as a whole and separately for its four regions.

The national poverty lines used with the 2006/7 HIES here come from the cost-of-basic-needs approach (Ravaillon, 1994) as documented in El Laithy and Abu-Ismail (2005). The first step is to derive a food line based on the sum of the caloric needs of each member of a household, derived from World Health Organization tables that consider age, sex, and activity level (proxied for Syria by urban/rural location). The food basket used to meet the caloric requirement—and the cost of a Calorie in each of Syria's four regions—is determined based on consumption patterns and average food prices observed in the 2006/7 HIES for households in the second quintile of total expenditure. The resulting food poverty line is household-specific and accounts for

household composition in terms of number of members (and subsequent economies of scale), composition by age and sex, and region of residence.

The second step is to define a "lower" national poverty line as the food line plus the non-food expenditure observed in the 2006/7 HIES for households whose *total expenditure* is at the food line. Thus, the lower line is the cost of the assumed caloric requirement, plus *part* of the apparently essential non-food expenditure that households make even before they fulfill their assumed food requirements. On average in Syria's 2006/7 HIES, the lower line is SYP72 per person per day (Figure 2), giving a household-level poverty rate of 8.7 percent and a person-level rate of 11.7 percent.

As the third and final step, an "upper" national poverty line is defined as the food line, plus the non-food expenditure observed in the 2006/7 HIES for households whose *food expenditure* is at the food line. This upper lower line is the cost of the assumed caloric requirement, plus *all* apparently essential non-food expenditure that households make just up to the point where they meet food requirements. On average in Syria's 2006/7 HIES, the upper line is SYP99 per person per day, giving a household-level poverty rate of 26.9 percent and a person-level poverty rate of 32.6 percent.

The scorecard here is constructed with the upper national line. Almost no households in Syria are below the food line, and the lower line is too low, as households below it are not meeting their basic needs for both food and non-food.

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

- Upper national
- Lower national
- 150% of upper national
- 200% of upper national
- $2.50/day 2005 PPP
- $3.75/day 2005 PPP
- $5.00/day 2005 PPP

The $2.50/day 2005 PPP line is derived using the 2005 PPP exchange rate for "individual consumption expenditure by households" (SYP24.65 per USD1.00, see World Bank, 2008) and the average all-Syria Consumer Price Index in 2005 (104.30) and during the 2006/7 HIES fieldwork from November 2006 to October 2007 (113.98).[3] The $2.50/day 2005 PPP line in 2007 is then (Sillers, 2006):

$$2 \cdot (\text{2005 PPP exchange rate}) \cdot \$1.25 \cdot \frac{\text{CPI}_{\text{Ave. 2006/7}}}{\text{CPI}_{\text{Ave. 2005}}} =$$
$$2 \cdot \left(\frac{\text{SYP24.65}}{\$1.00}\right) \cdot \$1.25 \cdot \frac{113.98}{104.30} = \text{SYP67.34}.$$

This is the all-Syria $2.50/day 2005 PPP line. To adjust for a given household's specific needs and prices, this figure is multiplied by the household's upper line and then divided by the all-Syria average upper line.

[3] The CPI figures are from Syria's Central Bureau of Statistics.

The $3.75/day and $5.00/day 2005 PPP lines are multiples of the $2.50/day 2005 PPP line. This paper does not present the $1.25/day 2005 PPP poverty line because less than 1 percent of households in Syria have expenditure below it. By chance, it turns out that the lower national line is close to $2.50/day 2005 PPP, and the upper national line is close to $3.75/day 2005 PPP.

3. Scorecard construction

For the Syria scorecard, about 115 potential indicators are initially prepared in the areas of:

- Family composition (such as household size)
- Education (such as school attendance of children)
- Employment (such as the place of work of the male head/spouse)
- Housing (such as the number of rooms)
- Ownership of durable goods (such as fans or automatic washing machines)

Figure 4 lists all the candidate indicators, ranked by the entropy-based "uncertainty coefficient" that is a measure of how well the indicator predicts poverty on its own (Goodman and Kruskal, 1979).

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 fans owned is probably more likely to change in response to small changes in poverty than is ownership of an air conditioner.

The scorecard itself is built using the upper national poverty line and Logit regression on the construction sub-sample. Indicator selection uses both judgment and statistics (forward stepwise, based on "c"). 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 its 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), including 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, now 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.

This algorithm is the Logit analogue to the familiar R^2-based stepwise with least-squares regression. It differs from naïve stepwise in that the criteria for selecting indicators include not only statistical accuracy but also judgment and non-statistical factors. The use of non-statistical criteria can improve robustness through time and helps ensure that indicators are simple and make sense to users.

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).

The single poverty scorecard here applies to all of Syria. Tests for Mexico and India (Schreiner, 2006a and 2006b), Sri Lanka (Narayan and Yoshida, 2005), and Jamaica (Grosh and Baker, 1995) suggest that segmenting scorecards by urban/rural does not improve targeting much, although such segmentation may improve the accuracy of estimated poverty rates (Tarozzi and Deaton, 2007).

4. Practical guidelines for scorecard use

The main challenge of scorecard design is not to squeeze out the last drops of accuracy but rather to improve the chances that scoring is actually used (Schreiner, 2005). When scoring projects fail, the reason is not usually technical 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 predict tolerably well, 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 want to adopt it and use it properly. Of course, accuracy is important, but so are 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 a single 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)

The scorecard in Figure 1 is ready to be photocopied and can be used with a simple spreadsheet database (Microfinance Risk Management, L.L.C., 2010) that records identifying information, indicator values, scores, and poverty likelihoods.

A field worker using the paper scorecard would:

- Record participant identifiers
- Read each question from the scorecard
- Circle each response and its points
- Write the points 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 data entry and filing

4.1 Quality control

Of course, field workers must be trained. High-quality outputs require high-quality inputs. If organizations or field workers gather their own data and if they believe that they have an incentive to exaggerate poverty rates (for example, if funders reward them for higher poverty rates), then it is wise to do on-going quality control via

data review and random audits (Matul and Kline, 2003).[4] IRIS Center (2007a) and Toohig (2008) are useful nuts-and-bolts guides for planning, budgeting, training field workers and supervisors, logistics, sampling, interviewing, piloting, recording data, and controlling quality.

In particular, while collecting scorecard indicators is relatively easier than most alternatives, it is still absolutely difficult. Training and explicit definitions of the terms and concepts in the scorecard is essential.[5] For the example of Nigeria, one study finds distressingly low inter-rater and test-retest correlations for indicators as seemingly simple and obvious as whether the household owns an automobile (Onwujekwe, Hanson, and Fox-Rushby, 2006).

In an example from Mexico, Martinelli and Parker (2007) find that in the first stage of targeting a conditional cash-transfer program, "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 Mexico does in the second stage of its targeting process—field agents can verify responses with a home visit and correct false reports, and this same procedure is suggested for poverty scoring as well.

[4] If an organization does not want field workers to know the points associated with indicators, then they can use the version of Figure 1 without points and apply them later at the central office.

[5] Appendix A is a guide for interpreting indicators in Syria's poverty scorecard.

4.2 Implementation and sampling

In terms of implementation and sample 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

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 then downloaded to a database

The subjects to be scored can be:

- All participants
- A representative sample of all participants
- All participants in a representative sample of branches
- A representative sample of all participants in a representative sample of branches
- A representative sample of a sub-group of interest for a particular question

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 confidence level 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 worker visits a participant at home (allowing measuring change)

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

- With different sets of participants, with each set representative of all participants
- With a single set of participants

An example bundle of choices for implementation and design is provided by BRAC and ASA, two microlenders in Bangladesh (each with more than 7 million participants) who are applying a poverty scorecard similar to the one here (Chen and Schreiner, 2009a). Their design is that loan officers in a random sample of branches apply the poverty scorecard to their clients 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 and scored. The sampling plans of ASA and BRAC cover 50,000–100,000 participants each, which is far more than would be required to inform most relevant questions at a typical pro-poor organization.

5. Estimates of household poverty likelihoods

The sum of scorecard points for a household is called the *score*. For Syria, scores range from 0 to 100. While higher scores indicate less likelihood of being below a poverty line, the scores themselves have only relative units. For example, doubling the score does not double the likelihood of being above a poverty line.

To get absolute units, scores must be converted to *poverty likelihoods*, that is, probabilities of being below a poverty line. This is done via simple look-up tables. For the example of the upper national line with the 2006/7 HIES, scores of 25–29 have a poverty likelihood of 45.5 percent, and scores of 30–34 have a poverty likelihood of 41.0 percent (Figure 5).

Naturally, the poverty likelihood associated with a score varies by poverty line. For example, scores of 25–29 are associated with a poverty likelihood of 45.5 percent for the upper national line but 15.5 percent for the lower national line.[6]

5.1 Calibrating scores with poverty likelihoods

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

[6] Starting with Figure 5, many figures have seven versions, one for each of the seven poverty lines. The tables are grouped by poverty line. Single tables that pertain to all poverty lines are placed with the tables for the upper national line.

For the example of the upper national line (Figure 6), there are 10,873 (normalized) households in the calibration sub-sample with a score of 25–29, of whom 4,949 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 25–29 is then 45.5 percent, as 4,949 ÷ 10,873 = 0.455.

To illustrate further with the upper national line and a score of 30–34, there are 12,819 (normalized) households in the calibration sample, of whom 5,261 (normalized) are below the line (Figure 6). Thus, the poverty likelihood for this score is 5,261 ÷ 12,819 = 41.0 percent.

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

Figure 7 shows, for all scores, the likelihood that expenditure falls in a range demarcated by two adjacent poverty lines. For example, the daily expenditure of someone with a score of 25–29 falls in the following ranges with probability:

- 15.5 percent below the lower national line
- 30.0 percent between the lower and the upper national lines
- 36.4 percent between the upper and 150% of the upper national line
- 7.0 percent between 150% of the upper national line and $5.00/day 2005 PPP
- 5.0 percent between $5.00/day 2005 PPP and 200% of the upper national line
- 6.1 percent above 200% of the upper national line

Even though the scorecard is constructed partly based on judgment, this calibration process produces poverty likelihoods that are objective, that is, derived from quantitative poverty lines and survey data on expenditure. The poverty likelihoods would be objective even if indicators and/or points were selected without any data at all. In fact, scorecards with objective poverty likelihoods of proven accuracy are often

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

5.2 Accuracy of estimates of households' poverty likelihoods

As long as the relationship between indicators and poverty does not change and as long as the scorecard is applied to households who are representative of the same population from which the scorecard was constructed, 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.[7]

But the relationship between indicators and poverty does change with time and also across sub-groups in Syria's population, so the scorecard is generally biased when applied after the end date of fieldwork for the 2006/7 HIES (as it must be applied in practice) or when applied with non-nationally representative groups (as it probably would be applied by local, pro-poor organizations).

How accurate are estimates of households' poverty likelihoods, given the assumption of representativeness? To check, 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 who have expenditure below a poverty line
- For each score range, record the difference between the estimated poverty likelihood (Figure 5) and the true poverty likelihood in the bootstrap sample
- Repeat the previous three steps 1,000 times
- For each score range, report the average difference between estimated and true poverty likelihoods across the 1,000 bootstrap samples
- For each score range, report the two-sided interval containing the central 900, 950, or 990 differences between estimated and true poverty likelihoods

For each score range and for $n = 16{,}384$, Figure 8 shows the average difference between estimated and true poverty likelihoods as well as confidence intervals for the

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

differences. For the upper national line in the validation sample, the average poverty likelihood across bootstrap samples for scores of 25–29 is too low by 1.5 percentage points. For scores of 30–34, the estimate is too high by 2.9 percentage points.[8]

The 90-percent confidence interval for the differences for scores of 25–29 is +/– 2.0 percentage points (Figure 8). This means that in 900 of 1,000 bootstraps, the difference between the estimate and the true value is between –3.5 and +0.5 percentage points (because –1.5 – 2.0 = –3.5, and –1.5 + 2.0 = +0.5). In 950 of 1,000 bootstraps (95 percent), the difference is –1.5 +/–2.3 percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is –6.0 +/–3.0 percentage points.

For many scores, Figure 8 shows differences—a few of them large—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 Syria's population. For targeting, however, what matters is less the differences across all score ranges and more the differences in score ranges just above and below the targeting cut-off. This mitigates the effects of bias and sampling variation on targeting (Friedman, 1997). Section 8 below looks at targeting accuracy in detail.

[8] These differences are not zero, despite 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 construction and calibration process.

Of course, 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 bias is overfitting. By construction, the scorecard here is unbiased, but it may still be *overfit* when applied after the October 2007 end of field work for the 2006/7 HIES. That is, the scorecard may fit the data from the 2006/7 HIES so closely that it captures not only real patterns but also some random patterns that, due to sampling variation, show up only in the 2006/7 HIES. Or the scorecard may be overfit in the sense that it is not robust to changes through time in the relationships between indicators and poverty. Finally, the scorecard could also be overfit when it is applied to samples from non-nationally representative sub-groups.

Overfitting can be mitigated by simplifying the scorecard and by not relying only on the 2006/7 HIES data but rather also considering experience, judgment, and theory. Of course, the scorecard here does just that. Bootstrapping scorecard construction—which is not done here—can also mitigate overfitting by reducing (but not eliminating) dependence on a single sampling instance. Combining scorecards can also help, at the cost of complexity.

In any case, most errors in individual households' likelihoods balance out in the estimates of groups' poverty rates (see later sections). Furthermore, much of the differences between scorecard estimates and true values may come from non-scorecard sources such as changes in the relationship between indicators and poverty, sampling

variation, changes in poverty lines, inconsistencies in data quality across time, and inconsistencies/imperfections in cost-of-living adjustments. These factors can be addressed only by improving data quantity and quality (which is beyond the scope of the scorecard) or by updating data. Given the scorecard's parsimony, attempts to further reduce overfitting would probably have limited returns.

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, 2010 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 51.2, 41.0, and 21.7 percent (upper national line, Figure 5). The group's estimated poverty rate is the households' average poverty likelihood of $(51.2 + 41.0 + 21.7) \div 3 = 38.0$ percent.[9]

6.1 Accuracy of estimated poverty rates at a point in time

How accurate is this estimate? For a range of sample sizes, Figure 10 reports average differences between estimated and true poverty rates as well as precision (confidence intervals for the differences) for the Syria scorecard applied to 1,000 bootstrap samples from the validation sample.

Summarizing Figure 10 across poverty lines and years for $n = 16{,}384$, Figure 9 shows that the absolute differences between the estimated poverty rate and the true rate for the scorecard applied to the validation sample are 1.1 percentage points or less. The average absolute difference across the seven poverty lines is 0.5 percentage points.

[9] The group's poverty rate is *not* the poverty likelihood associated with the average score. Here, the average score is $(20 + 30 + 40) \div 3 = 30$, and the poverty likelihood associated with the average score is 41.0 percent. This is not the 38.0 percent found as the average of the three poverty likelihoods associated with each of the three scores.

In terms of precision, the 90-percent confidence interval for a group's estimated poverty rate at a point in time in 2006/7 with $n = 16{,}384$ is +/–0.5 percentage points or less (Figure 9). This means that in 900 of 1,000 bootstraps of this size, the absolute difference between the estimate and the average estimate is 0.5 percentage points or less.

In the specific case of the upper national line, 90 percent of all samples of $n = 16{,}384$ produce estimates that differ from the true value in the range of +1.1 – 0.5 = +0.6 to +1.1 + 0.5 = +1.6 percentage points. This is because +1.1 is the average difference and +/–0.5 is its 90-percent confidence interval. The average difference is +1.1 because the average scorecard estimate is too high by 1.1 percentage points; the scorecard tends to estimate a poverty rate of 27.4 percent for the validation sample, but the true value is 26.3 percent (Figure 2). Future accuracy will depend on how closely the period of application resembles 2006/7.

6.2 Standard-error formula for estimates of poverty rates at a point in time

How precise are the point-in-time estimates? Because they are averages, the estimates have a Normal distribution and can be characterized by their average difference vis-à-vis true values, along 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 for indirect measurement via poverty scorecards (Schreiner, 2008a), note that the textbook formula (Cochran, 1977) that relates confidence intervals with standard errors in the case of direct measurement of poverty rates is $c = +/- z \cdot \sigma$, 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, with a sample $n = 16{,}384$, 90-percent confidence ($z = 1.64$), and a poverty rate p of 26.3 percent (the true rate in the validation sample for the upper national line in Figure 2), the confidence interval c is

$$+/- z \cdot \sqrt{\frac{p \cdot (1-p)}{n}} = +/- 1.64 \cdot \sqrt{\frac{0.263 \cdot (1-0.263)}{16{,}384}} = +/–0.564 \text{ percentage points.}$$

Poverty scorecards, however, do not measure poverty directly, so this formula is not applicable. To derive a formula for the Syria scorecard, consider Figure 10, 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, the upper national line, and the validation sub-sample, the 90-percent

confidence interval is +/–0.515 percentage points.[10] Thus, the ratio of confidence intervals with poverty scoring versus direct measurement is 0.515 ÷ 0.564 = 0.91.

Now consider the same case, but with n = 8,192. The confidence interval under direct measurement is $+/-1.64 \cdot \sqrt{\frac{0.263 \cdot (1-0.263)}{8{,}192}}$ =+/–0.798 percentage points. The empirical confidence interval with the Syria scorecard for the upper national line (Figure 10) is +/–0.700 percentage points. Thus for n = 8,192, the ratio is 0.700 ÷ 0.798 = 0.88.

This ratio of 0.88 for n = 8,192 is close to the ratio of 0.91 for n = 16,384. Indeed, across all sample sizes of 256 or more in Figure 10, the average ratio turns out to be 0.92, implying that confidence intervals for indirect estimates of poverty rates via the Syria scorecard and the upper national poverty line are about 8-percent narrower than those for direct estimates. This 0.92 appears in Figure 9 as the "α factor" because if $\alpha = 0.92$, then the formula relating confidence intervals c and standard errors for the Syria scorecard is $c = +/- z \cdot \alpha \cdot \sigma$. The standard error for point-in-time estimates of poverty rates via scoring is $\alpha \cdot \sqrt{\frac{p \cdot (1-p)}{n}}$.

In general, α could be more or less than 1.00. When α is less than 1.00, it means that the scorecard is more precise than direct measurement. This occurs in all seven cases in Figure 9.

[10] Due to rounding, Figure 10 displays 0.5, not 0.515.

The formula relating confidence intervals to standard errors for poverty scoring can be rearranged to give a formula for determining sample size n before measurement.[11] If $\hat{p}$ is the expected poverty rate before measurement, then the formula for n based on the desired confidence level that corresponds to z and the desired confidence interval $+/-c$ under poverty scoring is $n = \left(\frac{\alpha \cdot z}{c}\right)^2 \cdot \hat{p} \cdot (1 - \hat{p})$.

To illustrate how to use this, suppose $c = 0.04115$ and $z = 1.64$ (90-percent confidence), and $\hat{p} = 0.2715$ (the average poverty rate for the upper national line in the construction and calibration sub-samples, Figure 2). Then the formula gives $n = \left(\frac{0.92 \cdot 1.64}{0.04115}\right)^2 \cdot 0.2715 \cdot (1 - 0.2715) = 266$, not far from the sample size of 256 observed for these parameters in Figure 10.

Of course, the α factors in Figure 9 are specific to Syria, its poverty lines, its poverty rates, and this scorecard. The method for deriving standard errors, however, is valid for any poverty scorecard following the approach in this paper.

In practice after the end of the HIES field work in October 2007, an organization would select a poverty line (say, the upper national line), select a desired confidence level (say, 90 percent, or $z = 1.64$), select a desired confidence interval (say, +/–2.0

[11] IRIS Center (2007a and 2007b) says that a sample size of $n = 300$ is sufficient for reporting estimated poverty rates to USAID. 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.

percentage points, or $c = 0.02$), make an assumption about $\hat{p}$ (perhaps based on a previous measurement such as the 26.9-percent average for the upper national line in the 2006/7 HIES in Figure 2), look up α (here, 0.92), assume that the scorecard is still valid in the future and/or for non-nationally representative sub-groups,[12] and then compute the required sample size. In this illustration,

$$n = \left(\frac{0.92 \cdot 1.64}{0.02}\right)^2 \cdot 0.269 \cdot (1 - 0.269) = 1{,}120.$$

[12] This paper reports accuracy for the scorecard applied to the validation sample, but it cannot test accuracy for later years or other groups. Performance will deteriorate with time to the extent that the relationship between indicators and poverty changes.

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 only the 2006/7 HIES, this paper cannot test estimates of change over time for Syria, 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, change could be for the better or for the worse, and scoring does not indicate what caused change. This point is often forgotten, confused, or ignored, so it bears repeating: poverty scoring simply estimates change, and it does not, in and of itself, indicate the reason for the change. In particular, estimating the impact of program participation on poverty status requires knowing what would have happened to participants if they had not been participants. Knowing this requires either strong assumptions or a control group that resembles participants in all ways except participation. To belabor the point, poverty scoring can help estimate 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 poverty scoring.

7.2 Calculating estimated changes in poverty rates over time

Consider the illustration begun in the previous section. On Jan. 1, 2010, a program samples three households who score 20, 30, and 40 and so have poverty likelihoods of 51.2, 41.0, and 21.7 percent (upper national line, Figure 5). The group's baseline estimated poverty rate is the households' average poverty likelihood of (51.2 + 41.0 + 21.7) ÷ 3 = 38.0 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, 2011, 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 now 25, 35, and 45 (poverty likelihoods of 45.5, 30.3, and 13.4 percent, upper national line, Figure 5). Their average poverty likelihood at follow-up is (45.5 + 30.3 + 13.4) ÷ 3 = 29.7 percent, an improvement of 38.0 – 29.7 = 8.3 percentage points.[13]

This suggests that about one of twelve participants crossed above the poverty line in 2010. (This is a net figure; some people start above the line and end below it, and vice versa.) Compared with those who started below the line, about one in five (8.3

[13] Of course, such a huge reduction in poverty is unlikely in a year's time, but this is just an example to show how poverty scoring can be used to estimate change.

÷ 38.0 = 21.8 percent) ended up above the line. Of course, poverty scoring does not reveal the reasons for this change.

7.3 Estimated changes in poverty rates in Syria

With only the 2006/7 HIES, it is not possible to measure the accuracy of scorecard estimates of changes in groups' poverty rates over time. In practice, of course, local pro-poor organizations in Syria can still apply the poverty 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.

7.4 Accuracy for estimated change in two independent samples

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

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

z, c, and p are defined as above, n is the sample size at both baseline and follow-up,[14] and α is the average (across a range of sample sizes) of the ratio of the observed bootstrap confidence intervals from a poverty scorecard and the theoretical confidence intervals from the textbook formula for direct measurement.

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

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

For 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 average of α (first averaged across poverty lines and years for a given country, and then averaged across countries) is 1.19. This is as reasonable a figure as any to use for Syria.

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 upper national line, $\alpha = 1.19$, and $\hat{p} = 0.269$

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

(from Figure 2). Then the baseline sample size is $n = 2 \cdot \left(\frac{1.19 \cdot 1.64}{0.02} \right)^2 \cdot 0.269 \cdot (1 - 0.269)$ = 3,745, and the follow-up sample size is also 3,745.

7.5 Accuracy for estimated change for one sample, scored twice

The general formula relating the confidence interval c to the standard error σ when using scoring to estimate change for a single group of households, all of whom are scored at two points in time, is:[15]

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

z, c, and α are defined as before, 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.

As usual, the formula for σ can be rearranged to give a formula for sample size n 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 overall change in the poverty rate will be zero, which implies $\hat{p}_{12} = \hat{p}_{21} = \hat{p}_*$, giving:

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

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

$\hat{p}_*$ could be anything between 0 to 0.5, so more information is needed before applying 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 Syria poverty scorecard is applied twice (once after the end of field work for the 2006/7 HIES and then again later) is:

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

In Peru (the only other country for which there is a data-based 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 upper national line, and the sample will be scored first in 2010 and then again in 2013 ($y = 3$). The before-baseline poverty rate is 26.9 percent ($p_{2006/7} = 0.269$, Figure 2), and suppose $\alpha = 1.30$. Then the baseline sample size is $n = 2 \cdot \left(\frac{1.30 \cdot 1.64}{0.02} \right)^2 \cdot \{ -0.02 + 0.016 \cdot 3 + 0.47 \cdot [0.269 \cdot (1 - 0.269)] \} = 2{,}737$. The same group of 2,737 households is scored at follow-up as well.

8. Targeting

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

There is a distinction between *targeting status* (scoring at or below a targeting cut-off) and *poverty status* (having expenditure below a poverty line). Poverty status is a fact that 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 11 depicts these four possible targeting outcomes. Targeting accuracy varies by cut-off; a higher cut-off has better inclusion (but worse leakage), while a lower cut-off has better exclusion (but worse undercoverage).

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

the four possible targeting outcomes and then to choose the cut-off that maximizes total net benefits (Adams and Hand, 2000; Hoadley and Oliver, 1998).

Figure 12 shows the distribution of households by targeting outcome. For an example cut-off of 29 or less and the scorecard applied to the validation sample, outcomes for the upper national line are:

- Inclusion: 13.4 percent are below the line and correctly targeted
- Undercoverage: 12.9 percent are below the line and mistakenly not targeted
- Leakage: 12.9 percent are above the line and mistakenly targeted
- Exclusion: 60.8 percent are above the line and correctly not targeted

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

- Inclusion: 18.4 percent are below the line and correctly targeted
- Undercoverage: 8.0 percent are below the line and mistakenly not targeted
- Leakage: 20.8 percent are above the line and mistakenly targeted
- Exclusion: 52.9 percent are above the line and correctly not targeted

Which cut-off is preferred depends on total net benefit. If each targeting outcome has a per-household benefit or cost, then total net benefit for a given cut-off is:

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

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

- Assign benefits and costs to possible outcomes, based on its values and mission
- Tally total net benefits for each cut-off using Figure 12 for a given poverty line
- Select the cut-off with the highest total net benefit

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

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

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

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

Figure 12 shows "Total Accuracy" for all cut-offs for Syria's scorecard. For the upper national line in the validation sample, total net benefit is greatest (74.8) for a cut-off of 24 or less, with about three in four households in Syria 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).[16]

As an alternative to assigning benefits and costs to targeting outcomes and then choosing a cut-off to maximize total net benefit, a program could set a cut-off to

[16] Figure 12 also reports "BPAC", the Balanced Poverty Accuracy Criteria used by USAID to certify poverty scorecards. IRIS Center (2005) says that BPAC considers accuracy in terms of the estimated poverty rate and in terms of targeting inclusion. BPAC = (Inclusion + |Undercoverage–Leakage|) x [100 ÷ (Inclusion+Undercoverage)].

achieve a desired poverty rate among targeted households. The third column of Figure 13 ("% targeted who are poor") shows the expected poverty rate among households in Syria who score at or below a given cut-off. For the example of the upper national line and the validation sample, targeting households who score 29 or less would target 26.3 percent of all households (second column) and lead to a poverty rate among those targeted of 51.1 percent (third column).

Figure 13 also reports two other measures of targeting accuracy. The first is a version of inclusion ("% of poor who are targeted"). For the example of the upper national line and the validation sample with a cut-off of 29 or less, 51.0 percent of all poor households are covered.

The final targeting measure in Figure 13 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For the upper national line, 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

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

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

The scorecard is built with a sub-sample of data from the 2006/7 HIES, tested on a different sub-sample from the 2006/7 HIES, and calibrated to seven poverty lines.

Accuracy is 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 in poverty rates are not the same as estimates of program impact. Targeting accuracy and formula for standard errors are also reported.

When the scorecard is applied to the validation sample with $n = 16{,}384$, the absolute difference between estimates and true poverty rates at a point in time is 1.1 percentage points or less and averages—across the seven poverty lines—0.5 percentage points. With 90-percent confidence, the precision of these differences is +/–0.5 percentage points or less. The scorecard is more precise than direct measurement.

For targeting, programs can use the results reported here to select a cut-off that fits their values and mission.

Although the statistical technique is innovative, and although technical accuracy is important, the design of the poverty scorecard 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 poverty scorecard is kept simple, using ten indicators that are inexpensive to collect and 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 understand and trust scoring and by allowing non-specialists to generate scores quickly in the field.

In sum, the simple poverty scorecard is a practical, objective way for pro-poor programs in Syria to measure poverty rates, track changes in poverty rates over time, and target services, provided that the scorecard is applied in a time period similar to that of 2006/7, the period when the data used to construct the scorecard was collected. The same approach can be applied to any country with similar data from a national income or expenditure survey.

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Figure 2: Poverty lines and poverty rates for all of Syria and by scoring sub-sample

			% with expenditure below a poverty line						
			National				International 2005 PPP		
Sub-sample	**Item**	**Households**	**Lower**	**Upper**	**150% upper**	**200% upper**	**$2.50/day**	**$3.75/day**	**$5.00/day**
All Syria	Poverty line (SYP/person/day)	12,009	72	99	149	199	67	101	135
	Poverty rate (household level)	12,009	8.7	26.9	59.3	77.1	5.9	28.3	67.7
	Poverty rate (person level)	12,009	11.7	32.6	66.9	83.1	7.6	34.3	74.8
Construction									
Selecting indicators and weights	Poverty rate (household level)	4,011	9.0	26.8	59.4	77.1	6.1	28.0	67.1
Calibration									
Associating scores with likelihoods	Poverty rate (household level)	3,989	8.7	27.5	59.3	76.9	5.8	28.9	67.9
Validation									
Measuring accuracy	Poverty rate (household level)	4,009	8.5	26.3	59.1	77.2	5.6	28.0	68.0
Change in household-level poverty rate (percentage points)									
From construction/calibration to validation			+0.4	+0.8	+0.2	–0.2	+0.4	+0.4	–0.5

Source: 2006/7 HIES

Figure 3: Poverty lines and poverty rates for all of Syria and by region, at the levels of the household and person

			Poverty rate (%) and poverty line (SYP/person/day)						
			National				International 2005 PPP		
District	**Line or rate**	**Level**	**Lower**	**Upper**	**150% upper**	**200% upper**	**$2.50/day**	**$3.75/day**	**$5.00/day**
All Syria	Line	Person	72	99	149	199	67	101	135
	Rate	Household	8.7	26.9	59.3	77.1	5.9	28.3	67.7
	Rate	Person	11.7	32.6	66.9	83.1	7.6	34.3	74.8
South	Line	Person	76	112	167	223	76	114	151
	Rate	Household	8.3	28.5	58.4	76.2	7.7	30.2	66.6
	Rate	Person	0.0	35.2	0.0	0.0	0.0	0.0	0.0
Northeast	Line	Person	66	87	130	173	59	88	118
	Rate	Household	10.8	29.2	64.3	80.9	5.5	30.8	72.5
	Rate	Person	14.1	34.4	70.8	85.9	6.9	36.1	78.5
Middle	Line	Person	73	99	148	198	67	101	134
	Rate	Household	6.1	20.1	52.1	71.9	3.6	21.3	60.8
	Rate	Person	8.3	25.0	60.1	78.9	4.9	26.7	68.4
Coastal	Line	Person	85	127	191	254	86	129	172
	Rate	Household	5.4	22.7	51.7	71.3	5.7	23.3	60.9
	Rate	Person	6.9	29.0	59.8	78.2	7.4	29.8	69.2

Source: 2006/7 HIES.

The South region comprises the governorates of Damascus, Rural Damascus, Deraa, El Suceda, and El Quneiton.

The Northest region comprises the governorates of Idleb, Aleppo, Al Raqqa, Deir Ezzor, and Hassakes.

The Middle region comprises the governorates of Homs and Hama.

The Coastal region comprises the governorates of Tartous and Latakkia.

Figure 4: Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly indicative of poverty)
92	How many members does the household have? (Eight or more; Seven; Six; Five; Four; Three; One or two)
63	Does the household have an automatic washing machine? (No; Yes)
59	Does the household have a vacuum cleaner? (No; Yes)
51	Does the household have a landline and/or mobile telephone? (None; Mobile, but no landline; Landline, but no mobile; Both landline and mobile)
50	Does the household own a motorcycle or car? (None; Motorcycle only; Car (regardless of motorcycle))
50	Do all children ages 6 to 18 attend public or private school? (No, not all attend (regardless of public or private); Yes, all attend, only public; No children in this age range; Yes, all attend, some or all private)
49	What type of residence does the household live in? (Arabic house, or other; Villa, or apartment)
48	Do all children ages 6 to 17 attend public or private school? (No, not all attend (regardless of public or private); Yes, all attend, only public; No children in this age range; Yes, all attend, some or all private)
46	Do all children ages 6 to 18 attend school? (No, not all attend; Yes, all attend; No children in this age range)
45	What is the highest level of education completed by the female head/spouse? (Illiterate or no data; No school, but literate; Elementary; No female head/spouse; Preparatory; Secondary; Institute, university, or higher degrees)
44	Do all children ages 6 to 16 attend public or private school? (No, not all attend (regardless of public or private); Yes, all attend, only public; No children in this age range; Yes, all attend, some or all private)
44	Do all children ages 6 to 17 attend school? (No, not all attend; Yes, all attend; No children in this age range)

Figure 4 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly associated with poverty)
40	How many fans does the household have? (None; One; Two; Three or more)
40	Do all children ages 6 to 16 attend school? (No, not all attend; Yes, all attend; No children in this age range)
38	How many household members are 18-years-old or younger? (Six or more; Five; Four; Three; Two; One; None)
36	Does the household have a microwave? (No; Yes)
36	Do all children ages 6 to 15 attend public or private school? (No, not all attend (regardless of public or private); Yes, all attend, only public; No children in this age range; Yes, all attend, some or all private)
34	What is the highest level of education completed by the male head/spouse? (Illiterate, other, or no data; No school but literate; Elementary; Preparatory; No male head/spouse; Secondary; Institute; University, or higher degree)
32	Do all children ages 6 to 15 attend school? (No, not all attend; Yes, all attend; No children in this age range)
32	How many household members are 17-years-old or younger? (Five or more; Four; Three; Two; One; None)
31	How many household members have seasonal, temporary, or irregular work? (Two or more; One; None)
31	What is the main profession of the male head/spouse? (Agriculture; Manufacturing; Does not work; Administration and clerking; Retail and services; No male head/spouse; Technician or associated professional)
29	Does the household have an air conditioner? (No; Yes)
29	Does the household have both a refrigerator and a freezer? (No; Yes)
28	How many complete bedroom sets does the household have? (None; One; Two)

Figure 4 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly associated with poverty)
28	Does the household have a freezer? (No; Yes)
27	Do all children ages 6 to 14 attend public or private school? (No, not all attend (regardless of public or private); Yes, all attend, only public; No children in this age range; Yes, all attend, some or all private)
27	How many household members work in the private sector? (Two or more; One or none)
27	How many household members worked at least one hour in the past week? (Three or more; Two; One; None)
27	What is the place of work of the female head/spouse in her main profession? (At home, farm, other, or no data; More than one female head/spouse; Does not work; No female head/spouse; Enterprise)
27	How many household members are 16-years-old or younger? (Five or more; Four; Three; Two; One; None)
26	Does the household have a television, video, and/or satellite dish? (No television (regardless of video or satellite dish); Television, but not all three; All three)
24	Does the household have a personal computer with an internet connection? (No; Computer, but no internet; Computer with internet)
24	What is the sector of work of the female head/spouse in her main profession? (Not government; More than one female head/spouse; Does not work; No female head/spouse; Government)
24	Does the female head/spouse participate in social insurance? (More than one female head/spouse; No; No female head/spouse; Yes)
24	What is the main profession of the female head/spouse? (Agriculture, manufacturing, or retail and services; More than one female head/spouse; Does not work; Administration or clerking; technician or associated professional, or no female head/spouse)

Figure 4 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly associated with poverty)
23	Do all children ages 6 to 13 attend public or private school? (No, not all attend (regardless of public or private); Yes, all attend, only public; No children in this age range; Yes, all attend, some or all private)
23	Do all children ages 6 to 14 attend school? (No, not all attend; Yes, all attend; No children in this age range)
22	What is the highest educational level completed by a family member? (Elementary, other, or no data; Preparatory; Secondary, no school but literate, or illiterate; Institute; University or higher degree)
22	What is the main material of the floor of the residence? (Not tile; Tile)
21	Does the household have an iron? (No; Yes)
21	In their main profession, how many household members are in retail, services, or manufacturing? (Two or more; One; None)
21	How many household members are 15-years-old or younger? (Five or more; Four; Three; Two; One; None)
20	How is the residence of the household registered? (Agricultural registry; Public notary, other, or no data; Official registry)
19	Does the household have a satellite dish? (No; Yes)
19	Do all children ages 6 to 12 attend public or private school? (No, not all attend (regardless of public or private); Yes, all attend, only public; No children in this age range; Yes, all attend, some or all private)
19	Do all children ages 6 to 13 attend school? (No, not all attend; Yes, all attend; No children in this age range)
19	In their main profession, are any household members in agriculture and forestry? (Yes; No)
19	How old is the female head/spouse? (35 to 39; 40 to 44; 45 to 54; 30 to 34; 25 to 29; 54 or older; 24 or younger, or no female head/spouse)

Figure 4 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly associated with poverty)
18	What is the main economic activity of the male head/spouse? (Agriculture and forestry; Building and construction; Does not work; Industry; Storage, transport, and communication; Finance, insurance, and real estate, services, or not stated; No male head/spouse; Catering (hotels and restaurants))
18	What is the place of work of the male head/spouse in his main profession? (Farm, or does not work; No male head/spouse; Enterprise, or at home; Other)
17	In their main profession, how many household members are in agriculture? (Two or more; One; None)
17	What is the main material of the walls of the residence? (Stone, clay, wood, or other; Cement bricks; Cement bricks with reinforcement; Concrete)
16	Does the household have a chandelier? (No; Yes)
16	How does the household dispose of solid waste? (Burned on the farm or in another specific place; Thrown in the road without plastic bags; Thrown in the road in plastic bags; In trash bin; Garbage collector)
15	Do all children ages 6 to 11 attend public or private school? (No, not all attend (regardless of public or private); Yes, all attend, only public; No children in this age range; Yes, all attend, some or all private)
15	How many household members are 14-years-old or younger? (Five or more; Four; Three; Two; One; None)
14	Do all children ages 6 to 12 attend school? (No, not all attend; Yes, all attend; No children in this age range)
14	How many rooms does the residence have? (One; Two or three; Four; Five or more)
13	In their main profession, how many household members are in retail, services, or manufacturing? (None; One; Two or more)
13	What is the nature of the work of the female head/spouse in her main profession? (More than one female head/spouse; Seasonal, temporary, irregular, other, or no data; No female head/spouse; Does not work; No female head/spouse; Continuous)

Figure 4 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly associated with poverty)
12	Does the household have a video player? (No; Yes)
12	Do any household members work on a farm? (No; Yes)
12	How many household members work in a family business or are self-employed (with or without employees)? (Two or more; One; None)
12	How old is the male head/spouse? (40 to 49; 50 to 59; 35 to 39; 60 or older; 30 to 34; 29 or younger, or no male head/spouse)
12	What is the nature of the work of the male head/spouse in his main profession? (Seasonal, temporary, or irregular; Does not work; Continuous; No male head/spouse)
12	How many household members are 13-years-old or younger? (Five or more; Four; Three; Two; One; None)
11	Does the household have an electric oven? (No; Yes)
11	Do all children ages 6 to 11 attend school? (No, not all attend; Yes, all attend; No children in this age range)
11	How many household members are wage workers (monetary or in-kind)? (Two or more; One; None)
10	Does any household member work in a family business? (Yes; No)
10	What is the main economic activity of the female head/spouse? (More than one female head/spouse; Does not work; Works; No female head/spouse)
10	What is the employment status of the female head/spouse in her main profession? (More than one female head/spouse; Does not work; Works; No female head/spouse)
10	How many bedrooms does the residence of the household have? (Two or less; Three; Four or more)
9	How many household members have continuous work? (Three or more; None; One; Two)
9	How many household members are 12-years-old or younger? (Five or more; Four; Three; Two; One; None)
9	Does the residence have a bathroom? (No; Yes)
8	Does the household have a diesel or electric boiler? (None; Electric, but not diesel; Diesel (regardless of electric))
7	What is the main source of drinking water for the household? (Not public network; Public network)
7	What is the means of the disposal of waste water for the household? (Not public network; Public network)

6	How many household members are 11-years-old or younger? (Four or more; Three; Two; One; None)

Figure 4 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly associated with poverty)
6	What is the main source of energy for heating for the residence? (Gasoline, kerosene, wood, or other; Electricity, or gas)
5	Does any family member attend a private school? (No; Yes)
5	Does the male head/spouse participate in social insurance? (No; Yes; No male head/spouse)
5	What is the employment status of the male head/spouse in his main profession? (Wage worker (monetary or in-kind), partner in family business, or other; Self-employed with no employees; Does not work; No male head/spouse; Self-employed with employees)
4	If the household has a farm, does it have any cows, sheep, or goats? (Farms, but no cows, sheep, or goats; Farms, has sheep or goats, but no cows; Farms, has cows, but no sheep or goats; Farms, has both cows and sheep or goats; Does not farm)
4	Does the household have a dishwasher? (No; Yes)
4	Does the household have a tape recorder? (No; Yes)
4	How many household members participate in social insurance? (None; One; Two or more)
3	If the household has a farm, does it have any sheep or goats? (Farms, but no sheep or goats; Farms, with sheep or goats; Does not farm)
3	How many household members work in an enterprise? (None; One; Two or more)
3	Did the female head/spouse work at least one hour in the past week? (More than on female head/spouse; No; Yes; No female head/spouse)
3	What is the sector of work of the male head/spouse in his main profession? (Cooperative, joint, family, or domestic; Private; Does not work; Government; No male head/spouse)
3	How many years old is the residence? (Not reported; 31 or older; 26 to 30; 21 to 25; 16 to 20; 11 to 15; 10 or younger)
3	Does the residence have a toilet? (No; Yes)
2	If the household has a farm, does it have any cows? (Farms, but no cows; Farms, with cows; Does not farm)

Figure 4 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly associated with poverty)
2	If the household has a farm, does it own or use any irrigated land? (Does not farm; Farms, with some irrigated land; Farms, but no irrigated land)
2	Does the household have a farm? (No; Yes)
2	Does the household have a sewing machine? (No; Yes)
2	Do any household members work in the family sector? (Yes; No)
2	How many household members work in the government sector? (None; One; Two or more)
2	What is the marital status of the female head/spouse? (Married; Not married; No female head/spouse)
2	What is the marital status of the male head/spouse? (Any status; No male head/spouse)
1	Does the household have a diesel or gas heater? (None; Diesel only; Gas (regardless of diesel))
1	Does the household have a refrigerator? (No; Yes)
1	Does the household have a television? (No; Yes)
1	Do any household members work in domestic service? (Yes; No)
1	Did the male head/spouse work at least one hour in the past week? (Yes; No; No male head/spouse)
1	How many household members are 6-years-old or younger? (Three or more; Two; One; None)
1	What is the main fuel used for cooking? (Not gas; Gas)
1	What is the tenancy status of the household in its residence? (Not owned nor rented (furnished); Owned or rented (furnished))
0	Does the household have a cylinder for cooking gas? (No; Yes)
0	Do any household members work at home? (Yes; No)
0	Are any household members self-employed (with or without employees)? (No; Yes)
0	What is the main source of energy for lighting the residence? (Not public network; Public network)

Source: 2006/7 HIES and the upper national poverty line.

Upper National Poverty Line

(and tables pertaining to all poverty lines)

Figure 5 (Upper national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	59.3
5–9	72.2
10–14	39.6
15–19	54.3
20–24	51.2
25–29	45.5
30–34	41.0
35–39	30.3
40–44	21.7
45–49	13.4
50–54	9.2
55–59	2.0
60–64	2.1
65–69	2.3
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (Upper national line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	176	÷	297	=	59.3
5–9	477	÷	661	=	72.2
10–14	571	÷	1,444	=	39.6
15–19	2,584	÷	4,759	=	54.3
20–24	4,236	÷	8,270	=	51.2
25–29	4,949	÷	10,873	=	45.5
30–34	5,261	÷	12,819	=	41.0
35–39	3,929	÷	12,948	=	30.3
40–44	2,415	÷	11,140	=	21.7
45–49	1,546	÷	11,555	=	13.4
50–54	765	÷	8,363	=	9.2
55–59	132	÷	6,746	=	2.0
60–64	92	÷	4,442	=	2.1
65–69	70	÷	2,990	=	2.3
70–74	0	÷	1,575	=	0.0
75–79	0	÷	734	=	0.0
80–84	0	÷	231	=	0.0
85–89	0	÷	57	=	0.0
90–94	0	÷	61	=	0.0
95–100	0	÷	35	=	0.0

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

Figure 7 (All poverty lines): Distribution of household poverty likelihoods across ranges demarcated by poverty lines

	Likelihood of expenditure in range demarcated by poverty lines per day per person					
	<Lower	=>Lower and <Upper	=>Upper and <150% upper	=>150% upper and <$5.00/day	=>$5.00/day and <200% upper	=>200% upper
Score	<SYP74	=>SYP74 and <SYP105	=>SYP105 and <SYP155	=>SYP155 and <SYP175	=>SYP175 and <SYP207	=>SYP207
0–4	42.9	16.4	33.5	0.0	7.2	0.0
5–9	43.8	28.4	27.8	0.0	0.0	0.0
10–14	20.8	18.8	36.2	9.9	8.0	6.3
15–19	30.7	23.6	28.5	7.0	6.4	3.7
20–24	23.4	27.9	33.9	5.9	4.0	5.0
25–29	15.5	30.0	36.4	7.0	5.0	6.1
30–34	8.8	32.2	38.4	5.0	5.3	10.2
35–39	8.5	21.9	39.8	8.3	6.7	14.8
40–44	2.8	18.9	41.1	10.9	8.1	18.2
45–49	1.7	11.7	35.8	11.1	12.0	27.7
50–54	0.8	8.3	23.7	13.2	16.6	37.4
55–59	0.4	1.5	19.3	10.8	16.6	51.2
60–64	0.0	2.1	9.1	10.3	16.1	62.4
65–69	0.0	2.3	4.0	5.8	15.2	72.7
70–74	0.0	0.0	5.2	3.5	10.3	81.0
75–79	0.0	0.0	7.6	15.0	6.4	71.0
80–84	0.0	0.0	0.0	0.0	5.1	94.9
85–89	0.0	0.0	0.0	0.0	0.0	100.0
90–94	0.0	0.0	0.0	0.0	0.0	100.0
95–100	0.0	0.0	0.0	0.0	0.0	100.0

Note: All poverty likelihoods in percentage units.
The $2.50/day 2005 PPP line is omitted because it is very close to the lower national line.
The $3.75/day 2005 PPP line is omitted because it is very close to the upper national line.

Figure 8 (Upper national line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 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	–20.5	14.9	15.6	17.0
5–9	+22.9	7.8	9.3	12.4
10–14	–8.0	6.8	7.3	8.3
15–19	+3.7	3.0	3.6	4.5
20–24	–3.8	3.1	3.3	3.6
25–29	–1.5	2.0	2.3	3.0
30–34	+2.9	1.7	2.1	2.9
35–39	+3.5	1.6	1.9	2.4
40–44	+0.2	1.5	1.8	2.4
45–49	+3.2	1.1	1.4	1.8
50–54	+1.7	1.1	1.3	1.8
55–59	+0.3	0.6	0.7	1.0
60–64	–0.2	0.9	1.0	1.4
65–69	+1.7	0.5	0.7	0.8
70–74	+0.0	0.0	0.0	0.0
75–79	–2.4	2.4	2.6	3.0
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 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				International 2005 PPP			
	Lower	Upper	150% upper	200% upper	$2.50/day	$3.75/day	$5.00/day	
Estimate minus true value								
2005/6 scorecard applied to 2005/6 validation	+0.2	+1.1	+0.1	–0.4	+0.3	+0.9	–0.3	
Precision of difference								
2005/6 scorecard applied to 2005/6 validation	0.3	0.5	0.5	0.5	0.3	0.5	0.5	
α factor								
2005/6 scorecard applied to 2005/6 validation	0.94	0.92	0.87	0.89	0.95	0.91	0.88	
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 (Upper 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	60.4	64.8	79.4
4	+2.3	31.3	37.7	49.6
8	+1.6	24.3	26.5	34.9
16	+2.0	16.6	19.3	24.8
32	+1.6	11.4	13.4	18.1
64	+1.4	8.1	9.9	12.9
128	+1.2	5.8	6.9	8.9
256	+1.0	4.1	4.9	6.3
512	+1.1	3.0	3.7	4.6
1,024	+1.0	2.1	2.5	3.3
2,048	+1.1	1.5	1.8	2.3
4,096	+1.1	1.0	1.2	1.6
8,192	+1.1	0.7	0.8	1.1
16,384	+1.1	0.5	0.6	0.8

Figure 11 (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 12 (Upper 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	0.2	26.1	0.1	73.6	73.8	–98.0
5–9	0.6	25.8	0.4	73.3	73.9	–94.2
10–14	1.3	25.1	1.1	72.5	73.8	–86.1
15–19	3.7	22.7	3.5	70.2	73.9	–58.8
20–24	8.3	18.1	7.2	66.5	74.8	–10.0
25–29	13.4	12.9	12.9	60.8	74.2	+50.8
30–34	18.4	8.0	20.8	52.9	71.2	+21.2
35–39	21.8	4.5	30.2	43.4	65.2	–14.8
40–44	24.2	2.1	39.0	34.7	58.9	–48.0
45–49	25.4	0.9	49.3	24.3	49.7	–87.3
50–54	26.1	0.3	57.1	16.6	42.7	–116.6
55–59	26.2	0.2	63.7	10.0	36.2	–141.7
60–64	26.3	0.0	68.0	5.6	31.9	–158.2
65–69	26.3	0.0	71.0	2.7	29.0	–169.4
70–74	26.3	0.0	72.6	1.1	27.4	–175.4
75–79	26.3	0.0	73.3	0.4	26.7	–178.1
80–84	26.3	0.0	73.5	0.2	26.5	–179.0
85–89	26.3	0.0	73.6	0.1	26.4	–179.2
90–94	26.3	0.0	73.6	0.0	26.4	–179.4
95–100	26.3	0.0	73.7	0.0	26.3	–179.6

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

Figure 13 (Upper national line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 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	0.3	81.6	0.9	4.4:1
5–9	1.0	60.2	2.2	1.5:1
10–14	2.4	52.9	4.8	1.1:1
15–19	7.2	51.5	14.0	1.1:1
20–24	15.4	53.6	31.4	1.2:1
25–29	26.3	51.1	51.0	1.0:1
30–34	39.1	46.9	69.7	0.9:1
35–39	52.1	41.9	82.9	0.7:1
40–44	63.2	38.3	92.0	0.6:1
45–49	74.8	34.0	96.5	0.5:1
50–54	83.1	31.4	99.0	0.5:1
55–59	89.9	29.1	99.4	0.4:1
60–64	94.3	27.9	99.8	0.4:1
65–69	97.3	27.1	99.9	0.4:1
70–74	98.9	26.6	99.9	0.4:1
75–79	99.6	26.4	100.0	0.4:1
80–84	99.8	26.4	100.0	0.4:1
85–89	99.9	26.4	100.0	0.4:1
90–94	100.0	26.4	100.0	0.4:1
95–100	100.0	26.3	100.0	0.4:1

Lower National Poverty Line

Figure 5 (Lower national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	42.9
5–9	43.8
10–14	20.8
15–19	30.7
20–24	23.4
25–29	15.5
30–34	8.8
35–39	8.5
40–44	2.8
45–49	1.7
50–54	0.8
55–59	0.4
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 6 (Lower national line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	127	÷	297	=	42.9
5–9	289	÷	661	=	43.8
10–14	300	÷	1,444	=	20.8
15–19	1,460	÷	4,759	=	30.7
20–24	1,931	÷	8,270	=	23.4
25–29	1,686	÷	10,873	=	15.5
30–34	1,128	÷	12,819	=	8.8
35–39	1,097	÷	12,948	=	8.5
40–44	310	÷	11,140	=	2.8
45–49	191	÷	11,555	=	1.7
50–54	68	÷	8,363	=	0.8
55–59	28	÷	6,746	=	0.4
60–64	0	÷	4,442	=	0.0
65–69	0	÷	2,990	=	0.0
70–74	0	÷	1,575	=	0.0
75–79	0	÷	734	=	0.0
80–84	0	÷	231	=	0.0
85–89	0	÷	57	=	0.0
90–94	0	÷	61	=	0.0
95–100	0	÷	35	=	0.0

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

Figure 8 (Lower national line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 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	+0.9	11.7	14.2	17.5
5–9	+19.5	6.8	8.2	10.9
10–14	+3.3	4.0	4.8	6.1
15–19	+4.4	2.6	3.2	4.3
20–24	–2.9	2.5	2.7	3.3
25–29	–2.7	2.1	2.2	2.7
30–34	+0.4	1.0	1.1	1.5
35–39	+1.9	0.9	1.1	1.4
40–44	–0.9	0.9	1.0	1.1
45–49	+0.9	0.3	0.4	0.4
50–54	+0.3	0.3	0.4	0.5
55–59	+0.1	0.2	0.3	0.4
60–64	–0.8	0.7	0.8	0.9
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 10 (Lower 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	+1.1	50.0	57.6	69.1
4	+0.5	18.8	26.5	32.3
8	+0.3	14.5	17.3	24.0
16	+0.4	10.3	12.4	15.7
32	+0.5	7.6	8.7	11.2
64	+0.4	5.4	6.6	8.5
128	+0.3	3.8	4.5	6.4
256	+0.2	2.7	3.2	4.2
512	+0.2	1.9	2.4	2.8
1,024	+0.2	1.4	1.7	2.0
2,048	+0.2	1.0	1.1	1.5
4,096	+0.2	0.7	0.8	1.0
8,192	+0.2	0.5	0.6	0.7
16,384	+0.2	0.3	0.4	0.5

Figure 12 (Lower 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	0.1	8.4	0.2	91.3	91.5	–95.0
5–9	0.3	8.2	0.7	90.8	91.1	–85.3
10–14	0.6	7.9	1.8	89.7	90.2	–65.2
15–19	1.8	6.7	5.3	86.2	88.0	+5.8
20–24	4.0	4.5	11.4	80.1	84.1	–34.8
25–29	6.0	2.5	20.3	71.2	77.2	–139.3
30–34	7.1	1.4	32.1	59.5	66.5	–277.6
35–39	7.9	0.6	44.2	47.3	55.2	–420.6
40–44	8.3	0.2	54.9	36.6	44.9	–547.0
45–49	8.4	0.1	66.4	25.1	33.5	–682.0
50–54	8.4	0.1	74.7	16.8	25.2	–780.0
55–59	8.4	0.0	81.4	10.1	18.5	–859.2
60–64	8.5	0.0	85.8	5.7	14.2	–911.0
65–69	8.5	0.0	88.8	2.7	11.2	–946.2
70–74	8.5	0.0	90.4	1.1	9.6	–964.8
75–79	8.5	0.0	91.1	0.4	8.9	–973.4
80–84	8.5	0.0	91.4	0.2	8.6	–976.1
85–89	8.5	0.0	91.4	0.1	8.6	–976.8
90–94	8.5	0.0	91.5	0.0	8.5	–977.5
95–100	8.5	0.0	91.5	0.0	8.5	–977.9

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

Figure 13 (Lower national line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 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	0.3	42.0	1.5	0.7:1
5–9	1.0	30.4	3.4	0.4:1
10–14	2.4	23.1	6.5	0.3:1
15–19	7.2	25.4	21.4	0.3:1
20–24	15.4	25.8	47.0	0.3:1
25–29	26.3	22.8	70.5	0.3:1
30–34	39.1	18.1	83.2	0.2:1
35–39	52.1	15.1	92.8	0.2:1
40–44	63.2	13.1	97.6	0.2:1
45–49	74.8	11.2	98.7	0.1:1
50–54	83.1	10.1	99.2	0.1:1
55–59	89.9	9.4	99.5	0.1:1
60–64	94.3	9.0	100.0	0.1:1
65–69	97.3	8.7	100.0	0.1:1
70–74	98.9	8.6	100.0	0.1:1
75–79	99.6	8.5	100.0	0.1:1
80–84	99.8	8.5	100.0	0.1:1
85–89	99.9	8.5	100.0	0.1:1
90–94	100.0	8.5	100.0	0.1:1
95–100	100.0	8.5	100.0	0.1:1

150% of the Upper National Poverty Line

Figure 5 (150% of upper national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	92.8
5–9	100.0
10–14	75.8
15–19	82.8
20–24	85.2
25–29	81.9
30–34	79.5
35–39	70.1
40–44	62.8
45–49	49.2
50–54	32.8
55–59	21.3
60–64	11.2
65–69	6.3
70–74	5.2
75–79	7.6
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (150% of upper national line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	275	÷	297	=	92.8
5–9	661	÷	661	=	100.0
10–14	1,094	÷	1,444	=	75.8
15–19	3,941	÷	4,759	=	82.8
20–24	7,043	÷	8,270	=	85.2
25–29	8,904	÷	10,873	=	81.9
30–34	10,188	÷	12,819	=	79.5
35–39	9,083	÷	12,948	=	70.1
40–44	6,996	÷	11,140	=	62.8
45–49	5,688	÷	11,555	=	49.2
50–54	2,745	÷	8,363	=	32.8
55–59	1,437	÷	6,746	=	21.3
60–64	496	÷	4,442	=	11.2
65–69	188	÷	2,990	=	6.3
70–74	82	÷	1,575	=	5.2
75–79	56	÷	734	=	7.6
80–84	0	÷	231	=	0.0
85–89	0	÷	57	=	0.0
90–94	0	÷	61	=	0.0
95–100	0	÷	35	=	0.0

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

Figure 8 (150% of upper national line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 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	−7.2	3.6	3.6	3.6
5–9	+23.3	7.1	8.6	10.9
10–14	−4.1	4.5	5.5	7.0
15–19	−4.7	3.3	3.5	3.9
20–24	−0.6	1.7	1.9	2.5
25–29	−2.2	1.8	1.9	2.3
30–34	+4.8	1.5	1.9	2.3
35–39	+1.6	1.7	2.0	2.8
40–44	−2.0	1.9	2.2	3.0
45–49	+3.4	2.0	2.4	3.1
50–54	−3.9	3.1	3.3	3.9
55–59	+1.2	2.0	2.3	3.2
60–64	−4.9	3.6	3.8	4.2
65–69	+1.0	1.7	2.0	2.7
70–74	−2.1	2.7	3.1	4.3
75–79	+5.2	2.0	2.3	3.0
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 10 (150% of upper 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	+1.3	65.1	74.5	87.0
4	+0.8	34.8	41.1	55.4
8	+1.0	24.6	28.9	38.0
16	+0.8	17.3	20.6	27.4
32	+0.7	12.0	14.3	18.8
64	+0.6	8.3	10.2	13.2
128	+0.5	6.2	7.6	9.6
256	+0.3	4.5	5.5	7.0
512	+0.2	3.1	3.9	5.1
1,024	+0.2	2.3	2.7	3.3
2,048	+0.1	1.6	1.9	2.4
4,096	+0.1	1.1	1.3	1.9
8,192	+0.1	0.7	0.9	1.3
16,384	+0.1	0.5	0.6	0.8

Figure 12 (150% of upper 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	0.3	58.8	0.0	40.9	41.2	–99.0
5–9	0.8	58.3	0.2	40.7	41.6	–97.0
10–14	2.0	57.1	0.4	40.5	42.4	–92.6
15–19	6.1	53.0	1.0	39.9	46.0	–77.5
20–24	13.3	45.8	2.2	38.7	52.0	–51.4
25–29	22.4	36.7	3.9	37.0	59.5	–17.5
30–34	32.0	27.1	7.1	33.8	65.9	+20.4
35–39	41.0	18.1	11.1	29.8	70.8	+57.5
40–44	48.2	10.9	15.0	25.9	74.1	+74.6
45–49	53.6	5.5	21.2	19.7	73.3	+64.1
50–54	56.7	2.5	26.5	14.4	71.1	+55.2
55–59	58.1	1.0	31.8	9.1	67.2	+46.2
60–64	58.8	0.3	35.5	5.4	64.2	+39.9
65–69	59.0	0.1	38.3	2.6	61.5	+35.1
70–74	59.1	0.0	39.8	1.1	60.2	+32.7
75–79	59.1	0.0	40.5	0.4	59.5	+31.5
80–84	59.1	0.0	40.7	0.2	59.3	+31.1
85–89	59.1	0.0	40.8	0.1	59.2	+31.0
90–94	59.1	0.0	40.9	0.0	59.1	+30.9
95–100	59.1	0.0	40.9	0.0	59.1	+30.8

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

Figure 13 (150% of upper national line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 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	0.3	100.0	0.5	Only poor targeted
5–9	1.0	84.3	1.4	5.4:1
10–14	2.4	82.0	3.3	4.5:1
15–19	7.2	85.7	10.4	6.0:1
20–24	15.4	86.0	22.5	6.1:1
25–29	26.3	85.3	38.0	5.8:1
30–34	39.1	81.9	54.2	4.5:1
35–39	52.1	78.8	69.4	3.7:1
40–44	63.2	76.3	81.6	3.2:1
45–49	74.8	71.6	90.6	2.5:1
50–54	83.1	68.2	95.8	2.1:1
55–59	89.9	64.6	98.2	1.8:1
60–64	94.3	62.3	99.5	1.7:1
65–69	97.3	60.6	99.8	1.5:1
70–74	98.9	59.8	100.0	1.5:1
75–79	99.6	59.3	100.0	1.5:1
80–84	99.8	59.2	100.0	1.5:1
85–89	99.9	59.2	100.0	1.4:1
90–94	100.0	59.1	100.0	1.4:1
95–100	100.0	59.1	100.0	1.4:1

200% of the Upper National Poverty Line

Figure 5 (200% of upper national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	93.7
15–19	96.3
20–24	95.0
25–29	93.9
30–34	89.8
35–39	85.2
40–44	81.8
45–49	72.3
50–54	62.6
55–59	48.8
60–64	37.6
65–69	27.3
70–74	19.0
75–79	29.0
80–84	5.1
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (200% of upper national line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	297	÷	297	=	100.0
5–9	661	÷	661	=	100.0
10–14	1,353	÷	1,444	=	93.7
15–19	4,581	÷	4,759	=	96.3
20–24	7,859	÷	8,270	=	95.0
25–29	10,213	÷	10,873	=	93.9
30–34	11,512	÷	12,819	=	89.8
35–39	11,028	÷	12,948	=	85.2
40–44	9,108	÷	11,140	=	81.8
45–49	8,356	÷	11,555	=	72.3
50–54	5,234	÷	8,363	=	62.6
55–59	3,290	÷	6,746	=	48.8
60–64	1,669	÷	4,442	=	37.6
65–69	817	÷	2,990	=	27.3
70–74	299	÷	1,575	=	19.0
75–79	213	÷	734	=	29.0
80–84	12	÷	231	=	5.1
85–89	0	÷	57	=	0.0
90–94	0	÷	61	=	0.0
95–100	0	÷	35	=	0.0

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

Figure 8 (200% of upper national line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+0.8	2.8	3.3	4.5
15–19	+1.0	1.3	1.5	2.1
20–24	–1.7	1.3	1.3	1.5
25–29	–0.1	0.9	1.1	1.5
30–34	–0.8	1.1	1.3	1.6
35–39	–0.1	1.3	1.5	2.0
40–44	–1.7	1.6	1.7	2.4
45–49	+1.5	1.7	2.0	2.8
50–54	+1.0	2.0	2.5	3.6
55–59	–2.2	2.5	2.9	3.8
60–64	–0.1	3.1	3.6	4.6
65–69	–3.4	3.7	4.4	5.4
70–74	–5.8	5.4	5.7	6.8
75–79	+12.2	5.2	6.1	8.2
80–84	–3.1	6.8	9.0	10.3
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 10 (200% of upper 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	68.2	76.1	87.5
4	+0.6	30.9	36.4	48.3
8	+0.2	21.6	25.6	32.7
16	+0.0	15.1	18.1	24.0
32	–0.2	10.2	12.4	16.4
64	–0.3	7.5	9.2	12.0
128	–0.3	5.4	6.3	8.2
256	–0.4	3.8	4.6	6.2
512	–0.5	2.6	3.2	4.3
1,024	–0.4	1.9	2.3	2.9
2,048	–0.4	1.3	1.6	2.2
4,096	–0.4	1.0	1.1	1.4
8,192	–0.4	0.7	0.8	1.1
16,384	–0.4	0.5	0.6	0.7

Figure 12 (200% of upper 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	0.3	76.9	0.0	22.8	23.1	–99.2
5–9	1.0	76.2	0.0	22.8	23.8	–97.5
10–14	2.3	74.9	0.1	22.7	25.0	–93.9
15–19	6.8	70.4	0.3	22.5	29.3	–81.9
20–24	14.9	62.3	0.6	22.2	37.1	–60.8
25–29	25.1	52.1	1.2	21.6	46.7	–33.4
30–34	36.7	40.5	2.4	20.4	57.1	–1.8
35–39	47.8	29.4	4.2	18.6	66.4	+29.4
40–44	57.2	20.0	6.1	16.7	73.9	+55.9
45–49	65.4	11.8	9.4	13.5	78.9	+81.6
50–54	70.6	6.6	12.5	10.3	80.9	+83.8
55–59	74.0	3.1	15.8	7.0	81.0	+79.5
60–64	75.8	1.4	18.6	4.2	80.0	+76.0
65–69	76.7	0.5	20.7	2.2	78.8	+73.2
70–74	77.0	0.2	21.8	1.0	78.0	+71.7
75–79	77.2	0.0	22.4	0.4	77.5	+70.9
80–84	77.2	0.0	22.7	0.2	77.3	+70.7
85–89	77.2	0.0	22.7	0.1	77.3	+70.6
90–94	77.2	0.0	22.8	0.0	77.2	+70.5
95–100	77.2	0.0	22.8	0.0	77.2	+70.5

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

Figure 13 (200% of upper national line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 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	0.3	100.0	0.4	Only poor targeted
5–9	1.0	100.0	1.2	Only poor targeted
10–14	2.4	95.8	3.0	22.8:1
15–19	7.2	95.4	8.8	20.8:1
20–24	15.4	96.3	19.2	25.9:1
25–29	26.3	95.4	32.5	20.5:1
30–34	39.1	93.8	47.5	15.1:1
35–39	52.1	91.9	62.0	11.3:1
40–44	63.2	90.4	74.0	9.4:1
45–49	74.8	87.5	84.7	7.0:1
50–54	83.1	84.9	91.4	5.6:1
55–59	89.9	82.4	95.9	4.7:1
60–64	94.3	80.3	98.1	4.1:1
65–69	97.3	78.8	99.3	3.7:1
70–74	98.9	77.9	99.8	3.5:1
75–79	99.6	77.5	100.0	3.4:1
80–84	99.8	77.3	100.0	3.4:1
85–89	99.9	77.3	100.0	3.4:1
90–94	100.0	77.2	100.0	3.4:1
95–100	100.0	77.2	100.0	3.4:1

$2.50/day 2005 PPP Poverty Line

Figure 5 ($2.50/day 2005 PPP line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	33.5
5–9	24.4
10–14	16.5
15–19	19.4
20–24	15.4
25–29	9.0
30–34	6.7
35–39	6.0
40–44	2.3
45–49	0.9
50–54	0.5
55–59	0.4
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 6 ($2.50/day 2005 PPP line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	100	÷	297	=	33.5
5–9	161	÷	661	=	24.4
10–14	238	÷	1,444	=	16.5
15–19	921	÷	4,759	=	19.4
20–24	1,275	÷	8,270	=	15.4
25–29	977	÷	10,873	=	9.0
30–34	855	÷	12,819	=	6.7
35–39	773	÷	12,948	=	6.0
40–44	258	÷	11,140	=	2.3
45–49	108	÷	11,555	=	0.9
50–54	45	÷	8,363	=	0.5
55–59	28	÷	6,746	=	0.4
60–64	0	÷	4,442	=	0.0
65–69	0	÷	2,990	=	0.0
70–74	0	÷	1,575	=	0.0
75–79	0	÷	734	=	0.0
80–84	0	÷	231	=	0.0
85–89	0	÷	57	=	0.0
90–94	0	÷	61	=	0.0
95–100	0	÷	35	=	0.0

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

Figure 8 ($2.50/day 2005 PPP line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 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	–0.7	11.5	13.9	16.7
5–9	+3.4	6.4	7.8	10.4
10–14	+2.1	3.8	4.4	5.9
15–19	+2.1	2.2	2.6	3.4
20–24	–1.3	1.7	1.9	2.6
25–29	–2.2	1.7	1.8	2.1
30–34	+1.4	0.8	0.9	1.2
35–39	+2.5	0.7	0.8	1.1
40–44	–0.2	0.6	0.7	0.9
45–49	+0.2	0.3	0.4	0.4
50–54	–0.2	0.4	0.4	0.6
55–59	+0.1	0.2	0.3	0.4
60–64	–0.8	0.7	0.8	0.9
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 10 ($2.50/day 2005 PPP 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	+0.5	48.6	55.2	60.1
4	+0.2	15.9	18.4	29.5
8	+0.1	13.0	14.6	18.5
16	+0.4	8.5	10.2	13.0
32	+0.6	6.3	7.3	9.6
64	+0.4	4.4	5.4	6.9
128	+0.4	3.2	3.8	5.0
256	+0.3	2.3	2.7	3.6
512	+0.3	1.6	2.0	2.4
1,024	+0.3	1.1	1.4	1.7
2,048	+0.3	0.8	0.9	1.2
4,096	+0.3	0.6	0.7	0.8
8,192	+0.3	0.4	0.5	0.6
16,384	+0.3	0.3	0.3	0.4

Figure 12 ($2.50/day 2005 PPP 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	0.1	5.5	0.2	94.2	94.3	–92.9
5–9	0.2	5.4	0.7	93.7	93.9	–78.6
10–14	0.5	5.1	1.9	92.5	92.9	–48.9
15–19	1.3	4.3	5.9	88.5	89.9	–4.5
20–24	2.7	2.9	12.7	81.7	84.4	–126.7
25–29	4.0	1.6	22.3	72.1	76.1	–298.3
30–34	4.7	0.9	34.5	59.9	64.6	–515.1
35–39	5.1	0.5	47.0	47.4	52.5	–738.4
40–44	5.4	0.2	57.8	36.6	41.9	–932.2
45–49	5.5	0.1	69.3	25.1	30.6	–1,136.8
50–54	5.5	0.1	77.6	16.8	22.3	–1,284.9
55–59	5.6	0.0	84.3	10.1	15.6	–1,404.9
60–64	5.6	0.0	88.7	5.7	11.3	–1,483.4
65–69	5.6	0.0	91.7	2.7	8.3	–1,536.7
70–74	5.6	0.0	93.3	1.1	6.7	–1,564.8
75–79	5.6	0.0	94.0	0.4	6.0	–1,578.0
80–84	5.6	0.0	94.2	0.2	5.8	–1,582.1
85–89	5.6	0.0	94.3	0.1	5.7	–1,583.1
90–94	5.6	0.0	94.4	0.0	5.6	–1,584.2
95–100	5.6	0.0	94.4	0.0	5.6	–1,584.8

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

Figure 13 ($2.50/day 2005 PPP line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 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	0.3	33.9	1.8	0.5:1
5–9	1.0	25.5	4.4	0.3:1
10–14	2.4	19.2	8.2	0.2:1
15–19	7.2	18.3	23.3	0.2:1
20–24	15.4	17.7	48.7	0.2:1
25–29	26.3	15.2	71.1	0.2:1
30–34	39.1	11.9	83.2	0.1:1
35–39	52.1	9.8	91.0	0.1:1
40–44	63.2	8.5	96.0	0.1:1
45–49	74.8	7.3	97.6	0.1:1
50–54	83.1	6.7	98.8	0.1:1
55–59	89.9	6.2	99.2	0.1:1
60–64	94.3	5.9	100.0	0.1:1
65–69	97.3	5.8	100.0	0.1:1
70–74	98.9	5.7	100.0	0.1:1
75–79	99.6	5.6	100.0	0.1:1
80–84	99.8	5.6	100.0	0.1:1
85–89	99.9	5.6	100.0	0.1:1
90–94	100.0	5.6	100.0	0.1:1
95–100	100.0	5.6	100.0	0.1:1

$3.75/day 2005 PPP Poverty Line

Figure 5 ($3.75/day 2005 PPP line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	59.3
5–9	76.2
10–14	39.6
15–19	55.3
20–24	54.2
25–29	48.0
30–34	42.9
35–39	32.0
40–44	23.8
45–49	13.6
50–54	10.3
55–59	2.0
60–64	2.1
65–69	2.3
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($3.75/day 2005 PPP line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	176	÷	297	=	59.3
5–9	503	÷	661	=	76.2
10–14	571	÷	1,444	=	39.6
15–19	2,630	÷	4,759	=	55.3
20–24	4,485	÷	8,270	=	54.2
25–29	5,224	÷	10,873	=	48.0
30–34	5,500	÷	12,819	=	42.9
35–39	4,147	÷	12,948	=	32.0
40–44	2,652	÷	11,140	=	23.8
45–49	1,569	÷	11,555	=	13.6
50–54	857	÷	8,363	=	10.3
55–59	132	÷	6,746	=	2.0
60–64	92	÷	4,442	=	2.1
65–69	70	÷	2,990	=	2.3
70–74	0	÷	1,575	=	0.0
75–79	0	÷	734	=	0.0
80–84	0	÷	231	=	0.0
85–89	0	÷	57	=	0.0
90–94	0	÷	61	=	0.0
95–100	0	÷	35	=	0.0

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

Figure 8 ($3.75/day 2005 PPP line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 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	–20.5	14.9	15.6	17.0
5–9	+23.4	7.8	9.2	12.3
10–14	–10.9	8.1	8.7	9.9
15–19	+2.5	3.0	3.5	4.7
20–24	–2.5	2.3	2.6	3.5
25–29	–0.3	2.0	2.3	2.9
30–34	+3.2	1.7	2.1	2.9
35–39	+2.6	1.6	2.0	2.5
40–44	+0.5	1.5	1.9	2.4
45–49	+1.3	1.3	1.5	2.0
50–54	+1.4	1.2	1.4	1.8
55–59	–0.8	0.8	0.9	1.2
60–64	–0.2	0.9	1.0	1.4
65–69	+1.7	0.5	0.7	0.8
70–74	+0.0	0.0	0.0	0.0
75–79	–2.4	2.4	2.6	3.0
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 10 ($3.75/day 2005 PPP 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	+2.6	61.1	65.2	81.3
4	+2.5	32.4	39.2	50.4
8	+1.6	24.2	27.5	36.3
16	+1.8	17.0	19.9	26.2
32	+1.5	11.1	13.6	18.0
64	+1.2	8.2	10.0	13.7
128	+1.0	6.1	7.0	9.2
256	+0.9	4.2	5.1	6.4
512	+0.9	3.1	3.7	4.6
1,024	+0.9	2.1	2.5	3.6
2,048	+0.9	1.5	1.9	2.4
4,096	+0.9	1.1	1.2	1.6
8,192	+0.9	0.7	0.8	1.1
16,384	+0.9	0.5	0.6	0.8

Figure 12 ($3.75/day 2005 PPP 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	0.2	27.8	0.1	72.0	72.2	–98.1
5–9	0.6	27.4	0.4	71.7	72.3	–94.4
10–14	1.3	26.7	1.1	70.9	72.3	–86.6
15–19	3.9	24.1	3.3	68.7	72.6	–60.6
20–24	8.6	19.4	6.9	65.2	73.7	–14.2
25–29	13.9	14.1	12.4	59.6	73.5	+43.6
30–34	19.0	9.0	20.1	51.9	71.0	+28.2
35–39	22.9	5.1	29.2	42.8	65.7	–4.4
40–44	25.5	2.5	37.7	34.3	59.7	–34.9
45–49	26.9	1.1	47.9	24.1	51.0	–71.1
50–54	27.6	0.3	55.5	16.5	44.2	–98.2
55–59	27.8	0.2	62.0	10.0	37.8	–121.6
60–64	27.9	0.0	66.4	5.6	33.6	–137.1
65–69	28.0	0.0	69.3	2.7	30.6	–147.7
70–74	28.0	0.0	70.9	1.1	29.1	–153.3
75–79	28.0	0.0	71.6	0.4	28.4	–155.9
80–84	28.0	0.0	71.9	0.2	28.1	–156.7
85–89	28.0	0.0	71.9	0.1	28.1	–156.9
90–94	28.0	0.0	72.0	0.0	28.0	–157.1
95–100	28.0	0.0	72.0	0.0	28.0	–157.2

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

Figure 13 ($3.75/day 2005 PPP line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 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	0.3	81.6	0.9	4.4:1
5–9	1.0	62.7	2.1	1.7:1
10–14	2.4	55.8	4.8	1.3:1
15–19	7.2	53.9	13.8	1.2:1
20–24	15.4	55.6	30.6	1.3:1
25–29	26.3	52.8	49.6	1.1:1
30–34	39.1	48.6	68.0	0.9:1
35–39	52.1	43.9	81.7	0.8:1
40–44	63.2	40.3	91.0	0.7:1
45–49	74.8	36.0	96.0	0.6:1
50–54	83.1	33.3	98.8	0.5:1
55–59	89.9	31.0	99.4	0.4:1
60–64	94.3	29.6	99.8	0.4:1
65–69	97.3	28.7	99.9	0.4:1
70–74	98.9	28.3	99.9	0.4:1
75–79	99.6	28.1	100.0	0.4:1
80–84	99.8	28.0	100.0	0.4:1
85–89	99.9	28.0	100.0	0.4:1
90–94	100.0	28.0	100.0	0.4:1
95–100	100.0	28.0	100.0	0.4:1

$5.00/day 2005 PPP Poverty Line

Figure 5 ($5.00/day 2005 PPP line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	92.8
5–9	100.0
10–14	85.7
15–19	89.8
20–24	91.0
25–29	88.9
30–34	84.5
35–39	78.5
40–44	73.7
45–49	60.4
50–54	46.0
55–59	32.1
60–64	21.4
65–69	12.1
70–74	8.6
75–79	22.6
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($5.00/day 2005 PPP line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	275	÷	297	=	92.8
5–9	661	÷	661	=	100.0
10–14	1,238	÷	1,444	=	85.7
15–19	4,274	÷	4,759	=	89.8
20–24	7,529	÷	8,270	=	91.0
25–29	9,669	÷	10,873	=	88.9
30–34	10,832	÷	12,819	=	84.5
35–39	10,159	÷	12,948	=	78.5
40–44	8,207	÷	11,140	=	73.7
45–49	6,975	÷	11,555	=	60.4
50–54	3,846	÷	8,363	=	46.0
55–59	2,168	÷	6,746	=	32.1
60–64	952	÷	4,442	=	21.4
65–69	362	÷	2,990	=	12.1
70–74	136	÷	1,575	=	8.6
75–79	166	÷	734	=	22.6
80–84	0	÷	231	=	0.0
85–89	0	÷	57	=	0.0
90–94	0	÷	61	=	0.0
95–100	0	÷	35	=	0.0

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

Figure 8 ($5.00/day 2005 PPP line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 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	–7.2	3.6	3.6	3.6
5–9	+8.9	4.4	5.2	6.8
10–14	+1.5	4.0	4.9	6.3
15–19	–0.8	1.7	2.0	2.6
20–24	–2.0	1.6	1.7	1.9
25–29	–0.2	1.2	1.4	1.9
30–34	+2.2	1.4	1.7	2.3
35–39	+1.4	1.5	1.8	2.3
40–44	–0.6	1.7	2.0	2.6
45–49	+2.5	1.9	2.3	2.9
50–54	–2.7	2.5	2.7	3.4
55–59	–6.0	4.2	4.5	4.9
60–64	–1.4	2.6	3.1	4.3
65–69	–2.9	2.9	3.2	4.4
70–74	–9.0	6.4	7.0	8.1
75–79	+17.8	2.8	3.5	4.6
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 10 ($5.00/day 2005 PPP 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	+1.3	69.3	76.2	89.2
4	+0.7	33.8	39.8	52.4
8	+0.5	24.1	28.7	35.2
16	+0.2	17.1	19.7	26.5
32	–0.0	11.7	13.7	18.8
64	–0.1	8.4	10.2	13.3
128	–0.1	5.7	6.9	9.5
256	–0.2	4.0	4.9	6.8
512	–0.4	2.9	3.4	4.3
1,024	–0.3	2.2	2.5	3.0
2,048	–0.3	1.5	1.7	2.4
4,096	–0.3	1.1	1.4	1.8
8,192	–0.3	0.8	0.9	1.2
16,384	–0.3	0.5	0.6	0.8

Figure 12 ($5.00/day 2005 PPP 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	0.3	67.7	0.0	32.0	32.3	–99.1
5–9	0.9	67.1	0.1	31.9	32.8	–97.3
10–14	2.1	65.9	0.3	31.7	33.8	–93.4
15–19	6.4	61.6	0.7	31.3	37.7	–80.0
20–24	14.2	53.9	1.3	30.7	44.9	–56.5
25–29	23.9	44.1	2.4	29.6	53.4	–26.2
30–34	34.4	33.6	4.7	27.3	61.7	+8.2
35–39	44.5	23.5	7.6	24.4	68.9	+42.0
40–44	52.8	15.2	10.4	21.6	74.4	+70.6
45–49	59.5	8.5	15.2	16.8	76.3	+77.6
50–54	63.6	4.4	19.5	12.5	76.1	+71.3
55–59	66.2	1.8	23.7	8.3	74.5	+65.2
60–64	67.2	0.8	27.1	4.9	72.2	+60.2
65–69	67.7	0.3	29.6	2.4	70.1	+56.5
70–74	68.0	0.0	30.9	1.1	69.0	+54.5
75–79	68.0	0.0	31.6	0.4	68.4	+53.5
80–84	68.0	0.0	31.8	0.2	68.2	+53.2
85–89	68.0	0.0	31.9	0.1	68.1	+53.1
90–94	68.0	0.0	32.0	0.0	68.0	+53.0
95–100	68.0	0.0	32.0	0.0	68.0	+53.0

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

Figure 13 ($5.00/day 2005 PPP line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 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	0.3	100.0	0.4	Only poor targeted
5–9	1.0	93.1	1.3	13.5:1
10–14	2.4	87.8	3.1	7.2:1
15–19	7.2	89.7	9.4	8.8:1
20–24	15.4	91.7	20.8	11.1:1
25–29	26.3	90.7	35.1	9.8:1
30–34	39.1	88.0	50.6	7.3:1
35–39	52.1	85.4	65.4	5.9:1
40–44	63.2	83.5	77.6	5.1:1
45–49	74.8	79.6	87.5	3.9:1
50–54	83.1	76.5	93.5	3.3:1
55–59	89.9	73.7	97.3	2.8:1
60–64	94.3	71.3	98.9	2.5:1
65–69	97.3	69.6	99.5	2.3:1
70–74	98.9	68.7	99.9	2.2:1
75–79	99.6	68.3	100.0	2.2:1
80–84	99.8	68.1	100.0	2.1:1
85–89	99.9	68.1	100.0	2.1:1
90–94	100.0	68.0	100.0	2.1:1
95–100	100.0	68.0	100.0	2.1:1

Appendix A:
Guidance for Interpreting Scorecard Indicators

This appendix refers to information translated from the *Enumerator's Manual* for the 2006/7 HIES ("the manual").

1. How many members does the household have?

A *household member* is "any individual who has resided for at least three months in the family household or who intends to reside for at least three months."

2. What type of residence does the household live in?

An *Arabic house* is "a house composed of a main separate room, and other separate annexes, next to one another. It usually includes an open-air courtyard, usually located in the middle of the house, and sometimes surrounded by an outside wall. It could have more than one floor, but it is for single family."

An *apartment* is "part of a building and is composed of one or more rooms with private kitchen, bathroom, and other rooms belonging to the same apartment. The apartment is always a part of a building having at least two private residences on the same floor."

A *villa* is "an independent residence unit composed of one or more floors connected by an indoor staircase. It usually has a wall surrounding the building and the space around it; that is, it usually has a private garden."

3. How many rooms does the residence have?

Only rooms used for sitting (living), sleeping, and dining (eating) are counted. In particular, the kitchen is counted only if it is also used for dining. The living room is counted. Bathrooms and garages are not counted.

4. Does the household have both a refrigerator and a freezer?

A non-functioning (broken) refrigerator or freezer does not count.

5. Does the household have an automatic washing machine?

An *automatic washing machine* is a "modern, internally computerized washing machine that does not require manual interaction. It is fully automatic, not semi-automatic." A non-functioning (broken) automatic washing machine does not count.

6. How many complete bedroom sets does the household have?

The manual provides no addition information about this indicator.

7. Does the household have a chandelier?

A *chandelier* is "a device used for both lighting and decoration. It has multiple bulbs."

8. How many fans does the household have?

Non-functioning (broken) fans do not count.

9. Does the household own a motorcycle or car?

Non-functioning (broken) motorcycles or cars do not count.

10. What is the place of work of the male head/spouse in his main profession?

The *male head/spouse* is the household head, if the head is male. If the household head is female, then the male head/spouse is the spouse of the head. If the household head is female and there is no spouse, then there is no male head/spouse.