Simple Poverty Scorecard®
Morocco

Mark Schreiner

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Abstract
The Simple Poverty Scorecard® uses 10 low-cost indicators from Morocco's 2007 Household Living Standards Survey to estimate the likelihood that a household has consumption below a given poverty line. Field workers can collect responses in about ten minutes. The scorecard's accuracy is reported for a range of poverty lines. The scorecard is a practical way for pro-poor programs in Morocco to measure poverty rates, to track changes in poverty rates over time, and to segment clients for differentiated treatment.

Version Note
This scorecard replaces an older one based on data for Morocco from 1998/9 (Schreiner, 2007). Because poverty lines and household consumption are defined differently, estimates from the two scorecards are not comparable.

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Author
Mark Schreiner directs Microfinance Risk Management, L.L.C. He is also a Senior Scholar at the Center for Social Development at Washington University in Saint Louis.

Simple Poverty Scorecard®

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

Indicator	Response	Points	Score
1. How many members does the household have?	A. Eight or more	0	
	B. Seven	4	
	C. Six	8	
	D. Five	13	
	E. Four	17	
	F. One, two, or three	29	
2. How many household members 10-years-old or older do not know how to read and write in any language?	A. Four or more	0	
	B. Two or three	4	
	C. One	6	
	D. None	9	
3. How many household members are currently working?	A. None	0	
	B. One or two	1	
	C. Three or more	6	
4. How many rooms does the household occupy?	A. One	0	
	B. Two	3	
	C. Three	6	
	D. Four	9	
	E. Five or more	12	
5. Does the household have a wash basin?	A. No	0	
	B. Yes	10	
6. Does the household have a clothes-washing machine?	A. No	0	
	B. Yes	6	
7. Does the household have an oven for bread (electric or gas), a stand-alone oven (electric or gas), or a stove/oven combo (electric or non-electric)?	A. No	0	
	B. Only bread	1	
	C. Only stand-alone	2	
	D. Only bread and stand-alone	5	
	E. Stove/oven combo (regardless of others)	6	
8. Does the household have a refrigerator or freezer?	A. No	0	
	B. Yes	4	
9. Does the household have a black-and-white TV, color TV, and a satellite dish?	A. No TV (regardless of satellite dish)	0	
	B. Black-and-white TV (regardless of color TV or dish)	2	
	C. Only color TV	4	
	D. Color TV with dish (without black-and-white TV)	8	
10. Does your household have a bicycle, motorcycle, or other motor vehicle used for transport?	A. No	0	
	B. Yes	10	

Score:

Back-page Worksheet:
Household Members, Age, Literacy, and Work Status

At the start, read to the respondent: *Please tell me the name and age of each member of your household. A* household *is a group of people—regardless of blood relationship—who normally sleep in the same main residence and who usually work together to satisfy their basic needs for shelter, food, clothing, and health care. The* main residence *is the room or group of rooms where household members normally live, that is, where they have stayed (or plan to stay) for at least six months. For each member, please also tell me whether he or she can read and write. Finally, I would like to know whether the member currently works, that is, helps to produce goods and services, even if only for an hour.* Working *is a broad concept, including people who normally are employed, even if they are not working today. It also encompasses all types of employment, including casual day labor, part-time work, and irregular/informal work.*

Write down the name and age of each household member. Then write the total number of members in the scorecard header next to "# Household members:" and circle the corresponding response to the first indicator. Then, count the members ages 10 and older who cannot read or write, and circle the response to the second indicator. Finally, count the members who work, and circle the response to the third indicator.

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

Name of member	Age	If <name> is 10 or older, can he/she read and write in at least one language?	Is <name> currently working?
1.		<10 years No Yes	No Yes
2.		<10 years No Yes	No Yes
3.		<10 years No Yes	No Yes
4.		<10 years No Yes	No Yes
5.		<10 years No Yes	No Yes
6.		<10 years No Yes	No Yes
7.		<10 years No Yes	No Yes
8.		<10 years No Yes	No Yes
9.		<10 years No Yes	No Yes
10.		<10 years No Yes	No Yes
11.		<10 years No Yes	No Yes
12.		<10 years No Yes	No Yes
Number of members:	—	Number "No":	Number "Yes":

Look-up table to convert scores to poverty likelihoods

	Poverty likelihood (%)							
	National			USAID	Intl. 2005 PPP			
Score	**100%**	**150%**	**200%**	**'Extreme'**	**$1.25**	**$2.50**	**$3.75**	**$5.00**
0–4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
5–9	72.4	93.7	100.0	51.8	38.7	93.0	100.0	100.0
10–14	43.8	87.3	95.9	28.0	17.9	77.7	96.5	99.5
15–19	36.9	77.3	92.7	22.5	13.1	72.9	93.6	98.4
20–24	26.6	62.9	83.8	14.5	7.8	58.2	87.9	96.3
25–29	14.5	46.3	76.9	6.9	3.6	42.0	81.6	94.1
30–34	8.6	38.3	63.9	2.5	1.5	32.8	69.3	87.6
35–39	3.8	19.5	45.0	1.5	0.5	16.1	51.4	77.8
40–44	1.9	13.7	32.7	0.6	0.1	11.1	37.3	65.7
45–49	0.5	8.7	26.3	0.0	0.0	5.7	29.9	57.7
50–54	0.0	3.4	15.5	0.0	0.0	1.9	20.3	42.6
55–59	0.0	2.0	9.9	0.0	0.0	1.1	12.9	30.3
60–64	0.0	1.2	5.8	0.0	0.0	0.6	8.4	23.8
65–69	0.0	0.0	2.1	0.0	0.0	0.0	2.6	13.2
70–74	0.0	0.0	0.9	0.0	0.0	0.0	0.9	6.8
75–79	0.0	0.0	0.4	0.0	0.0	0.0	0.4	2.8
80–84	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85–89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90–94	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95–100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Simple Poverty Scorecard®
Morocco

1. Introduction

This paper presents the Simple Poverty Scorecard®. Pro-poor programs in Morocco can use it to estimate the likelihood that a household has consumption below a given poverty line, to estimate a population's poverty rate at a point in time, to track changes in a population's poverty rate over time, and to segment participants for differentiated treatment.

This scorecard replaces an older one based on data from 1998/9 (Schreiner, 2007). Because poverty lines and household consumption are defined differently, estimates from the two scorecards are not comparable.

The direct approach to poverty measurement via consumption surveys is difficult and costly. As a case in point, Morocco's 2007 *Enquête Nationale sur le Niveau de Vie des Ménages* (ENNVM, Household Living Standards Survey) runs 168 pages. In a series of eight visits, enumerators helped households keep a 7-day item-by-item record of their food consumption and also collected more than 350 other consumption items, including, for example, "In the past week, did you acquire one to nine kilograms of couscous (whether hard wheat, soft wheat, barley, etc.) via purchase, gift, or from your own production? If yes, how many kilograms did you acquire? What was the price per

kilogram? What was the total cost? Now then, in the past week, did you acquire one to nine kilograms of pasta? . . ."

In comparison, the indirect approach via the Simple Poverty Scorecard® is quick and inexpensive. It uses ten verifiable indicators (such as "How many rooms does the household occupy?" and "Does the household have a wash basin?") to get a score that is highly correlated with poverty status as measured by the exhaustive ENNVM survey.

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

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

[1] USAID defines a household as "very poor" if its daily per-capita consumption is less than the highest of the $1.25/day 2005 PPP line (MAD7.25 in average prices from

a poverty line over time. In all these cases, the Simple Poverty Scorecard® provides a consumption-based, objective tool with known accuracy. While consumption surveys are costly even for governments, some local pro-poor organizations may be able to implement an inexpensive poverty-assessment tool to help with poverty monitoring and (if desired) targeting.

The statistical approach here aims to be understood by non-specialists. After all, if managers are to adopt poverty scoring on their own and apply it to inform their decisions, then they first must trust that it works. Transparency and simplicity build trust. Getting "buy-in" matters; proxy means tests and regressions on the "determinants of poverty" have been around for three decades, but they are rarely used to inform decisions by local, pro-poor organizations. This is not because they do not work, but because they are presented (when they are presented at all) as tables of regression coefficients incomprehensible to non-specialists (with cryptic indicator names such as "`LGHHSZ_2`" and with points with negative values and many decimal places). Thanks to the predictive-modeling phenomenon known as the "flat maximum", simple scoring approaches can be about as accurate as complex ones (Schreiner, 2012a; Caire and Schreiner, 2012).

Beyond its simplicity and transparency, the Simple Poverty Scorecard®'s technical approach is innovative in how it associates scores with poverty likelihoods, in

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December 2006 to November 2007, Figure 1) or the USAID "extreme" line that divides people in households below the national line into two equal-size groups (MAD8.55).

the extent of its accuracy tests, and in how it derives formulas for standard errors. Although the accuracy tests are simple and commonplace in statistical practice and in the for-profit field of credit-risk scoring, they have rarely been applied to poverty-assessment tools.

The scorecard is based on data from the 2007 ENNVM from Morocco's Direction de la Statistique. Indicators are selected to be:

- Inexpensive to collect, easy to answer quickly, and simple to verify
- Strongly correlated with poverty
- Liable to change over time as poverty status changes
- Applicable in all regions of Morocco

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

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

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

Third, poverty scoring can estimate changes in the poverty rate for a group of households (or for two independent samples of households, both of which are representative of the same population) between two points in time. This estimate is the baseline/follow-up change in the average poverty likelihood of the group(s).

Poverty scoring can also be used for targeting. To help managers choose an appropriate targeting cut-off for their purposes, this paper reports several measures of targeting accuracy for a range of possible cut-offs.

The scorecard's indicators and points are derived from household consumption data and 200% of Morocco's national poverty line. Scores from this one scorecard are calibrated to poverty likelihoods for eight poverty lines.

The scorecard is constructed and calibrated using half of the data from the 2007 ENNVM. The other half is used to validate the scorecard's accuracy for estimating households' poverty likelihoods, for estimating groups' poverty rates at a point in time, and for targeting.

All three scoring estimators are *unbiased*. That is, they match the true value on average in repeated samples when constructed from (and applied to) a single, unchanging population. Like all predictive models, the specific scorecard here is constructed from a single sample and so misses the mark to some unknown extent when applied to a different population or when applied after 2007.[2]

Thus, while the indirect scoring approach is less costly than the direct survey approach, it is also biased when applied in practice. (The survey approach is unbiased by definition.) There is bias because the scorecard must assume that the future relationships between indicators and poverty in all possible groups of households will be

[2] Important examples include nationally representative samples at a different point in time or sub-groups that are not nationally representative (Tarozzi and Deaton, 2009).

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

On average when applied to the validation sample with 1,000 bootstraps of $n =$ 16,384, the difference between scorecard estimates of groups' poverty rates and the true rates at a point in time for the 200% of the national poverty line is +0.8 percentage points. The average absolute difference across all eight poverty lines is 0.4 percentage points, and the maximum absolute difference for any poverty line is 1.3 percentage points. These differences are due to sampling variation, not bias; the average difference would be zero if the whole 2007 ENNVM were to be repeatedly re-fielded and divided into sub-samples before repeating the entire process of constructing and validating scorecards.

The 90-percent confidence intervals for these estimates are ±0.5 percentage points or less. For $n =$ 1,024, the 90-percent intervals are ±2.1 percentage points or less.

Section 2 below documents data and poverty lines. Sections 3 and 4 describe scorecard construction and offer guidelines for use in practice. Sections 5 and 6 tell how to estimate households' poverty likelihoods and groups' poverty rates at a point in time. Section 7 discusses estimating changes in poverty rates over time, and Section 8 covers targeting. Section 9 places the scorecard here in the context of similar exercises for Morocco. The last section is a summary.

2. Data and poverty lines

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

2.1 Data

The scorecard is based on data from the 7,062 households in the 2007 ENNVM. This is Morocco's most recent national consumption survey.

For the purposes of poverty scoring, the households in the 2007 ENNVM are randomly divided into two sub-samples:

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

2.2 Poverty rates

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

Suppose a program serves two households. The first household is poor (its per-capita consumption is less than a given poverty line), and it has three members, one of

whom is a program participant. The second household is non-poor and has four members, two of whom are program participants.

Poverty rates are at the level of either households or people. If the program defines its *participants* as households, then the household level is relevant. The estimated household-level poverty rate is the equal-weighted average of poverty statuses (or estimated poverty likelihoods) across participants' households. In the example here, this is $\frac{1 \cdot 1 + 1 \cdot 0}{1 + 1} = \frac{1}{2} = 0.5 = 50$ percent. In the "$1 \cdot 1$" term in the numerator, the first "1" is the first household's weight, and the second "1" is the first household's poverty status (poor). In the "$1 \cdot 0$" term in the numerator, the "1" is the second household's weight, and the "0" is the second household's poverty status (non-poor). The "$1 + 1$" in the denominator is the sum of the weights of the two households. Each household has a weight of one (1) because the unit of analysis is the household.

Alternatively, a person-level rate is relevant if a program defines all people in households that benefit from its services as *participants*. In the example here, the person-level rate is the household-size-weighted average of poverty statuses for households with participants, or $\frac{3 \cdot 1 + 4 \cdot 0}{3 + 4} = \frac{3}{7} = 0.43 = 43$ percent. In the "$3 \cdot 1$" term in the numerator, the "3" is the first household's weight because it has three members, and the "1" is its poverty status (poor). In the "$4 \cdot 0$" term in the numerator, the "4" is the second household's weight because it has four members, and the zero is its poverty status (non-poor). The "$3 + 4$" in the denominator is the sum of the weights of the two

households. A household's weight is its number of members because the unit of analysis is the household member.

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

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

Figure 1 reports poverty rates for eight poverty lines for Morocco in 2007 for households and people, for Morocco as a whole, for urban and rural areas, and for the construction and validation samples. Person-level poverty rates are included in Figure 1

because these are the rates reported by governments and used in most policy discussions. Household-level poverty rates are also reported because—as illustrated above—household-level poverty likelihoods can be straightforwardly converted into poverty rates for other units of analysis. This is also why the Simple Poverty Scorecard® is constructed, calibrated, and validated with household weights.

2.3 Poverty lines

Morocco's national poverty line (*seuil de pauvreté relative*, sometimes called here "100% of the national line") is MAD10.50 per person per day in urban areas and MAD9.78 in rural areas (Figure 1). For Morocco as a whole, this implies poverty rates of 6.5 percent (households) and 8.9 percent (people).

Haut-Commissariat du Plan (HCP, 2008) reports the values of the urban national line as well as an urban food-poverty line of MAD5.51 that is the cost of a food basket with a minimum level of Calories. It also notes that urban households whose total consumption (food and non-food) is at the food line spend MAD3.11 on food and MAD2.40 on non-food. Following the cost-of-basic-needs approach of Ravallion (1998), HCP (2008) derives an "absolute" poverty line (MAD7.91) that is the sum of the food line and the non-food consumption of households whose total consumption is at the food line. The national line (*seuil relative*) is higher (MAD10.19), derived as the sum of the food line and the non-food consumption of households whose food consumption is at the food line (HCP, 2010).

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

- 100% of national
- 150% of national
- 200% of national
- USAID "extreme"
- $1.25/day 2005 PPP
- $2.50/day 2005 PPP
- $3.75/day 2005 PPP
- $5.00/day 2005 PPP

The scorecard is constructed using 200% of the national poverty line. 100% of the national line is not used because few households are under it.

The USAID "extreme" line is defined as the median per-capita consumption of people (not households) in a given poverty-line region (urban or rural) who are below 100% of the national line (United States Congress, 2004).

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

- 2005 PPP exchange rate of MAD5.51 per $1.00 (World Bank, 2008)
- Consumer Price Index for Morocco of:
  - Average in 2005: 168.7[3]
  - Average from December 2006 to November 2007 (during ENNVM fieldwork): 177.52[4]
- Average all-Morocco national line (Figure 1): MAD10.19
- National line for urban (MAD10.50) and rural areas (MAD9.78, Figure 1)

[3] `hcp.ma/ICV_-par-grands-groupes_a184.html?print=1`, retrieved 24 May 2013.
[4] Haut Commissariat du Plan, "Note d'Information Relative à l'Indice du Coût de la Vie", various issues.

Using the formula from Sillers (2006), the all-Morocco $1.25/day 2005 PPP line is:

$$(\text{2005 PPP exchange rate}) \cdot \$1.25 \cdot \left(\frac{\text{CPI}_{\text{Dec. 2006 to Nov. 2007}}}{\text{CPI}_{2005}} \right) =$$

$$\left(\frac{\text{MAD5.51}}{\$1.00} \right) \cdot \$1.25 \cdot \left(\frac{177.52}{168.7} \right) = \text{MAD7.25}.$$

This line applies to Morocco on average. The urban and rural $1.25/day lines are found by multiplying the all-Morocco $1.25/day line by a given area's national line and then dividing it by the all-Morocco national line. For example, the urban $1.25/day line is $\text{MAD7.25} \cdot \left(\frac{\text{MAD10.50}}{\text{MAD10.19}} \right) = \text{MAD7.47}.$

USAID microenterprise partners in Morocco who use the Simple Poverty Scorecard® to report poverty rates to USAID should use the USAID "extreme" line. This is because USAID defines "very poor" as those households whose consumption is below the highest of two lines:

- $1.25/day 2005 PPP (MAD7.25, Figure 1)
- USAID "extreme" line (MAD8.55).

3. Scorecard construction

For Morocco, about 110 candidate indicators are initially prepared in the areas of:

- Household composition (such as number of members)
- Education (such as literacy)
- Housing (such as the number of rooms)
- Ownership of durable assets (such as wash basins or refrigerators)
- Employment (such as the number of members who work)
- Agriculture (such as ownership of livestock)

Figure 2 lists the candidate indicators, ordered by the entropy-based "uncertainty coefficient" (Goodman and Kruskal, 1979) that measures how well a given indicator predicts poverty on its own.

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

The scorecard itself is built using 200% of the national poverty line and Logit regression on the construction sub-sample. Indicator selection uses both judgment and statistics. The first step is to use Logit to build one scorecard for each candidate indicator. Each scorecard's power to rank households by poverty status is measured as "c" (SAS Institute Inc., 2004).

One of these one-indicator scorecards is then selected based on several factors (Schreiner *et al.*, 2004; Zeller, 2004). These include improvement in accuracy, likelihood of acceptance by users (determined by simplicity, cost of collection, and "face validity" in terms of experience, theory, and common sense), sensitivity to changes in poverty, variety among indicators, applicability across regions, relevance for distinguishing among households at the poorer end of the distribution of consumption, and verifiability.

A series of two-indicator scorecards are then built, each based on the one-indicator scorecard selected from the first round, with a second candidate indicator added. The best two-indicator scorecard is then selected, again based on "c" and judgment about how to balance the non-statistical criteria. These steps are repeated until the scorecard has 10 indicators that work together well.

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

This algorithm is similar to the common R^2-based stepwise least-squares regression. It differs from naïve stepwise in that the selection of indicators considers both statistical[5] and non-statistical criteria. The non-statistical criteria can improve

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

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

The single scorecard here applies to all of Morocco. Tests for Indonesia (World Bank, 2012), Bangladesh (Sharif, 2009), India and Mexico (Schreiner, 2006 and 2005a), Sri Lanka (Narayan and Yoshida, 2005), and Jamaica (Grosh and Baker, 1995) suggest that segmenting poverty-assessment tools by urban/rural does not improve targeting accuracy much, although segmentation in general may improve the bias and precision of estimates of poverty rates (Tarozzi and Deaton, 2009).

4. Practical guidelines for scorecard use

The main challenge of scorecard design is not to maximize statistical accuracy but rather to improve the chances that the scorecard is actually used (Schreiner, 2005b). When scoring projects fail, the reason is not usually statistical inaccuracy but rather the failure of an organization to decide to do what is needed to integrate scoring in its processes and to train and convince its employees to use the scorecard properly (Schreiner, 2002). After all, most reasonable scorecards have similar targeting accuracy, thanks to the empirical phenomenon known as the "flat maximum" (Caire and Schreiner, 2012; Hand, 2006; Baesens *et al.*, 2003; Lovie and Lovie, 1986; Kolesar and Showers, 1985; Stillwell, Barron, and Edwards, 1983; Dawes, 1979; Wainer, 1976; Myers and Forgy, 1963). The bottleneck is less technical and more human, not statistics but organizational-change management. Accuracy is easier to achieve than adoption.

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

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

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

The scorecard (and its back-page worksheet) is ready to be photocopied. A field worker using Morocco's paper scorecard would:

- Record the names and identifiers of the participant, the field worker, and the relevant organizational service point
- Record the date that the participant first joined the organization
- Record the date of the scorecard interview
- Complete the back-page worksheet with each household member's name, age, literacy, and work status
- Record household size and the responses to the scorecard's first, second, and third indicators based on the back-page worksheet
- Read each of the remaining seven questions one-by-one from the scorecard, drawing a circle around the relevant response options and their points, and writing each point value in the far right-hand column
- Add up the points to get a total score
- Implement targeting policy (if any)
- Deliver the paper scorecard to a central office for data entry and filing

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

review and random audits (Matul and Kline, 2003).[6] IRIS Center (2007a) and Toohig (2008) are useful nuts-and-bolts guides for budgeting, training field workers and supervisors, logistics, sampling, interviewing, piloting, recording data, and controlling quality.

In particular, while collecting scorecard indicators is relatively easier than alternative ways of measuring poverty, it is still absolutely difficult. Training and explicit definitions of terms and concepts in the scorecard are essential, and field workers should scrupulously study and follow the "Guidelines for the Interpretation of Scorecard Indicators" found at the end of this paper, as they are an integral part of the Simple Poverty Scorecard®.[7]

For the example of Nigeria, one study (Onwujekwe, Hanson, and Fox-Rushby, 2006) found distressingly low inter-rater and test-retest correlations for indicators as seemingly simple as whether the household owns an automobile. At the same time, Grosh and Baker (1995) suggest that gross underreporting of assets does not affect targeting. For the first stage of targeting in a conditional cash-transfer program in

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[6] If a program does not want field workers to know the points associated with responses, then it can use a version of the scorecard that does not display the points and then apply the points and compute scores later at a central office. Schreiner (2012b) argues that hiding points in Colombia (Camacho and Conover, 2011) did little to deter cheating and that, in any case, cheating by the user's central office was more damaging than cheating by field workers and respondents. Even if points are hidden, response options and poverty still have common-sense relationships.

[7] The guidelines here are the only ones that organizations should give to field workers. All other issues of interpretation are to be left to the judgment of field workers and respondents, as this seems to be what Morocco's Direction de la Statistique did when it fielded the 2007 ENNVM.

Mexico, Martinelli and Parker (2007, pp. 24–25) find that "underreporting [of asset ownership] is widespread but not overwhelming, except for a few goods . . . [and] overreporting is common for a few goods, which implies that self-reporting may lead to the exclusion of deserving households". Still, as is done in Mexico in the second stage of its targeting process, most false self-reports can be corrected (or avoided in the first place) by field workers who make a home visit. This is the recommended procedure for local, pro-poor organizations in Morocco, if they use the scorecard for targeting.

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

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

In general, the sampling design should follow from the organization's goals for the exercise, the questions to be answered, and the budget.

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

- Employees of the organization
- Third parties

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

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

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

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

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

Frequency of application can be:

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

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

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

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

5. Estimates of household poverty likelihoods

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

To get absolute units, scores must be converted to *poverty likelihoods*, that is, probabilities of being below a poverty line. This is done via simple look-up tables. For the example of 200% of the national line, scores of 35–39 have a poverty likelihood of 45.0 percent, and scores of 40–44 have a poverty likelihood of 32.7 percent (Figure 3).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 35–39 are associated with a poverty likelihood of 45.0 percent for 200% of the national line but of 0.5 percent for the $1.25/day 2005 PPP line.[8]

5.1 Calibrating scores with poverty likelihoods

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

[8] Starting with Figure 3, many figures have eight versions, one for each of the eight poverty lines. To keep them straight, they are grouped by poverty line. Single tables pertaining to all eight lines are placed with the tables for 200% of the national line.

For the example of 200% of the national line (Figure 4), there are 12,305 (normalized) households in the calibration sub-sample with a score of 35–39. Of these, 5,531 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 35–39 is then 45.0 percent, because 5,531 ÷ 12,305 = 45.0 percent.

To illustrate with 200% of the national line and a score of 40–44, there are 12,002 (normalized) households in the calibration sample, of whom 3,928 (normalized) are below the line (Figure 4). The poverty likelihood for this score is then 3,928 ÷ 12,002 = 32.7 percent.

The same method is used to calibrate scores with estimated poverty likelihoods for the other seven poverty lines.[9]

Figure 5 shows, for all scores, the likelihood that a given household's consumption falls in a range demarcated by two adjacent poverty lines.

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

For the example of 200% of the national line, the probability that a household with a score of 35–39 falls between two adjacent poverty lines is:

- 0.5 percent below $1.25/day
- 0.9 percent between $1.25/day and the USAID "extreme" line
- 2.3 percent between the USAID "extreme" line and 100% of the national line
- 12.3 percent between 100% of the national line and $2.50/day
- 3.4 percent between $2.50/day and 150% of the national line
- 25.4 percent between 150% and 200% of the national line
- 6.5 percent between 200% of the national line and $3.75/day
- 26.4 percent between $3.75/day and $5.00/day
- 22.2 percent above $5.00/day

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

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

5.2 Accuracy of estimates of households' poverty likelihoods

As long as the relationships between indicators and poverty do not change over time, and as long as the scorecard is applied to households that are representative of the same population from which the scorecard was originally constructed, then this calibration process produces unbiased estimates of poverty likelihoods. *Unbiased* means that in repeated samples from the same population, the average estimate matches the true value. The scorecard also produces unbiased estimates of poverty rates at a point in time and unbiased estimates of changes in poverty rates between two points in time.[10]

Of course, the relationships between indicators and poverty do change to some unknown extent over time and also across sub-groups in Morocco's population. Thus,

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

the scorecard will generally be biased when applied after November 2007 (the last month of fieldwork for the 2007 ENNVM) or when applied with sub-groups that are not nationally representative.

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

- Score each household in the validation sample
- Draw a new bootstrap sample *with replacement* from the validation sample
- For each score, compute the true poverty likelihood in the bootstrap sample, that is, the share of households with the score and with consumption below a poverty line
- For each score, record the difference between the estimated poverty likelihood (Figure 3) and the true poverty likelihood in the bootstrap sample
- Repeat the previous three steps 1,000 times
- For each score, report the average difference between estimated and true poverty likelihoods across the 1,000 bootstrap samples
- For each score, report the two-sided intervals containing the central 900, 950, and 990 differences between estimated and true poverty likelihoods

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

For 200% of the national line, the average poverty likelihood across bootstrap samples for scores of 35–39 in the validation sample is too high by 0.5 percentage points. For scores of 40–44, the estimate is too low by 6.4 percentage points.[11]

The 90-percent confidence interval for the differences for scores of 35–39 is ±2.0 percentage points (200% of the national line, Figure 6). This means that in 900 of 1,000 bootstraps, the difference between the estimate and the true value is between –1.5 and +2.5 percentage points (because +0.5 – 2.0 = –1.5, and +0.5 + 2.0 = +2.5). In 950 of 1,000 bootstraps (95 percent), the difference is +0.5 ± 2.4 percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is +0.5 ± 3.2 percentage points.

Figure 6 shows some differences—most of them small—between estimated poverty likelihoods and true values. There are differences is because the validation sample is a single sample that—thanks to sampling variation—differs in distribution from the construction/calibration sub-samples and from Morocco's population. For targeting, however, what matters is less the difference in all score ranges and more the difference in score ranges just above and below the targeting cut-off. This mitigates the effects of bias and sampling variation on targeting (Friedman, 1997). Section 8 below looks at targeting accuracy in detail.

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

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

Another possible source of differences between estimates and true values is overfitting. The scorecard here is unbiased, but it may still be *overfit* when applied after the end of the ENNVM fieldwork in November 2007. That is, it may fit the data from the 2007 ENNVM so closely that it captures not only some real patterns but also some random patterns that, due to sampling variation, show up only in the 2007 ENNVM but not in the overall population of Morocco. Or the scorecard may be overfit in the sense that it is not robust when relationships between indicators and poverty change over time or when it is applied to non-nationally representative samples.

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

Most errors in individual households' likelihoods do balance out in the estimates of groups' poverty rates (see the next section). Furthermore, at least some of the differences will come from non-scorecard sources such as changes in the relationships between indicators and poverty, sampling variation, changes in poverty lines, inconsistencies in data quality across time, and imperfections in cost-of-living adjustments across time and across geographic regions. These factors can be addressed

only by improving data quantity and quality (which is beyond the scope of the scorecard) or by reducing overfitting (which likely has limited returns, given the scorecard's parsimony).

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

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

To illustrate, suppose an organization samples three households on 1 January 2013 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 83.8, 63.9, and 32.7 percent (200% of the national line, Figure 3). The group's estimated poverty rate is the households' average poverty likelihood of (83.8 + 63.9 + 32.7) ÷ 3 = 60.1 percent.

Be careful; the group's poverty rate is *not* the poverty likelihood associated with the average score. Here, the average score is 30, which corresponds to a poverty likelihood of 63.9 percent. This differs from the 60.1 percent found as the average of the three individual poverty likelihoods associated with each of the three scores. Unlike poverty likelihoods, scores are ordinal symbols, like letters in the alphabet or colors in the spectrum. Because scores are not cardinal numbers, they cannot be added up or averaged across households. Only three operations are valid for scores: conversion to poverty likelihoods, analysis of distributions (Schreiner, 2012a), or comparison—if desired—with a cut-off for targeting. The safest rule to follow is: Always use poverty likelihoods, never scores.

6.1 Accuracy of estimated poverty rates at a point in time

For the Morocco scorecard applied to 1,000 bootstraps of $n = 16{,}384$ from the validation sample, the maximum absolute difference between the estimated poverty rate at a point in time and the true rate is 1.3 percentage points (Figure 8, summarizing Figure 7 across all eight poverty lines). The average absolute difference across poverty lines is 0.4 percentage points. At least part of these differences is due to sampling variation in the division of the 2007 ENNVM into two sub-samples.

When estimating poverty rates at a point in time, the bias reported in Figure 8 should be subtracted from the average poverty likelihood to make the estimate unbiased. For the Morocco scorecard and 200% of the national line, bias is +0.8 percentage points, so the unbiased estimate in the three-household example above is 60.1 – (+0.8) = 59.3 percent.

In terms of precision, the 90-percent confidence interval for a group's estimated poverty rate at a point in time with $n = 16{,}384$ is ±0.5 percentage points or less (Figure 8). This means that in 900 of 1,000 bootstraps of this size, the estimate (after subtracting off bias) is within 0.5 percentage points of the true value.

For example, suppose that the average poverty likelihood in a sample of $n =$ 16,384 with the Morocco scorecard and 200% of the national line is 60.1 percent. Then estimates in 90 percent of such samples would be expected to fall in the range of 60.1 – (+0.8) – 0.5 = 58.8 percent to 60.1 – (+0.8) + 0.5 = 59.8 percent, with the most likely true value being the unbiased estimate in the middle of this range (60.1 – (+0.8) = 59.3

percent). This is because the original (biased) estimate is 60.1 percent, bias is +0.8 percentage points, and the 90-percent confidence interval for 200% of the national line is ±0.5 percentage points (Figure 8).

6.2 Formula for standard errors for estimates of poverty rates

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

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

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

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

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

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

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

N is the population size, and

n is the sample size.

For example, Morocco's 2007 ENNVM gives a direct-measurement estimate of the household-level poverty rate for 200% of the national line of $\hat{p} = 37.1$ percent (Figure 1). If this estimate came from a sample of $n = 16{,}384$ households from a population N of 6,100,202 (the number of households in Morocco in 2007), then the finite population correction ϕ is $\sqrt{\frac{6{,}100{,}202 - 16{,}384}{6{,}100{,}202 - 1}} = 0.9987$, which can be taken as $\phi = 1$. If the desired confidence level is 90-percent ($z = 1.64$), then the confidence interval $\pm c$ is $\pm\, z \cdot \sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}} = \pm 1.64 \cdot \sqrt{\frac{0.371 \cdot (1 - 0.371)}{16{,}384}} \cdot 1 = \pm 0.619$ percentage points.

Poverty scoring, however, does not measure poverty directly, so this formula is not applicable. To derive a formula for the Morocco scorecard, consider Figure 7, which reports empirical confidence intervals $\pm c$ for the differences for the scorecard applied to 1,000 bootstraps of various sizes from the validation sample. For example, with $n =$ 16,384 and 200% of the national line, the 90-percent confidence interval is ± 0.515 percentage points.[12]

Thus, the 90-percent confidence interval with $n = 16{,}384$ is ± 0.515 percentage points for the Morocco scorecard and ± 0.619 percentage points for direct measurement. The ratio of the two intervals is $0.515 \div 0.619 = 0.83$.

[12] Due to rounding, Figure 7 displays 0.5, not 0.515.

Now consider the same exercise, but with $n = 8{,}192$. The confidence interval under direct measurement and 200% of the national line is

$\pm 1.64 \cdot \sqrt{\frac{0.371 \cdot (1 - 0.371)}{8{,}192}} \cdot 1 = \pm 0.875$ percentage points. The empirical confidence interval with the Morocco scorecard (Figure 7) is ±0.740 percentage points. Thus for $n = 8{,}192$, the ratio of the two intervals is $0.740 \div 0.875 = 0.85$.

This ratio of 0.85 for $n = 8{,}192$ is quite close to the ratio of 0.83 for $n = 16{,}384$. Across all sample sizes of 256 or more in Figure 7, the average ratio turns out to be 0.85, implying that confidence intervals for indirect estimates of poverty rates via the Morocco scorecard and 200% of the national poverty line are—for a given sample size—about 15-percent narrower than confidence intervals for direct estimates via the 2007 ENNVM. This 0.85 appears in Figure 8 as the "α factor" because if $\alpha = 0.85$, then the formula for confidence intervals c for the Morocco scorecard is $\pm c = \pm z \cdot \alpha \cdot \sigma$. That is, the formula for the standard error σ for point-in-time estimates of poverty rates via scoring is $\alpha \cdot \sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}}$.

In general, α can be more or less than 1.00. When α is less than 1.00, it means that the scorecard is more precise than direct measurement. This occurs for all eight poverty lines in Figure 8.

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

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

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

To illustrate how to use this, suppose the population N is 6,100,202 (the number of households in Morocco in 2007), suppose $c = 0.04215$, $z = 1.64$ (90-percent confidence), and the relevant poverty line is 200% of the national line so that the most sensible expected poverty rate $\tilde{p}$ is Morocco's overall poverty rate for that line in 2007 (37.1 percent at the household level, Figure 1). The α factor is 0.85 (Figure 8). Then the sample-size formula gives

$n = 6{,}100{,}202 \cdot \left(\frac{1.64^2 \cdot 0.85^2 \cdot 0.371 \cdot (1 - 0.371)}{1.64^2 \cdot 0.85^2 \cdot 0.371 \cdot (1 - 0.371) + 0.04125^2 \cdot (6{,}100{,}202 - 1)} \right) = 267$, which is not far from the sample size of 256 observed for these parameters in Figure 7 for 200% of the national line. Taking the finite population correction factor ϕ as one (1) gives the same answer, as $n = \left(\frac{0.85 \cdot 1.64}{0.04125} \right)^2 \cdot 0.371 \cdot (1 - 0.371) = 267$.[13]

[13] Although USAID has not specified required confidence levels nor intervals, IRIS Center (2007a and 2007b) says that a sample size of $n = 300$ is sufficient for USAID reporting. USAID microenterprise partners in Morocco should report using the USAID "extreme" line. Given the α factor of 0.93 for this line (Figure 8), an expected before-measurement household-level poverty rate of 37.1 percent (the all-Morocco rate for

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

In practice after the end of fieldwork for the ENNVM in November 2007, a program would select a poverty line (say, 200% of the national line), note its participants' population size (for example, $N = 10{,}000$ participants), select a desired confidence level (say, 90 percent, or $z = 1.64$), select a desired confidence interval (say, ±2.0 percentage points, or $c = \pm 0.02$), make an assumption about $\widetilde{p}$ (perhaps based on a previous measurement such as the household-level poverty rate for 200% of the national line for Morocco overall of 37.1 percent in the 2007 ENNVM in Figure 1), look up α (here, 0.85 in Figure 8), assume that the scorecard will still work in the future and for non-nationally representative sub-groups,[14] and then compute the required sample size. In this illustration,

$$n = 10{,}000 \cdot \left(\frac{1.64^2 \cdot 0.85^2 \cdot 0.371 \cdot (1 - 0.371)}{1.64^2 \cdot 0.85^2 \cdot 0.371 \cdot (1 - 0.371) + 0.02^2 \cdot (10{,}000 - 1)} \right) = 1{,}019.$$

2007, Figure 1), and a confidence level of 90 percent, then $n = 300$ implies a confidence interval of $\pm 1.64 \cdot 0.93 \cdot \sqrt{\frac{0.371 \cdot (1 - 0.371)}{300}} = \pm 4.3$ percentage points.

[14] This paper reports accuracy for the scorecard applied to the validation sample, but it cannot test accuracy for later years or for sub-groups. Performance after November 2007 will resemble that in the 2007 ENNVM with deterioration over time to the extent that the relationships between indicators and poverty status change.

7. Estimates of changes in poverty rates over time

The change in a group's poverty rate between two points in time is estimated as the change in the average poverty likelihood of the households in the group. Because poverty lines and household consumption are defined differently for the ENNVM for 2007 and 1998/8, this paper cannot test estimates of change over time for Morocco, and it can only suggest approximate formulas for standard errors. Nonetheless, the relevant concepts are presented here because, in practice, local pro-poor organizations can apply the scorecard to collect their own data and measure change through time.

7.1 Warning: Change is not impact

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

7.2 Estimating changes in poverty rates over time

Consider the illustration begun in the previous section. On 1 January 2013, an organization samples three households who score 20, 30, and 40 and so have poverty likelihoods of 83.8, 63.9, and 32.7 percent (200% of the national line, Figure 3). Adjusting for the known bias of +0.8 percentage points (Figure 8), the group's baseline estimated poverty rate is the households' average poverty likelihood of [(83.8 + 63.9 + 32.7) ÷ 3] – (+0.8) = 59.3 percent.

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

- Score a new, independent sample, measuring change across samples
- Score the same sample at both baseline and follow-up

By way of illustration, suppose that two years later on 1 January 2015, the organization samples three additional households who are in the same population as the three original households (or suppose that the same three original households are scored a second time) and finds that their scores are 25, 35, and 45 (poverty likelihoods of 76.9, 45.0, and 26.3 percent, 200% of the national line, Figure 3). Adjusting for known bias, the average poverty likelihood at follow-up is [(76.9 + 45.0 + 26.3) ÷ 3] – (+0.8) = 48.6 percent, an improvement of 59.3 – 48.6 = 10.7 percentage points.[15]

[15] Of course, such a huge reduction in poverty in two years is highly unlikely, but this is just an example to show how poverty scoring can be used to estimate change.

Thus, about one in nine participants in this hypothetical example cross the poverty line in 2013/5.[16] Among those who start below the line, about one in six (10.7 ÷ 59.3 = 18.0 percent) on net end up above the line.[17]

7.3 Accuracy for estimated change

Given the changes in the definitions of poverty lines and in the definition of the measure of consumption between the 1998/9 ENNVM and the 2007 ENNVM, 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 Morocco can still use the Simple Poverty Scorecard® to estimate change. The rest of this section suggests approximate formulas for standard errors that may be used until there is additional data.

7.3.1 Precision for estimates of change in two samples

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

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

[16] This is a net figure; some people start above the line and end below it, and vice versa.
[17] Poverty scoring does not reveal the reasons for this change.

Here, z, c, $\hat{p}$ and N are defined as above, n is the sample size at both baseline and follow-up,[18] and α is the average (across a range of bootstrapped sample sizes) of the ratio of the observed confidence interval from a scorecard and the theoretical confidence interval under direct measurement.

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

This α has been measured for 11 countries (Schreiner, 2013a, 2013b, 2012c, 2010, 2009a, 2009b, 2009c, 2009d; Chen and Schreiner, 2009; and Schreiner and Woller, 2010a and 2010b). The simple average of α across countries—after averaging α across poverty lines and survey years within each country—is 1.15. This is as reasonable a figure as any to use for Morocco.

To illustrate the use of this formula to determine sample size for estimating changes in poverty rates across two independent samples, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is ± 2 percentage points ($\pm c = \pm 0.02$), the poverty line is 200% of the national line, $\alpha = 1.15$,

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

$\hat{p} = 0.371$ (the household-level poverty rate in 2007 for 200% of the national line in Figure 1), and the population N is large enough relative to the expected sample size n that the finite population correction ϕ can be taken as one. Then the baseline sample size is $n = 2 \cdot \left(\frac{1.15 \cdot 1.64}{0.02}\right)^2 \cdot 0.371 \cdot (1 - 0.371) \cdot 1 = 4{,}151$, and the follow-up sample size is also 4,151.

7.3.2 Precision for estimated change for one sample, scored twice

Analogous to previous derivations, the general formula relating the confidence interval $\pm c$ to the standard error σ when using a scorecard to estimate change for a single group of households, all of whom are scored at two points in time, is:[19]

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

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

The formula for confidence intervals can be rearranged to give a formula for sample size before measurement. This requires an estimate (based on information available before measurement) of the expected shares of all households who cross the

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

poverty line $\widetilde{p}_{12}$ and $\widetilde{p}_{21}$. Before measurement, a conservative assumption is that the change in the poverty rate will be zero, which implies $\widetilde{p}_{12} = \widetilde{p}_{21} = \widetilde{p}_{*}$, giving:

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

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

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

Given this, a sample-size formula for a group of households to whom the Morocco scorecard is applied twice (once after November 2007 and then again later) is

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

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

To illustrate the use of this formula, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is ± 2.0 percentage points ($\pm c = \pm 0.02$), the poverty line is 200% of the national line, the sample will first be scored in 2013 and then again in 2016 ($y = 3$), and the population N is so large relative to the expected sample size n that the finite population correction ϕ can be taken as one. The pre-baseline poverty rate p_{2007} is taken as 37.1 percent (Figure 1), and α is assumed to

be 1.30. Then the baseline sample size is

$n = 2 \cdot \left(\frac{1.30 \cdot 1.64}{0.02}\right)^2 \cdot \left\{-0.02 + 0.016 \cdot 3 + 0.47 \cdot \left[0.371 \cdot (1 - 0.371)\right]\right\} \cdot 1 = 3{,}130$. The same group of 3,130 households is scored at follow-up as well.

8. Targeting

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

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

Targeting is successful when households truly below a poverty line are targeted (*inclusion*) and when households truly above a poverty line are not targeted (*exclusion*). Of course, no scorecard is perfect, and targeting is unsuccessful when households truly below a poverty line are not targeted (*undercoverage*) or when households truly above a poverty line are targeted (*leakage*).

Figure 9 depicts these four possible targeting outcomes. Targeting accuracy varies by the cut-off score; a higher cut-off has better inclusion (but worse leakage), while a lower cut-off has better exclusion (but worse undercoverage).

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

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

Figure 10 shows the distribution of households by targeting outcome for Morocco. For an example cut-off of 35–39, outcomes for 200% of the national line in the validation sample are:

- Inclusion: 28.2 percent are below the line and correctly targeted
- Undercoverage: 8.9 percent are below the line and mistakenly not targeted
- Leakage: 14.8 percent are above the line and mistakenly targeted
- Exclusion: 48.1 percent are above the line and correctly not targeted

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

- Inclusion: 32.6 percent are below the line and correctly targeted
- Undercoverage: 4.5 percent are below the line and mistakenly not targeted
- Leakage: 22.3 percent are above the line and mistakenly targeted
- Exclusion: 40.5 percent are above the line and correctly not targeted

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

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

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

- Assign benefits and costs to possible outcomes, based on its values and mission
- Tally total net benefits for each cut-off using Figure 10 for a given poverty line
- Select the cut-off with the highest total net benefit

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

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

A common choice of benefits and costs is "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 10 shows "Total Accuracy" for all cut-offs for the Morocco scorecard. For 200% of the national line in the validation sample, total net benefit is greatest (77.6) for a cut-off of 34 or less, with more than three in four households in Morocco 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).[20]

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

As an alternative to assigning benefits and costs to targeting outcomes and then choosing a cut-off to maximize total net benefit, a program could set a cut-off to achieve a desired poverty rate among targeted households. The third column of Figure 11 ("% targeted HHs who are poor") shows, for the Morocco scorecard applied to the validation sample, the expected poverty rate among households who score at or below a given cut-off. For the example of 200% of the national line, targeting households who score 39 or less would target 43.0 percent of all households (second column) and produce a poverty rate among those targeted of 65.7 percent (third column).

Figure 11 also reports two other measures of targeting accuracy. The first is a version of coverage ("% poor HHs who are targeted"). For the example of 200% of the national line with the validation sample and a cut-off of 39 or less, 75.9 percent of all poor households are covered.

The final targeting measure in Figure 11 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For 200% of the national line with the validation sample and a cut-off of 39 or less, covering 1.9 poor households means leaking to 1 non-poor household.

9. Context of poverty-assessment tools in Morocco

This section discusses three existing poverty-assessment tools for Morocco in terms of their goals, methods, definitions of *poverty*, data, indicators, cost, bias, and precision. In general, the advantages of the Simple Poverty Scorecard® are its:

- Use of data from the latest nationally representative consumption survey
- Reporting of bias and precision from out-of-sample tests
- Feasibility for local, pro-poor programs, due to its simplicity and transparency

9.1 Gwatkin *et al.*

Gwatkin *et al.* (2007) construct a poverty-assessment tool for Morocco with an approach that they use in 56 countries with Demographic and Health Surveys (Rutstein and Johnson, 2004). They use Principal Components Analysis to make an asset index from simple, low-cost indicators available for the 11,513 households in Morocco's 2003/4 DHS. The PCA index is like the scorecard here except that, because the DHS does not collect data on consumption, it is based on a different conception of poverty, its accuracy vis-à-vis a consumption-based poverty is unknown, and it can only be assumed to be a proxy for long-term wealth/economic status.[21] Well-known examples of the PCA asset-index approach include Stifel and Christiaensen (2007), Zeller *et al.* (2006), Filmer and Pritchett (2001), and Sahn and Stifel (2000 and 2003).

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

The 37 indicators in Gwatkin *et al.* are similar to those in the scorecard here in terms of their simplicity, low cost, and verifiability:

- Characteristics of the residence:
  - Type of floors
  - Main means of lighting
  - Presence of electricity
  - Main type of cooking fuel
  - Source of drinking water
  - Type of toilet arrangement
  - Main type of window
  - Main means of waste disposal
  - Number of people per sleeping room
- Whether the household has a domestic worker not related to the head
- Ownership of consumer durables:
  - Radios
  - Televisions (in general)
  - Small color televisions
  - Large color televisions
  - Video players
  - Satellite dishes
  - Telephones
  - Refrigerators
  - Water heaters
  - Dishwashers
  - Vacuum cleaners
  - Microwaves
  - Clothes-washing machines
  - Air conditioners
  - Means of transporting goods (in general)
  - Bicycles
  - Motorcycles or scooters
  - Cars or trucks
  - Tractors
  - House
  - Commercial building
  - Machinery and industrial equipment
  - Non-farm land
- Whether members of the household work their own or family's agricultural land
- Ownership of agricultural assets:
  - Livestock
  - Poultry
  - Farm land

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

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

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

Still, the Gwatkin *et al.* index is more difficult and costly than the Simple Poverty Scorecard®. While the scorecard here requires adding up 10 integers, some of which are usually zero, Gwatkin *et al.*'s asset index requires adding up 147 numbers, each with five decimal places and half with negative signs.

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

In essence, Gwatkin *et al.*—like all asset indexes—define *poverty* in terms of the indicators and points in the index itself. Thus, the index is not a proxy standing in for something else (such as consumption) but rather a direct measure of a non-consumption-based definition of *poverty*. There is nothing wrong—and a lot right—about defining *poverty* in this way, but it is not as common as a consumption-based definition.

The asset-index approach defines people as *poor* if their assets (physical, human, financial, and social) fall below a threshold. Arguments for the asset-based view include

Carter and Barrett (2006), Schreiner and Sherraden (2006), Sahn and Stifel (2003), and Sherraden (1991). The main advantages of the asset-based view are that:

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

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

9.2 Ezzrari

Ezzrari (no date) uses a version of PCA that accounts for the categorical nature of indicators to construct two (urban and rural) asset indexes for Morocco to:

- Measure asset-based poverty, including change over time
- Check concordance between asset- and consumption-based poverty

Ezzrari builds the asset index using the 2007 ENNVM and then applies it to that same data and to the 2000/1 National Household Consumption and Expenditure Survey (*Enquête Nationale sur la Consommation et les Dépenses des Ménages*, ENCDM). The index's 29 indicators presumably have the same or similar wording and response options in both surveys:

- Education:
  - Literacy of the household head
  - Share of household members who are literate
  - Share of household members with no formal schooling
- Employment:
  - Whether the household head is unemployed
  - Whether any youth in the household are unemployed
- Assess to public services:
  - Electricity
  - Piped water
  - Sewer
  - Health care
  - Health insurance
- Characteristics of the residence:
  - Type of residence
  - Whether the residence is shared with other households
  - Source of drinking water
  - Type of toilet arrangement
  - Presence of a bathtub or shower
  - Presence of a kitchen
  - Presence of a bathroom
  - Number of people per room

- Ownership of consumer durables:
  - Gas stove
  - Gas oven
  - Refrigerator
  - Freezer
  - Television
  - Satellite dish
  - Mobile telephone
- Quintile of consumption
- Nutrition:
  - Food poverty
  - Wasting
  - Stunting

Most of these indicators are straightforward, simple, and inexpensive. Still, Ezzrari's asset index would be difficult to apply in the field, as it requires calculating three ratios, measuring childrens' age, height, and weight, somehow determining food poverty, and measuring consumption. Calculating the index requires multiplying the average values for Morocco as a whole of its 140 response options by each of 140 weights, all of which have two decimal places, and half of which are negative.

Ezzrari defines a household as *poor* if its asset index is below 60 percent of the median index (by urban and rural). In the 2007 ENNVM, the person-level asset-poverty rate is 12.1 percent, while the consumption-poverty rate here is 8.9 percent (Figure 1). Of course, these figures are based on different definitions of *poverty*.

The correlation between asset-poverty and consumption-poverty is 0.46. Without reference to any benchmark, Ezzrari calls this "fairly weak" (p. 24). He also reports that 31.5 percent of the asset-poor are not consumption-poor, and that 42.8 percent of the consumption-poor are not asset-poor.

Like Sahn and Stifle (2000), Ezzrari measures change in asset-poverty over time. He applies the asset index and its poverty line from the 2007 ENNVM to the 2000/1 ENCDM. At the person level, asset-poverty fell from 23.9 percent in 2000/1 to 12.1 percent in 2007. For comparison, consumption-based poverty fell from 15.3 percent to 8.9 percent. Ezzrari concludes that consumption-poverty does not capture some changes in well-being, especially those related to access to non-market goods supplied via networks or government, such as education, piped water, and electricity.

Overall, Ezzrari is well documented and well analyzed, ranking among the best country-specific asset indexes. The main difference between the asset approach and the consumption approach is definitional; both are useful, with their own strengths and weaknesses. For example, the asset index does not adjust for household size, while the scorecard does. This leads to the scorecard's underestimating poverty for some single-person households. No asset index by any author tests bias out-of-sample (that, with data that was not used to construct the index), nor reports standard errors, even though this can be done straightforwardly.

9.3 Douidich

Douidich (2010)[22] uses the "poverty mapping" approach of Elbers, Lanjouw, and Lanjouw (2003) to estimate poverty rates for Morocco's 1,689 communes. The purpose is to "understand poverty and inequality levels at detailed spatial scales as a prerequisite for fine geographic targeting of interventions aimed at improving welfare" (Lanjouw, 2004, p. 1).[23] Indeed, promoting the use of poverty maps for geographic targeting is the main theme of the World Bank's 2004 poverty report for Morocco.

Douidich makes poverty-assessment tools for nine regions in Morocco using regression to estimate the logarithm of consumption in the 2007 ENNVM, considering only indicators found also in Morocco's 2004 population census. The nine tools are then applied to census data to estimate poverty rates for the national line at the level of communes. Such estimates would not be possible with only the 2007 ENNVM due to its smaller sample size. HCP (2010) uses the estimates to make "poverty maps" that quickly show how poverty rates vary across communes in a way that makes sense to non-specialists.

[22] See also HCP (2010).

[23] Lanjouw's poverty map is a precursor to that of Douidich. It is based on the 1994 census and the 1998/9 ENNVM. When applied to census data for all of Morocco, its estimated poverty rate is 1.3 percentage points higher than that in the 1998/9 ENNVM.

Poverty mapping in Douidich has much in common with poverty scoring here in that they both:

- Build poverty-assessment tools with nationally representative survey data and then apply them to other data on groups that rarely is nationally representative
- Use simple, verifiable indicators that are quick and inexpensive to collect
- Provide unbiased estimates when their assumptions hold
- Estimate poverty rates for groups
- Seek to be useful in practice and so aim to be transparent to non-specialists

Strengths specific to poverty mapping include that it:

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

The particular strengths of poverty scoring include that it:

- Is simpler in terms of both construction and application
- Tests accuracy empirically
- Associates poverty likelihoods with scores non-parametrically
- Surfaces estimates of poverty likelihoods for individual households
- Reduces overfitting by selecting indicators with statistical and non-statistical criteria
- Reports simple formulas for standard errors
- Reports bias and standard errors

The basic difference between the two approaches is that poverty mapping seeks to help governments to target pro-poor policies, while poverty scoring seeks to help local pro-poor organizations to manage their social performance.[24] On a technical level,

[24] Another apparent difference is that the developers of poverty mapping (Elbers, Lanjouw, and Lanjouw, 2003; Demombynes *et al.*, 2004) say that its first-stage poverty-assessment tools are too inaccurate to be used for targeting at the household level. In contrast, Schreiner (2008b) supports household-level targeting as a legitimate,

Douidich estimates consumption directly, whereas the scorecard here estimates poverty likelihoods.

Like all papers related to poverty mapping in Morocco, Douidich does not report the indicators used to estimate household consumption. It is known, however, that the indicators include community-level averages from the census. For practical purposes, this means that local, pro-poor organizations cannot use of poverty-mapping's first-stage tools to estimate the poverty of their participants nor to do on-the-spot targeting of individual households.

Because the census does not measure consumption, Douidich cannot measure bias. Even though a central strength of poverty mapping is its ability to produce estimates of standard errors, none of Morocco's poverty maps report them.

There are poverty maps for dozens of countries, but, in terms of policy impact, Morocco is probably poverty mapping's poster child. Unlike in some other places, the World Bank helped the HCP learn to produce poverty maps on its own. This led not only to the recent map in Douidich (2010) but also to an older, unpublished map based on the 2004 population census and the 2000/1 ENCDM.[25]

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potentially useful application of poverty scoring. In Elbers *et al.* (2007) and in Douidich, Ezzrari, and Lanjouw (2008, for Morocco), the developers of poverty mapping take a small step away from their original position, allowing that household-level targeting may be usefully accurate, especially when combined with geographic targeting.

[25] This poverty map in Douidich, Ezzrari and Lanjouw (2008) seeks "to assess the potential gains in targeting efficiency from geographic targeting . . . to inform the design of policies" (p. 3). They find "potentially large gains in targeting performance from disaggregating to the local level" (p. 4).

Litvack (2007)[26] says that poverty mapping's impact in Morocco follows from the World Bank's consistent, broad-based, and long-term engagement with policymakers that promoted the understanding of poverty maps and, in general, the value of the geographic targeting of social spending. Also, the entire effort started when Douidich at the HCP requested technical assistance for the first poverty map.

According to Litvack (2007, p. 221–2), "The impact of the poverty maps on Moroccan social policy has been strong and direct." In May 2005, soon after World Bank (2004) and the first poverty maps were released,

> King Mohammed VI launched the National Initiative for Human Development (*Initiative Nationale pour le Développement Humain*, INDH), which he referred to as "the program of my reign." The government announced that US$1 billion would be allocated to the program, half of which would go to efforts to target extra resources to the poorest 360 rural communes and poorest 250 urban neighborhoods. The king had made numerous speeches about his desire to improve social conditions by encouraging policies that are more responsive to local needs (*une politique de proximité*), but, apparently, the poverty maps provided him with the objective information needed to launch a specific effort. (While the king never directly mentioned the poverty maps, the policy initiative he proposed was based on commune-level targeting, which is only possible through the new information provided by the maps.)

HCP (2009) reports that, between 2004 and 2007, poverty rates in rural communes targeted by the INDH decreased from 36.0 percent to 21.0 percent (a reduction of 41 percent or 15 percentage points), while poverty rates in non-targeted rural communes decreased from 16.9 percent to 12.2 percent (a reduction of 28 percent or 4.7 percentage points). While some of this must be due to the greater ease of

[26] About 7 of the 19 pages in Litvack (2007) are plagiarized from Lanjouw (2004).

reducing poverty when it starts high rather than low, much of it must also be due to the INDH. For poverty mapping, Morocco is a success story.

10. Conclusion

Pro-poor programs in Morocco can use the Simple Poverty Scorecard® to segment clients for differentiated treatment as well as to estimate:

- The likelihood that a household has consumption below a given poverty line
- The poverty rate of a population at a point in time
- The change in the poverty rate of a population over time

The scorecard is inexpensive to use and can be understood by non-specialists. It is designed to be practical for pro-poor organizations in Morocco that want to improve how they monitor and manage their social performance.[27]

The scorecard is constructed with half of the data from Morocco's 2007 ENNVM, calibrated to eight poverty lines, and tested on data from the other half of the ENNVM. Bias and precision are reported for estimates of households' poverty likelihoods, groups' poverty rates at a point in time, and changes in groups' poverty rates over time. Of course, the scorecard's estimates of changes are not the same as estimates of program impact. Targeting accuracy is also reported.

When the scorecard is applied to the validation sample, the maximum absolute difference between estimates versus true poverty rates for groups of households at a point in time is 1.3 percentage points. The average absolute bias across the eight poverty lines is about 0.4 percentage points. Unbiased estimates may be had by subtracting the known bias for a given poverty line from the original estimates. For $n =$

[27] This scorecard replaces an older one based on data from 1998/9 (Schreiner, 2007). Because poverty status is defined differently, estimates from the two scorecards are not comparable. Only the new scorecard should be used from now on.

16,384 and 90-percent confidence, the precision of these differences is ±0.5 percentage points or better.

If an organization wants to use the scorecard for targeting, then the results here provide useful information for selecting a cut-off that fits its mission and values.

Although the statistical technique is innovative, and although technical accuracy is important, the design of the scorecard focuses on transparency and ease-of-use. After all, accuracy is irrelevant if an organization feels so daunted by a scorecard's complexity or its cost that it does not even try to use it.

For this reason, the scorecard is kept simple, using ten indicators that are straightforward, low-cost, and verifiable. Points are all zeros or positive integers, and scores range from 0 (most likely below a poverty line) to 100 (least likely below a poverty line). Scores are converted to poverty likelihoods via simple look-up tables, and targeting cut-offs are likewise straightforward to apply. The design attempts to facilitate adoption by helping managers to understand and trust scoring and by allowing non-specialists to add up scores quickly in the field.

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

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Guidelines for the Interpretation of Scorecard Indicators

The following is based on guidelines in the final report for Morocco's 2007 ENNVM:

Haut-Commissariat au Plan. (2010) "Rapport de Synthèse: Enquête Nationale sur les Revenues et les Niveaux de Vie des Ménages", Direction de la Statistique, `hcp.ma/file/103388/`, retrieved 29 May 2013.[the *Final Report*]

1. How many members does the household have?
   A. Eight or more
   B. Seven
   C. Six
   D. Five
   E. Four
   F. One, two, or three

According to pp. 195–196 of the *Final Report*, a *household* is "a group of people—regardless of blood relationship—who normally sleep in the same main residence and who usually work together to satisfy their basic needs for shelter, food, clothing, and health care."

According to p. 202 of the *Final Report*, "a *household* may consist of more than one person or just one person. The way that households work together to share resources to satisfy their members' basic needs will vary. A household might reside in:

- All or part of a building
- More than one building
- A room in a hotel, a *fendak*, or similar arrangements
- A business locale, such as when a shopkeeper lives in the store
- Some other establishment, such as a business, school, office, etc."

According to pp. 202–3 of the *Final Report*, the *main residence* is "the shelter unit (one room, more than one room, a building, etc.) in which a household normally lives. A household cannot have more than one main residence.

"The concept of *normally lives* means staying in the residence (or planning to stay there) for at least six months. Thus, the following cases are not considered as *residents*:

- Someone who has lived in an institutional setting for six months or more, even if he or she happens to be at the household's residence on the time of the interview
- Someone present in the household only temporarily, such as a visitor, guest, or domestic servant who do not stay to sleep at the residence overnight"

According to pp. 203–4 of the *Final Report*, "a *household member* is anyone who, at the time of the interview, meets the following criteria:

- Has his or her main residence with the household being interviewed
- Depends economically on the household, that is, works together with the other members of the household and shares resources to meet basic food and non-food needs

"A *household member* could be:

- Present (at the residence at the time of the interview)
- Temporarily absent (absent from his/her main residence for less than six months)

"The following are to be counted as *household members*:

- Lodgers who sleep in the household's residence and who eat at least lunch or supper with the household
- People who, at the time of the interview, are living in an institutional setting but who have been absent from the household for less than six months
- Students who are absent at the time of the interview but who live in boarding schools or in on-campus dormitories"

2. How many household members 10-years-old or older do not know how to read and write in any language?
    A. Four or more
    B. Two or three
    C. One
    D. None

The definition of *household member* found above for the first indicator also applies to this second indicator.

According to p. 204 of the *Final Report*, *age* is "counted in completed years as of the person's previous birthday before the day of the interview."

3. How many household members are currently working?
    A. None
    B. One or two
    C. Three or more

According to p. 212 of the *Final Report*, *working* means "participating in the production of goods and services, even if only for an hour. It includes people who normally are employed, but who are temporarily absent from their job on the day of the interview. The concept of *working* is to be interpreted broadly, as it encompasses all types of employment, including casual day labor, part-time work, and irregular/informal work."

4. How many rooms does the household occupy?
    A. One
    B. Two
    C. Three
    D. Four
    E. Five or more

The *Final Report* does not offer any guidelines related to this indicator.

5. Does the household have a wash basin?
    A. No
    B. Yes

The *Final Report* does not offer any guidelines related to this indicator.

6. Does the household have a clothes-washing machine?
    A. No
    B. Yes

The *Final Report* does not offer any guidelines related to this indicator.

7. Does the household have an oven for bread (electric or gas), a stand-alone oven (electric or gas), or a stove/oven combo (electric or non-electric)?
   A. No
   B. Only bread
   C. Only stand-alone
   D. Only bread and stand-alone
   E. Stove/oven combo (regardless of others)

The *Final Report* does not offer any guidelines related to this indicator.

After asking about the possession of each of the three types of stoves, record the response as follows:

Does the household have an oven . . . ?			Response option
For bread	Stand-alone	Oven/stove combo	
No	No	No	A
Yes	No	No	B
No	Yes	No	C
Yes	Yes	No	D
No	No	Yes	E
Yes	No	Yes	E
No	Yes	Yes	E
Yes	Yes	Yes	E

8. Does the household have a refrigerator or freezer?
    A. No
    B. Yes

The *Final Report* does not offer any guidelines related to this indicator.

9. Does the household have a black-and-white TV, color TV, and a satellite dish?
   A. No TV (regardless of satellite dish)
   B. Black-and-white TV (regardless of color TV or dish)
   C. Only color TV
   D. Color TV with dish (without black-and-white TV)

The *Final Report* does not offer any guidelines related to this indicator.

After asking about the possession of each of the three items, record the response as follows:

Does the household have a . . . ?			Response option
Black-and-white TV	Color TV	Satellite dish	
No	No	No	A
Yes	No	No	B
No	Yes	No	C
Yes	Yes	No	B
No	No	Yes	A
Yes	No	Yes	B
No	Yes	Yes	D
Yes	Yes	Yes	B

10. Does your household have a bicycle, motorcycle, or other motor vehicle used for transport?
    A. No
    B. Yes

The *Final Report* does not offer any guidelines related to this indicator.

Figure 1: Poverty lines and poverty rates for all of Morocco and for urban/rural, by poverty line, and by household-level/person-level

			Poverty rates (% with expenditure less than a poverty line) and poverty lines (MAD/person/day)							
			National line			USAID	Intl. 2005 PPP			
	Level	n	100%	150%	200%	'Extreme'	$1.25	$2.50	$3.75	$5.00
Poverty lines:										
Urban	People	4,266	10.50	15.76	21.01	9.13	7.47	14.94	22.42	29.89
Rural	People	2,796	9.78	14.67	19.56	7.81	6.96	13.91	20.87	27.82
All Morocco	People	7,062	10.19	15.28	20.38	8.55	7.25	14.50	21.74	28.99
Poverty Rates:										
Urban	Households	4,266	3.5	14.0	28.4	1.8	0.8	11.7	31.8	50.1
	People	—	4.8	17.5	34.2	2.4	1.0	14.9	38.0	57.7
Rural	Households	2,796	11.5	32.3	51.5	5.8	3.8	28.9	55.7	73.0
	People	—	14.4	38.0	58.3	7.1	4.5	33.9	62.3	78.8
All Morocco	Households	7,062	6.5	20.9	37.1	3.3	1.9	18.2	40.8	58.7
	People	—	8.9	26.4	44.7	4.4	2.6	23.1	48.6	66.9
Construction and calibration										
Selecting indicators and points, and associating scores with likelihoods	Households	3,544	6.6	20.9	37.0	3.3	1.9	18.2	40.7	58.5
	People	—	9.1	26.7	44.8	4.5	2.6	23.4	48.7	66.9
Validation										
Measuring accuracy	Households	3,518	6.5	20.8	37.1	3.3	1.9	18.2	40.9	59.0
	People	—	8.8	26.2	44.6	4.4	2.6	22.9	48.5	66.9

Source: 2007 ENNVM. Poverty lines in average prices for all of Morocco from December 2006 to November 2007.

Figure 2: Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
1,400	Do you have a bathroom and a traditional place for bathing, bathtub, shower, or wash basin? (No bathroom (regardless of others); Bathroom, but without any of the others; Bathroom with a bathtub or shower (without wash basin); Bathroom with a wash basin (without bathtub and without shower); Bathroom with wash basin and with bathtub or shower)
1,374	Do you have a bathroom with a shower and wash basin? (No bathroom (regardless of others); Bathroom, but no shower nor wash basin; Bathroom with a wash basin, but no shower, or bathroom with shower, but no wash basin; Bathroom with shower and wash basin)
1,120	Does the household have a wash basin? (No; Yes)
1,025	Does the household have a clothes-washing machine? (No; Yes)
1,013	How many household members 10-years-old or older do not know how to read and write in any language? (Four or more; Two or three; One; None)
997	Does the household have a black-and-white TV, color TV, and a satellite dish? (No TV (regardless of satellite dish); Black-and-white TV (regardless of color TV or dish); Only color TV; Color TV with dish (without black-and-white TV))
988	Does the household have a water heater (gas, electric, or solar)? (No; Yes)
979	Do you have a shower? (No; Yes)
936	In what type of residence does the household live? (Rural house of stone or packed earth; Shack/shed or residence in a shanty town; Rural house of concrete; Traditional house; Modern house, Room in an institution, shelter not designed for human habitation, or other; Villa/detached house or flat in a detached house, or an apartment in an apartment building)
917	How many members does the household have? (Eight or more; Seven; Six; Five; Four; One, two, or three)
913	How many household members are 18-years-old or younger? (Five or more; Four; Three; Two; One; None)
897	Does the household have a refrigerator or freezer? (No; Yes)
873	How many household members are 17-years-old or younger? (Four or more; Three; Two; One; None)

Figure 2 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
864	Are any household members covered by health insurance of any type? (No; Yes)
861	Does the household have a satellite dish? (No; Yes)
824	Is the female head/spouse covered by health insurance of any type? (No; No female head/spouse; Yes)
820	How many household members are 16-years-old or younger? (Four or more; Three; Two; One; None)
810	If the residence has water piped in from the public network, is your water meter individual or shared? (The residence does not have water piped in from the public network; Shared; Individual)
797	How many household members are 15-years-old or younger? (Four or more; Three; Two; One; None)
785	Can the female head/spouse read and write in Arabic, French, or some other language? (None, or another language (but not Arabic or French); Only Arabic, or only Arabic and another language (but not French); No female head/spouse; Arabic and French; Only French, French and another language (but not Arabic), or all three)
780	What is the main source of drinking water for the household? (Irrigation canal, or private cistern; Springs, or sub-surface water under sandy river bed; Shared unprotected source; Shared protected source; Free standpipe ; Water vendor, water truck, shared cistern, or other; Fee-based standpipe; Private well; The residence has water piped in from the public network)
761	How many household members are 14-years-old or younger? (Four or more; Three; Two; One; None)
761	If your residence is not connected to piped water from the public network, does your household treat its drinking water? (No; Yes, with bleach, by boiling, with tablets, with lime, or in some other way; The residence has water piped in from the public network)
748	Is the male head/spouse covered by health insurance of any type? (No male head/spouse; No; Yes)
741	Does the residence have water piped in from the public network? (No; Yes)
730	What is the highest educational level (with or without professional training) that the male head/spouse has completed? (No male head/spouse; None, pre-school or religious instruction, or primary (without professional training); M'sid or Koranic school, primary (with professional training), or middle school (without professional training); Middle school (with professional training), or higher)

Figure 2 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
723	What is the highest educational level (with or without professional training) that the female head/spouse has completed? (None; Pre-school or religious instruction, m'sid or Koranic school, or primary (without professional training); Primary (with professional training), or middle school (without professional training); No female head/spouse; Middle school (with professional training), or high school (without professional training); High school (with professional training), or higher)
715	How do you dispose of waste water? (Drained onto the ground; Cesspool or pit, or other; Septic tank; Sewer)
700	How many household members ages 7 to 17 currently go to school or to another educational institution or did so at some point in the past 12 months? (None; All, and all with public schools; There are no members ages 7 to 17; All, and at least one with a private school)
694	How many household members ages 7 to 13 currently go to school or to another educational institution or did so at some point in the past 12 months? (None; All, and all with public schools; There are no members ages 7 to 13; All, and at least one with a private school)
693	What is the main occupation of the male head/spouse? (No male head/spouse; Workers in agriculture an fishing (including skilled workers), studied for a occupation, but has not worked in it (nor in any other profession) yet, or non-agricultural day laborers and elementary occupations; Does not work; Craft and related trades workers (excluding those in agriculture); Retail an wholesale workers and those in financial services, plant and machine operators and assemblers, or salaried employees; Self-employed workers in agriculture, fishing, forestry, hunting, and similar workers; Legislators, local elected officials, managers in the government bureaucracy, and senior officials and managers of businesses, and professionals and intellectuals, or technicians and associated professionals)
692	Does the household have an oven for bread (electric or gas), a stand-alone oven (electric or gas), or a stove/oven combo (electric or non-electric)? (No; Only bread; Only stand-alone; Only bread and stand-alone; Stove/oven combo (regardless of others))
687	How many household members are 13-years-old or younger? (Three or more; Two; One; None)

Figure 2 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
678	How many household members ages 7 to 18 currently go to school or to another educational institution or did so at some point in the past 12 months? (None; All, and all with public schools; There are no members ages 7 to 18; All, and at least one with a private school)
674	How many household members ages 7 to 15 currently go to school or to another educational institution or did so at some point in the past 12 months? (None; All, and all with public schools; There are no members ages 7 to 15; All, and at least one with a private school)
670	How many household members ages 7 to 12 currently go to school or to another educational institution or did so at some point in the past 12 months? (None; All, and all with public schools; There are no members ages 7 to 12; All, and at least one with a private school)
664	How many household members are 12-years-old or younger? (Three or more; Two; One; None)
661	How many household members ages 7 to 16 currently go to school or to another educational institution or did so at some point in the past 12 months? (None; All, and all with public schools; There are no members ages 7 to 16; All, and at least one with a private school)
659	Does the household have a food processor? (No; Yes)
647	How many household members ages 7 to 14 currently go to school or to another educational institution or did so at some point in the past 12 months? (None; All, and all with public schools; There are no members ages 7 to 14; All, and at least one with a private school)
641	How many household members are 11-years-old or younger? (Three or more; Two; One; None)
632	Does the household have a color TV? No; Yes)
631	How does the household dispose of its garbage? (Thrown on the ground, or other; Picked up by the garbage truck of the municipality; Public dumpster)
621	Can the female head/spouse read and write in at least one language? (No; No female head/spouse; Yes)
610	How many household members are currently working in agriculture or fishing (including skilled workers) or as non-agricultural day laborers or in elementary occupations? (Three or more; Two; One; None)
609	Does the household have a land-line telephone? (No; Yes)

Figure 2 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
583	Can the male head/spouse read and write in Arabic, French, or some other language? (No male head/spouse; None; Only Arabic, Arabic and French, Arabic and another language (but not French), or another language (but not Arabic or French); Only French, French and another language (but not Arabic), or all three)
570	How many household members ages 7 to 11 currently go to school or to another educational institution or did so at some point in the past 12 months? (None; All, and all with public schools; There are no members ages 7 to 11; All, and at least one with a private school)
565	Do all household members ages 7 to 17 currently go to school or to another educational institution or did they do so at some point in the past 12 months? (No; Yes; There are no members ages 7 to 17)
550	Do all household members ages 7 to 18 currently go to school or to another educational institution or did they do so at some point in the past 12 months? (No; Yes; There are no members ages 7 to 18)
545	What is the sector of economic activity in the place where the male head/spouse works now? (Agriculture, forestry and fishing, or unemployed people looking for their first job; Construction and infrastructure; Social services offered to the general public (education, health care, social work, collective action), or other services; Trade; No male head/spouse; Does not work; Logistics, storage, and communications; Manufacturing and crafts; Repairs, or administration)
541	Do you burn wood, or crop residue or animal dung as a fuel in your residence? (No; Yes)
512	Does your residence have electricity? (No; Yes, without a meter; Yes, with a shared meter; Yes, with a private meter)
506	Does the household have an oven (stand-alone or with a stove) and an oven for bread? (None; Only oven for bread; Only oven (stand-alone or with stove); Both types)
504	Do all household members ages 7 to 16 currently go to school or to another educational institution or did they do so at some point in the past 12 months? (No; Yes; There are no members ages 7 to 16)

Figure 2 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
496	Do all household members ages 7 to 15 currently go to school or to another educational institution or did they do so at some point in the past 12 months? (No; Yes; There are no members ages 7 to 15)
468	How many household members can read and write in some language other than Arabic or French? (None; One; Two or more)
466	Do all household members ages 7 to 13 currently go to school or to another educational institution or did they do so at some point in the past 12 months? (No; Yes; There are no members ages 7 to 13)
460	How many household members are currently working in a place where the main sector of economic activity is agriculture, forestry, or fishing? (Four or more; Three; Two; One; None)
444	How many household members are 6-years-old or younger? (Two or more; One; None)
443	Does your household have a bicycle, motorcycle, or other motor vehicle used for transport? (No ; Yes)
443	Do all household members ages 7 to 14 currently go to school or to another educational institution or did they do so at some point in the past 12 months? (No; Yes; There are no members ages 7 to 14)
439	Does the household have a personal computer? (No; Yes)
434	What is the main occupation of the female head/spouse? (Self-employed workers in agriculture, fishing, forestry, hunting, and similar workers; Workers in agriculture an fishing (including skilled workers); Non-agricultural day laborers and elementary occupations; Does not work; Retail an wholesale workers and those in financial services, craft and related trades workers (excluding those in agriculture), plant and machine operators and assemblers, or studied for a occupation, but has not worked in it (nor in any other profession) yet; No female head/spouse; Legislators, local elected officials, managers in the government bureaucracy, and senior officials and managers of businesses, and professionals and intellectuals, technicians and associated professionals, or salaried employees)
429	How many household members are currently working in agriculture or fishing (including skilled workers)? (Two or more; One; None)

Figure 2 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
425	Are any household members currently working as salaried employees, technicians and associated professionals, legislators, local elected officials, managers in the government bureaucracy, and senior officials and managers of businesses, and professionals and intellectuals? (No; Yes)
425	What is the sector of economic activity in the place where the female head/spouse works now? (Agriculture, forestry and fishing; Social services offered to the general public (education, health care, social work, collective action), or other services; Does not work, or unemployed people looking for their first job; Manufacturing and crafts, construction and infrastructure, or trade; No female head/spouse; Logistics, storage, and communications, repairs, or administration)
425	Do all household members ages 7 to 12 currently go to school or to another educational institution or did they do so at some point in the past 12 months? (No; Yes; There are no members ages 7 to 12)
411	Do you have a bathtub? (No; Yes)
386	Do you use crop residue or animal dung as a fuel? (Yes, only crop residue; No; Yes, both; Yes, only animal dung)
377	Do you have a bathroom? (No; Yes)
374	Can the male head/spouse read and write in at least one language? (No; No male head/spouse; Yes)
365	Do you use candles for lighting? (Yes, frequently; Yes, infrequently; No)
359	Do all household members ages 7 to 11 currently go to school or to another educational institution or did they do so at some point in the past 12 months? (No; Yes; There are no members ages 7 to 11)
345	Does the household have a stove with oven (electric or non-electric)? (No; Yes)
337	Does the household have a land-line or cellular telephone? (No; Yes)
313	How many household members are currently working in a place where the main sector of economic activity is administration? (No; Yes)
313	Does the household have a vacuum cleaner? (No; Yes)
302	Does the household have a VCR? (No; Yes)

Figure 2 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
283	What is your tenancy status in your residence? (Owner or co-owner, or other; Rent-free housing; Renter, renter with *pas de porte*, mortgaged with or without rental, or housing provided by employer; Inherited the property)
260	If the household has any agricultural land, or if any household member, over the past 12 months, worked as a self-employed person in agriculture, then does the household currently have any sheep, goats, or kids? (Yes; The household has agricultural land, or someone was self-employed in agriculture, but the household does not have any sheep, goats, or kids; There is no agricultural land nor anyone who was self-employed in agriculture)
257	If the household has any agricultural land, or if any household member, over the past 12 months, worked as a self-employed person in agriculture, then does the household currently have any cattle, sheep, camels, horses, mules, or donkeys? (Yes; The household has agricultural land, or someone was self-employed in agriculture, but the household does not have any cattle, sheep, camels, horses, mules, or donkeys; There is no agricultural land nor anyone who was self-employed in agriculture)
248	How many household members are currently working, but not as salaried employees? (Four or more; Three; Two; One; None)
243	Do you burn wood in your residence? (Yes, frequently; Yes, infrequently; No)
243	How many household members are currently working? (None; One or two; Three or more)
242	If the household has any agricultural land, or if any household member, over the past 12 months, worked as a self-employed person in agriculture, then does the household currently have any sheep? (Yes; The household has agricultural land, or someone was self-employed in agriculture, but the household does not have any sheep; There is no agricultural land nor anyone who was self-employed in agriculture)
241	Does the household have a cellular telephone? (No; Yes)
234	Does the household have a radio, Walkman, transistor radio, radio-cassette player, hi-fi stereo system, record player, or CD player? (None; Only radio, Walkman, or a transistor radio; Radio-cassette player (regardless of radio, Walkman, or a transistor radio, and without hi-fi stereo system, record player, or CD player); Hi-fi stereo system, record player, or CD player (regardless of others))

Figure 2 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
231	If the household has any agricultural land, or if any household member, over the past 12 months, worked as a self-employed person in agriculture, then does the household currently have any camels, horses, mules, or donkeys? (Yes; The household has agricultural land, or someone was self-employed in agriculture, but the household does not have any camels, horses, mules, or donkeys; There is no agricultural land nor anyone who was self-employed in agriculture)
231	What is the employment status of the female head/spouse? (Domestic servant, unpaid worker in a family business, apprentice, member of a cooperative, or other; Self-employed; Does not work; Unemployed, and has never been employed; Salaried, or employer; No female head/spouse)
223	Does the household have an air conditioner or a fan? (No; Yes)
222	If the household has any agricultural land, or if any household member, over the past 12 months, worked as a self-employed person in agriculture, then does the household currently have any goats and kids? (Yes; The household has agricultural land, or someone was self-employed in agriculture, but the household does not have any goats or kids; There is no agricultural land nor anyone who was self-employed in agriculture)
218	If the household has any agricultural land, or if any household member, over the past 12 months, worked as a self-employed person in agriculture, then does the household currently have any chickens, ducks, turkeys, pigeons, other fowl, rabbits, or bees? (Yes; The household has agricultural land, or someone was self-employed in agriculture, but the household does not have any chickens, ducks, turkeys, pigeons, other fowl, rabbits, or bees; There is no agricultural land nor anyone who was self-employed in agriculture)
217	If the household has any agricultural land, or if any household member, over the past 12 months, worked as a self-employed person in agriculture, then does the household have any irrigated agricultural land? (Someone was self-employed in agriculture, but the household does not own any agricultural land, or someone was self-employed in agriculture, and the household owns agricultural land, but none of it is irrigated; Yes; There is no agricultural land nor anyone who was self-employed in agriculture)

Figure 2 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
214	If the household has any agricultural land, or if any household member, over the past 12 months, worked as a self-employed person in agriculture, then does the household currently have any cattle? (Yes; The household has agricultural land, or someone was self-employed in agriculture, but the household does not have any cattle; There is no agricultural land nor anyone who was self-employed in agriculture)
212	Does the household have any agricultural land, or did any household member, over the past 12 months, work as a self-employed person in agriculture? (Yes; No)
212	If the household has any agricultural land, or if any household member, over the past 12 months, worked as a self-employed person in agriculture, then does the household have any agricultural land? (Yes, or someone was self-employed in agriculture, but the household does not own any agricultural land; There is no agricultural land nor anyone who was self-employed in agriculture)
209	Does the household have a black-and-white TV? (Yes; No)
209	How many household members are currently unpaid workers in a family business? (Two or more; One; None)
207	Does the household currently have any cattle, camels, horses, mules, or donkeys? (Yes; No)
200	How many household members are currently working but not as self-employed workers in agriculture, fishing, forestry, hunting, and similar workers nor in agriculture or fishing (including skilled workers) or as non-agricultural day laborers or in elementary occupations? (None; One; Two or more)
198	How many household members are currently working but not as self-employed workers in agriculture, fishing, forestry, hunting, and similar workers nor in agriculture or fishing (including skilled workers) or as non-agricultural day laborers or in elementary occupations? (Two or more; One; None)
184	Does the household have a microwave oven? (No; Yes)
172	How many household members can read and write in French? (None; One; Two; Three; Four or more)
169	Does the household have a space heater (gas, kerosene or electric)? (No; Yes)
158	Does the household have a video camera? (No; Yes)

Figure 2 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
157	Do you have a kitchen? (No; Yes)
144	Does the household have a stand-alone oven (electric or gas)? (No; Yes)
142	Do any household members ages 7 to 18 currently go to private school? (No; Yes)
137	Are any household members currently self-employed? (Yes; No)
133	How many rooms does your household occupy? (One; Two; Three; Four; Five or more)
132	What is the employment status of the male head/spouse? (Self-employed, or unemployed, and has never been employed; Salaried; No male head/spouse; Does not work; Employer, domestic servant, unpaid worker in a family business, apprentice, member of a cooperative, or other)
127	Does the household have a gas oven for bread (electric or gas)? (No; Yes)
125	Are any household members currently working in a place where the main sector of economic activity is construction and infrastructure projects? (Yes; No)
118	How many household members are currently working in a place where the main sector of economic activity is not agriculture, forestry, or fishing? (None; One; Two; Three or more)
103	How many household members are currently working as non-agricultural day laborers or in elementary occupations? (Yes; No)
101	Are any household members currently working in a place where the main sector of economic activity is administration or social services offered to the general public (education, health care, social work, collective action), or other services? (No; Yes)
82	Is the female head/spouse currently working? (Yes; No; No female head/spouse)
74	Does the household have a sewing machine (electric or pedal-powered) or a knitting machine? (No; Yes)
62	What is the marital status of the female head/spouse? (Married, or divorced; Widow; Never-married, or no female head/spouse)
61	How many household members can read and write in Arabic? (None; One; Two; Three; Four; Five or more)

Figure 2 (cont.): Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those most strongly linked with higher poverty likelihoods)
54	What is the structure of household headship? (Both male and female heads/spouses; Female head/spouse only; Male head/spouse only)
48	What is the marital status of the male head/spouse? (Married; No male head/spouse; Never-married, divorced, or widower)
48	How many household members can read and write in some language? (None; One; Two; Three; Four; Five or more)
40	Is the female head/spouse currently unemployed but seeking work? (No; Yes; No female head/spouse)
39	In their current main occupation, how many household members are salaried employees? (None; One; Two or more)
36	Is the male head/spouse currently working? (Yes; No male head/spouse; No)
33	Do you burn charcoal in your residence? (No; Yes, infrequently; Yes, frequently)
14	Does the household live by itself in the residence? (No; Yes)
11	Is the male head/spouse currently unemployed but seeking work? (No; Yes; No male head/spouse)
11	Are any household members currently working in a place where the main sector of economic activity is social services offered to the general public (education, health care, social work, collective action), or other services? (Yes; No)
6	How many household members are currently working in a place where the main sector of economic activity is manufacturing and crafts? (No; Yes)
5	Are any household members currently unemployed and have never held a job? (Yes; No)
2	Do you have a traditional place for bathing? (Yes; No)
2	Does your residence have a well? (Yes; No)
2	Are any household members currently unemployed? (Yes; No)

Source: 2007 ENNVM and 200% of the national poverty line

Tables for
200% of the National Poverty Line

(and Tables Pertaining to All Eight Poverty Lines)

Figure 3 (200% of the national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	95.9
15–19	92.7
20–24	83.8
25–29	76.9
30–34	63.9
35–39	45.0
40–44	32.7
45–49	26.3
50–54	15.5
55–59	9.9
60–64	5.8
65–69	2.1
70–74	0.9
75–79	0.4
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

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

Score	Households at score and < poverty line		All households at score		Poverty likelihood (%)
0–4	0	÷	0	=	100.0
5–9	238	÷	238	=	100.0
10–14	1,415	÷	1,476	=	95.9
15–19	2,661	÷	2,869	=	92.7
20–24	6,672	÷	7,965	=	83.8
25–29	6,383	÷	8,305	=	76.9
30–34	6,263	÷	9,795	=	63.9
35–39	5,531	÷	12,305	=	45.0
40–44	3,928	÷	12,002	=	32.7
45–49	2,597	÷	9,872	=	26.3
50–54	1,411	÷	9,099	=	15.5
55–59	667	÷	6,748	=	9.9
60–64	345	÷	5,962	=	5.8
65–69	99	÷	4,776	=	2.1
70–74	27	÷	2,870	=	0.9
75–79	13	÷	3,398	=	0.4
80–84	0	÷	984	=	0.0
85–89	0	÷	856	=	0.0
90–94	0	÷	422	=	0.0
95–100	0	÷	60	=	0.0

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

Figure 5 (All poverty lines): Probability that a given household's per-capita consumption falls in a range demarcated by two adjacent poverty lines

	Likelihood (%) of having expenditure in range demarcated by poverty lines								
	<$1.25/day	**≥$1.25/day and <USAID**	**≥USAID and <100% Natl.**	**≥100% Natl. and <$2.50/day**	**≥$2.50/day and <150% Natl.**	**≥150% Natl. and <200% Natl.**	**≥200% Natl. and <$3.75/day**	**≥$3.75/day and <$5.00/day**	**≥$5.00/day**
Score	**<MAD7.25**	**≥MAD7.25 and <MAD8.55**	**≥MAD8.55 and <MAD10.19**	**≥MAD10.19 and <MAD14.50**	**≥MAD14.50 and <MAD15.28**	**≥MAD15.28 and <MAD20.38**	**≥MAD20.38 and <MAD21.74**	**≥MAD21.74 and <MAD28.99**	**≥MAD28.99**
0–4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5–9	38.7	13.1	20.6	20.7	0.6	6.3	0.0	0.0	0.0
10–14	17.9	10.2	15.7	34.0	9.6	8.5	0.6	3.0	0.5
15–19	13.1	9.4	14.4	36.0	4.4	15.5	0.8	4.8	1.6
20–24	7.8	6.7	12.1	31.6	4.7	20.8	4.1	8.4	3.7
25–29	3.6	3.3	7.6	27.4	4.4	30.5	4.8	12.5	5.9
30–34	1.5	1.0	6.1	24.2	5.5	25.6	5.3	18.3	12.4
35–39	0.5	0.9	2.3	12.3	3.4	25.4	6.5	26.4	22.2
40–44	0.1	0.6	1.3	9.2	2.6	19.1	4.6	28.4	34.3
45–49	0.0	0.0	0.5	5.2	2.9	17.7	3.5	27.8	42.3
50–54	0.0	0.0	0.0	1.9	1.4	12.2	4.8	22.4	57.4
55–59	0.0	0.0	0.0	1.1	0.9	7.9	3.0	17.5	69.7
60–64	0.0	0.0	0.0	0.6	0.6	4.6	2.6	15.4	76.2
65–69	0.0	0.0	0.0	0.0	0.0	2.1	0.5	10.6	86.8
70–74	0.0	0.0	0.0	0.0	0.0	0.9	0.0	5.9	93.2
75–79	0.0	0.0	0.0	0.0	0.0	0.4	0.0	2.4	97.2
80–84	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
85–89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
90–94	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
95–100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Figure 6 (200% of the national line): Average differences between estimated and true poverty likelihoods for households from 1,000 bootstraps of n = 16,384 with confidence intervals by score range, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	**Diff.**	**90-percent**	**95-percent**	**99-percent**
0–4	+0.0	0.0	0.0	0.0
5–9	+5.9	5.1	6.5	8.4
10–14	+2.1	2.5	3.0	4.1
15–19	+7.1	2.8	3.3	4.4
20–24	–2.0	1.8	2.0	2.4
25–29	+6.0	2.2	2.5	3.3
30–34	+0.8	2.1	2.5	3.5
35–39	+0.5	2.0	2.4	3.2
40–44	–6.4	4.3	4.4	4.8
45–49	+4.1	1.7	2.1	3.1
50–54	+2.7	1.4	1.7	2.2
55–59	+2.4	1.4	1.6	2.0
60–64	+1.6	1.0	1.2	1.6
65–69	+0.9	0.5	0.6	0.7
70–74	–0.4	0.9	1.0	1.4
75–79	+0.4	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 7 (200% of the national line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.1	65.6	68.8	88.0
4	+1.5	33.6	39.4	50.5
8	+1.1	24.6	28.7	37.2
16	+0.9	16.4	20.7	25.8
32	+0.9	11.6	14.3	18.6
64	+0.8	8.1	10.4	14.0
128	+0.7	6.0	7.5	10.1
256	+0.8	4.2	5.2	7.1
512	+0.8	3.1	3.6	4.6
1,024	+0.8	2.1	2.4	3.1
2,048	+0.8	1.5	1.8	2.3
4,096	+0.8	1.0	1.2	1.6
8,192	+0.8	0.7	0.9	1.1
16,384	+0.8	0.5	0.6	0.8

Figure 8 (All poverty lines): Average differences between estimates and true values for poverty rates of a group of households at a point in time, precision, and the α factor for precision, scorecard applied to the validation sample

	Poverty line							
	National line			USAID	Intl. 2005 PPP			
	100%	**150%**	**200%**	**'Extreme'**	**$1.25**	**$2.50**	**$3.75**	**$5.00**
Estimate minus true value	+0.2	+0.1	+0.8	+0.0	–0.1	–0.0	+0.9	+1.3
Precision of difference	0.3	0.5	0.5	0.2	0.2	0.5	0.5	0.5
α factor for precision	0.87	0.91	0.85	0.93	0.97	0.94	0.84	0.82

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 9 (All poverty lines): Possible targeting outcomes

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

Figure 10 (200% of the national line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	37.1	0.0	62.9	62.9	–100.0
≤9	0.2	36.9	0.0	62.8	63.1	–98.8
≤14	1.6	35.6	0.1	62.7	64.3	–91.1
≤19	4.0	33.1	0.6	62.3	66.3	–76.8
≤24	10.8	26.3	1.7	61.1	72.0	–37.1
≤29	16.6	20.5	4.3	58.6	75.2	+0.8
≤34	22.7	14.5	8.0	54.9	77.6	+43.6
≤39	28.2	8.9	14.8	48.1	76.3	+60.3
≤44	32.6	4.5	22.3	40.5	73.2	+39.9
≤49	34.9	2.2	29.9	32.9	67.8	+19.4
≤54	36.2	1.0	37.7	25.1	61.3	–1.6
≤59	36.7	0.4	43.9	18.9	55.7	–18.3
≤64	37.0	0.1	49.6	13.2	50.2	–33.6
≤69	37.1	0.0	54.3	8.6	45.7	–46.2
≤74	37.1	0.0	57.1	5.7	42.9	–53.9
≤79	37.1	0.0	60.5	2.3	39.5	–63.0
≤84	37.1	0.0	61.5	1.3	38.5	–65.7
≤89	37.1	0.0	62.4	0.5	37.6	–68.0
≤94	37.1	0.0	62.8	0.1	37.2	–69.1
≤100	37.1	0.0	62.9	0.0	37.1	–69.3

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

Figure 11 (200% of the national line): Share of all households who are targeted (that is, score at or below the cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.2	91.7	0.6	11.0:1
≤14	1.7	92.5	4.3	12.4:1
≤19	4.6	88.0	10.9	7.3:1
≤24	12.5	86.3	29.2	6.3:1
≤29	20.9	79.6	44.7	3.9:1
≤34	30.6	74.0	61.1	2.9:1
≤39	43.0	65.7	75.9	1.9:1
≤44	55.0	59.4	87.9	1.5:1
≤49	64.8	53.8	94.0	1.2:1
≤54	73.9	48.9	97.4	1.0:1
≤59	80.7	45.5	98.9	0.8:1
≤64	86.6	42.7	99.7	0.7:1
≤69	91.4	40.6	99.9	0.7:1
≤74	94.3	39.4	100.0	0.6:1
≤79	97.7	38.0	100.0	0.6:1
≤84	98.7	37.6	100.0	0.6:1
≤89	99.5	37.3	100.0	0.6:1
≤94	99.9	37.2	100.0	0.6:1
≤100	100.0	37.1	100.0	0.6:1

Tables for

100% of the National Poverty Line

Figure 3 (100% of the national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	72.4
10–14	43.8
15–19	36.9
20–24	26.6
25–29	14.5
30–34	8.6
35–39	3.8
40–44	1.9
45–49	0.5
50–54	0.0
55–59	0.0
60–64	0.0
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (100% of the national line): Average differences between estimated and true poverty likelihoods for households from 1,000 bootstraps of $n = 16{,}384$ with confidence intervals by score range, scorecard applied to the validation sample

	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	+32.0	13.7	16.2	20.8
10–14	–11.7	8.6	9.0	10.2
15–19	+7.3	3.5	4.3	5.8
20–24	+2.2	2.0	2.4	3.1
25–29	+0.3	1.7	2.0	2.6
30–34	+0.1	1.2	1.5	2.0
35–39	–0.7	0.8	0.9	1.2
40–44	+0.9	0.4	0.4	0.5
45–49	–0.3	0.4	0.4	0.6
50–54	–0.7	0.6	0.6	0.7
55–59	+0.0	0.0	0.0	0.0
60–64	+0.0	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 7 (100% of the national line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.1	50.0	61.2	70.0
4	+0.5	18.2	22.3	31.6
8	+0.3	12.5	16.0	21.9
16	+0.4	9.3	11.0	14.1
32	+0.3	6.3	7.6	10.1
64	+0.3	4.5	5.2	6.9
128	+0.2	3.1	3.7	4.9
256	+0.3	2.3	2.7	3.6
512	+0.2	1.6	2.0	2.5
1,024	+0.2	1.1	1.3	1.7
2,048	+0.2	0.8	1.0	1.2
4,096	+0.2	0.6	0.7	0.9
8,192	+0.2	0.4	0.5	0.6
16,384	+0.2	0.3	0.3	0.4

Figure 10 (100% of the national line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	6.5	0.0	93.5	93.5	–100.0
≤9	0.1	6.4	0.2	93.4	93.5	–95.0
≤14	0.9	5.6	0.9	92.7	93.5	–60.4
≤19	1.7	4.8	2.9	90.6	92.3	–2.9
≤24	3.7	2.8	8.9	84.6	88.3	–37.3
≤29	4.9	1.6	16.0	77.6	82.4	–146.4
≤34	5.7	0.8	25.0	68.5	74.2	–285.7
≤39	6.2	0.3	36.7	56.8	63.0	–467.1
≤44	6.3	0.1	48.6	44.9	51.2	–650.3
≤49	6.4	0.1	58.4	35.1	41.5	–801.4
≤54	6.5	0.0	67.4	26.1	32.6	–940.8
≤59	6.5	0.0	74.2	19.3	25.8	–1,044.9
≤64	6.5	0.0	80.2	13.4	19.8	–1,136.9
≤69	6.5	0.0	84.9	8.6	15.1	–1,210.6
≤74	6.5	0.0	87.8	5.7	12.2	–1,254.9
≤79	6.5	0.0	91.2	2.3	8.8	–1,307.4
≤84	6.5	0.0	92.2	1.3	7.8	–1,322.5
≤89	6.5	0.0	93.0	0.5	7.0	–1,335.8
≤94	6.5	0.0	93.5	0.1	6.5	–1,342.3
≤100	6.5	0.0	93.5	0.0	6.5	–1,343.2

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

Figure 11 (100% of the national line): Share of all households who are targeted (that is, score at or below the cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	36.6	0.0	0.6:1
≤9	0.2	36.6	1.3	0.6:1
≤14	1.7	49.7	13.2	1.0:1
≤19	4.6	37.2	26.3	0.6:1
≤24	12.5	29.1	56.3	0.4:1
≤29	20.9	23.4	75.4	0.3:1
≤34	30.6	18.5	87.3	0.2:1
≤39	43.0	14.4	95.7	0.2:1
≤44	55.0	11.5	97.7	0.1:1
≤49	64.8	9.9	99.0	0.1:1
≤54	73.9	8.8	100.0	0.1:1
≤59	80.7	8.0	100.0	0.1:1
≤64	86.6	7.5	100.0	0.1:1
≤69	91.4	7.1	100.0	0.1:1
≤74	94.3	6.9	100.0	0.1:1
≤79	97.7	6.6	100.0	0.1:1
≤84	98.7	6.6	100.0	0.1:1
≤89	99.5	6.5	100.0	0.1:1
≤94	99.9	6.5	100.0	0.1:1
≤100	100.0	6.5	100.0	0.1:1

Tables for

150% of the National Poverty Line

Figure 3 (150% of the national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	93.7
10–14	87.3
15–19	77.3
20–24	62.9
25–29	46.3
30–34	38.3
35–39	19.5
40–44	13.7
45–49	8.7
50–54	3.4
55–59	2.0
60–64	1.2
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 (150% of the national line): Average differences between estimated and true poverty likelihoods for households from 1,000 bootstraps of $n = 16{,}384$ with confidence intervals by score range, scorecard applied to the validation sample

	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	+7.5	8.3	10.3	12.9
10–14	+5.5	4.0	4.9	6.1
15–19	+10.2	3.6	4.2	5.6
20–24	+0.4	2.3	2.7	3.4
25–29	–0.5	2.4	2.9	3.9
30–34	–0.5	2.2	2.6	3.6
35–39	+2.4	1.4	1.7	2.2
40–44	–4.9	3.4	3.6	4.1
45–49	+2.8	1.0	1.1	1.5
50–54	–1.9	1.4	1.6	1.8
55–59	+0.4	0.6	0.7	0.9
60–64	+1.2	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 7 (150% of the national line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.6	63.4	74.6	84.3
4	+1.3	29.8	36.5	51.9
8	+0.9	21.8	26.4	36.9
16	+0.4	15.6	19.3	26.2
32	+0.3	10.7	12.6	16.5
64	+0.2	7.7	9.2	11.6
128	+0.2	5.7	6.7	8.8
256	+0.1	3.9	4.8	6.2
512	+0.1	2.7	3.2	4.3
1,024	+0.2	1.8	2.2	3.0
2,048	+0.1	1.3	1.6	2.0
4,096	+0.1	0.9	1.1	1.5
8,192	+0.1	0.7	0.8	1.1
16,384	+0.1	0.5	0.6	0.8

Figure 10 (150% of the national line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	20.8	0.0	79.2	79.2	–100.0
≤9	0.2	20.6	0.0	79.1	79.3	–97.9
≤14	1.4	19.5	0.4	78.8	80.2	–85.3
≤19	3.3	17.5	1.3	77.9	81.2	–62.2
≤24	8.2	12.6	4.3	74.9	83.1	–0.2
≤29	11.9	8.9	8.9	70.2	82.2	+57.2
≤34	15.6	5.2	15.0	64.1	79.7	+27.8
≤39	17.8	3.1	25.2	54.0	71.8	–20.7
≤44	19.6	1.3	35.4	43.8	63.4	–69.7
≤49	20.2	0.6	44.6	34.6	54.8	–114.0
≤54	20.7	0.1	53.2	26.0	46.7	–155.2
≤59	20.8	0.0	59.8	19.3	40.2	–187.0
≤64	20.8	0.0	65.8	13.4	34.2	–215.6
≤69	20.8	0.0	70.6	8.6	29.4	–238.6
≤74	20.8	0.0	73.4	5.7	26.6	–252.3
≤79	20.8	0.0	76.8	2.3	23.2	–268.6
≤84	20.8	0.0	77.8	1.3	22.2	–273.3
≤89	20.8	0.0	78.7	0.5	21.3	–277.4
≤94	20.8	0.0	79.1	0.1	20.9	–279.5
≤100	20.8	0.0	79.2	0.0	20.8	–279.8

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

Figure 11 (150% of the national line): Share of all households who are targeted (that is, score at or below the cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.2	82.1	0.9	4.6:1
≤14	1.7	79.3	6.5	3.8:1
≤19	4.6	71.9	15.8	2.6:1
≤24	12.5	65.7	39.6	1.9:1
≤29	20.9	57.2	57.3	1.3:1
≤34	30.6	50.9	74.8	1.0:1
≤39	43.0	41.4	85.3	0.7:1
≤44	55.0	35.6	94.0	0.6:1
≤49	64.8	31.2	97.1	0.5:1
≤54	73.9	28.0	99.4	0.4:1
≤59	80.7	25.8	100.0	0.3:1
≤64	86.6	24.1	100.0	0.3:1
≤69	91.4	22.8	100.0	0.3:1
≤74	94.3	22.1	100.0	0.3:1
≤79	97.7	21.3	100.0	0.3:1
≤84	98.7	21.1	100.0	0.3:1
≤89	99.5	20.9	100.0	0.3:1
≤94	99.9	20.9	100.0	0.3:1
≤100	100.0	20.8	100.0	0.3:1

Tables for

the USAID "Extreme" Poverty Line

Figure 3 (USAID "extreme" line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	51.8
10–14	28.0
15–19	22.5
20–24	14.5
25–29	6.9
30–34	2.5
35–39	1.5
40–44	0.6
45–49	0.0
50–54	0.0
55–59	0.0
60–64	0.0
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (USAID "extreme" line): Average differences between estimated and true poverty likelihoods for households from 1,000 bootstraps of $n = 16{,}384$ with confidence intervals by score range, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	**Diff.**	**90-percent**	**95-percent**	**99-percent**
0–4	+0.0	0.0	0.0	0.0
5–9	+29.2	11.4	13.6	18.3
10–14	–10.6	8.2	8.7	9.6
15–19	+9.8	2.5	3.0	4.1
20–24	+2.5	1.5	1.7	2.3
25–29	–0.4	1.3	1.5	2.0
30–34	–2.5	1.8	1.9	2.0
35–39	–0.3	0.5	0.6	0.8
40–44	+0.4	0.1	0.2	0.2
45–49	–0.6	0.5	0.5	0.6
50–54	–0.3	0.2	0.3	0.3
55–59	+0.0	0.0	0.0	0.0
60–64	+0.0	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 7 (USAID "extreme" line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.3	7.3	50.0	63.0
4	–0.1	15.1	18.0	23.7
8	–0.0	9.3	11.3	17.5
16	+0.0	6.4	8.1	11.1
32	–0.1	4.8	5.5	8.1
64	+0.0	3.5	4.0	5.4
128	+0.0	2.5	2.9	4.1
256	+0.1	1.7	2.1	2.6
512	+0.0	1.2	1.4	1.9
1,024	+0.1	0.9	1.0	1.3
2,048	+0.0	0.6	0.7	0.9
4,096	+0.0	0.4	0.5	0.7
8,192	+0.0	0.3	0.4	0.5
16,384	+0.0	0.2	0.3	0.3

Figure 10 (USAID "extreme" line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	3.3	0.0	96.7	96.7	–100.0
≤9	0.1	3.2	0.2	96.5	96.6	–91.1
≤14	0.6	2.7	1.1	95.6	96.2	–30.1
≤19	1.0	2.3	3.6	93.1	94.1	–9.4
≤24	1.9	1.4	10.6	86.1	88.0	–222.6
≤29	2.5	0.8	18.3	78.4	80.9	–457.2
≤34	2.9	0.4	27.7	69.0	71.9	–742.2
≤39	3.2	0.1	39.8	56.9	60.1	–1,108.8
≤44	3.2	0.1	51.8	45.0	48.2	–1,472.6
≤49	3.3	0.0	61.6	35.1	38.4	–1,770.8
≤54	3.3	0.0	70.6	26.1	29.4	–2,046.5
≤59	3.3	0.0	77.4	19.3	22.6	–2,251.5
≤64	3.3	0.0	83.3	13.4	16.7	–2,432.7
≤69	3.3	0.0	88.1	8.6	11.9	–2,577.8
≤74	3.3	0.0	91.0	5.7	9.0	–2,665.0
≤79	3.3	0.0	94.4	2.3	5.6	–2,768.3
≤84	3.3	0.0	95.4	1.3	4.6	–2,798.2
≤89	3.3	0.0	96.2	0.5	3.8	–2,824.2
≤94	3.3	0.0	96.6	0.1	3.4	–2,837.0
≤100	3.3	0.0	96.7	0.0	3.3	–2,838.8

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

Figure 11 (USAID "extreme" line): Share of all households who are targeted (that is, score at or below the cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.2	22.3	1.6	0.3:1
≤14	1.7	34.2	17.8	0.5:1
≤19	4.6	21.5	29.9	0.3:1
≤24	12.5	15.4	58.8	0.2:1
≤29	20.9	12.1	76.5	0.1:1
≤34	30.6	9.6	89.2	0.1:1
≤39	43.0	7.4	96.5	0.1:1
≤44	55.0	5.8	97.4	0.1:1
≤49	64.8	5.0	99.1	0.1:1
≤54	73.9	4.5	100.0	0.0:1
≤59	80.7	4.1	100.0	0.0:1
≤64	86.6	3.8	100.0	0.0:1
≤69	91.4	3.6	100.0	0.0:1
≤74	94.3	3.5	100.0	0.0:1
≤79	97.7	3.4	100.0	0.0:1
≤84	98.7	3.3	100.0	0.0:1
≤89	99.5	3.3	100.0	0.0:1
≤94	99.9	3.3	100.0	0.0:1
≤100	100.0	3.3	100.0	0.0:1

Tables for

the $1.25/day 2005 PPP Poverty Line

Figure 3 ($1.25/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	38.7
10–14	17.9
15–19	13.1
20–24	7.8
25–29	3.6
30–34	1.5
35–39	0.5
40–44	0.1
45–49	0.0
50–54	0.0
55–59	0.0
60–64	0.0
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($1.25/day line): Average differences between estimated and true poverty likelihoods for households from 1,000 bootstraps of n = 16,384 with confidence intervals by score range, scorecard applied to the validation sample

	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	+16.1	11.4	13.6	18.3
10–14	–0.3	4.2	4.8	6.4
15–19	+4.7	2.1	2.5	3.5
20–24	+1.0	1.2	1.4	1.8
25–29	–1.2	1.1	1.3	1.6
30–34	–1.8	1.3	1.4	1.6
35–39	–0.4	0.4	0.4	0.5
40–44	+0.1	0.0	0.0	0.0
45–49	+0.0	0.0	0.0	0.0
50–54	–0.3	0.2	0.3	0.3
55–59	+0.0	0.0	0.0	0.0
60–64	+0.0	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 7 ($1.25/day line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.3	3.9	6.6	56.1
4	–0.2	11.9	15.8	21.2
8	–0.1	7.8	9.8	14.3
16	+0.1	4.9	6.0	8.9
32	–0.1	3.5	4.4	5.7
64	–0.1	2.5	3.1	4.4
128	–0.1	1.9	2.2	2.9
256	–0.0	1.3	1.6	2.1
512	–0.1	0.9	1.1	1.5
1,024	–0.1	0.7	0.8	1.0
2,048	–0.1	0.5	0.6	0.7
4,096	–0.1	0.3	0.4	0.5
8,192	–0.1	0.2	0.3	0.4
16,384	–0.1	0.2	0.2	0.3

Figure 10 ($1.25/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	1.9	0.0	98.1	98.1	–100.0
≤9	0.1	1.9	0.2	97.9	98.0	–84.7
≤14	0.3	1.6	1.4	96.7	97.1	+7.9
≤19	0.6	1.3	4.0	94.1	94.7	–108.1
≤24	1.2	0.8	11.4	86.7	87.9	–496.4
≤29	1.5	0.4	19.3	78.8	80.3	–912.2
≤34	1.8	0.1	28.9	69.2	71.0	–1,411.7
≤39	1.9	0.0	41.1	57.0	58.9	–2,049.9
≤44	1.9	0.0	53.1	45.0	46.9	–2,678.2
≤49	1.9	0.0	62.9	35.1	37.0	–3,195.0
≤54	1.9	0.0	72.0	26.1	28.0	–3,669.8
≤59	1.9	0.0	78.8	19.3	21.2	–4,023.0
≤64	1.9	0.0	84.7	13.4	15.3	–4,335.1
≤69	1.9	0.0	89.5	8.6	10.5	–4,585.1
≤74	1.9	0.0	92.4	5.7	7.6	–4,735.3
≤79	1.9	0.0	95.8	2.3	4.2	–4,913.2
≤84	1.9	0.0	96.8	1.3	3.2	–4,964.7
≤89	1.9	0.0	97.6	0.5	2.4	–5,009.5
≤94	1.9	0.0	98.0	0.1	2.0	–5,031.6
≤100	1.9	0.0	98.1	0.0	1.9	–5,034.7

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

Figure 11 ($1.25/day line): Share of all households who are targeted (that is, score at or below the cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.2	22.3	2.8	0.3:1
≤14	1.7	20.3	18.2	0.3:1
≤19	4.6	13.3	31.8	0.2:1
≤24	12.5	9.2	60.5	0.1:1
≤29	20.9	7.3	79.4	0.1:1
≤34	30.6	5.8	92.6	0.1:1
≤39	43.0	4.4	98.5	0.0:1
≤44	55.0	3.4	98.5	0.0:1
≤49	64.8	2.9	98.5	0.0:1
≤54	73.9	2.6	100.0	0.0:1
≤59	80.7	2.4	100.0	0.0:1
≤64	86.6	2.2	100.0	0.0:1
≤69	91.4	2.1	100.0	0.0:1
≤74	94.3	2.0	100.0	0.0:1
≤79	97.7	2.0	100.0	0.0:1
≤84	98.7	1.9	100.0	0.0:1
≤89	99.5	1.9	100.0	0.0:1
≤94	99.9	1.9	100.0	0.0:1
≤100	100.0	1.9	100.0	0.0:1

Tables for

the $2.50/Day 2005 PPP Poverty Line

Figure 3 ($2.50/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	93.0
10–14	77.7
15–19	72.9
20–24	58.2
25–29	42.0
30–34	32.8
35–39	16.1
40–44	11.1
45–49	5.7
50–54	1.9
55–59	1.1
60–64	0.6
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 line): Average differences between estimated and true poverty likelihoods for households from 1,000 bootstraps of n = 16,384 with confidence intervals by score range, scorecard applied to the validation sample

	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	+18.5	11.6	13.2	18.1
10–14	–4.1	4.0	4.9	6.1
15–19	+8.6	3.6	4.3	5.9
20–24	+1.3	2.3	2.9	3.6
25–29	+1.7	2.5	3.0	3.8
30–34	–1.6	2.1	2.4	3.5
35–39	+1.4	1.3	1.6	2.0
40–44	–5.0	3.5	3.6	4.1
45–49	+1.4	0.8	1.0	1.3
50–54	–0.6	0.6	0.8	1.0
55–59	+0.9	0.2	0.3	0.3
60–64	+0.6	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 7 ($2.50/day line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.4	58.7	71.1	82.3
4	+1.0	28.3	33.7	50.7
8	+0.5	20.9	24.9	33.8
16	+0.2	15.2	18.1	23.1
32	+0.1	10.3	12.1	16.4
64	+0.1	7.4	9.0	12.1
128	+0.0	5.5	6.6	8.7
256	–0.1	3.8	4.6	6.0
512	–0.0	2.7	3.2	4.3
1,024	+0.0	1.8	2.1	2.9
2,048	–0.0	1.3	1.6	1.9
4,096	–0.1	0.9	1.1	1.5
8,192	–0.0	0.7	0.8	1.0
16,384	–0.0	0.5	0.6	0.7

Figure 10 ($2.50/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	18.2	0.0	81.8	81.8	–100.0
≤9	0.2	18.0	0.1	81.8	81.9	–97.8
≤14	1.3	16.8	0.4	81.5	82.8	–83.2
≤19	3.2	15.0	1.4	80.4	83.6	–57.3
≤24	7.7	10.5	4.8	77.0	84.7	+11.5
≤29	10.8	7.4	10.1	71.8	82.5	+44.5
≤34	14.0	4.1	16.6	65.2	79.3	+8.5
≤39	15.9	2.2	27.0	54.8	70.7	–48.9
≤44	17.4	0.8	37.5	44.3	61.7	–106.8
≤49	17.9	0.3	46.9	34.9	52.8	–158.6
≤54	18.1	0.0	55.8	26.0	44.2	–207.3
≤59	18.2	0.0	62.5	19.3	37.5	–244.3
≤64	18.2	0.0	68.5	13.4	31.5	–277.1
≤69	18.2	0.0	73.3	8.6	26.7	–303.4
≤74	18.2	0.0	76.1	5.7	23.9	–319.2
≤79	18.2	0.0	79.5	2.3	20.5	–338.0
≤84	18.2	0.0	80.5	1.3	19.5	–343.4
≤89	18.2	0.0	81.4	0.5	18.6	–348.1
≤94	18.2	0.0	81.8	0.1	18.2	–350.4
≤100	18.2	0.0	81.8	0.0	18.2	–350.7

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

Figure 11 ($2.50/day line): Share of all households who are targeted (that is, score at or below the cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.2	70.4	0.9	2.4:1
≤14	1.7	77.6	7.3	3.5:1
≤19	4.6	69.0	17.4	2.2:1
≤24	12.5	61.4	42.4	1.6:1
≤29	20.9	51.7	59.4	1.1:1
≤34	30.6	45.8	77.3	0.8:1
≤39	43.0	37.1	87.7	0.6:1
≤44	55.0	31.7	95.9	0.5:1
≤49	64.8	27.6	98.5	0.4:1
≤54	73.9	24.5	99.9	0.3:1
≤59	80.7	22.5	100.0	0.3:1
≤64	86.6	21.0	100.0	0.3:1
≤69	91.4	19.9	100.0	0.2:1
≤74	94.3	19.3	100.0	0.2:1
≤79	97.7	18.6	100.0	0.2:1
≤84	98.7	18.4	100.0	0.2:1
≤89	99.5	18.2	100.0	0.2:1
≤94	99.9	18.2	100.0	0.2:1
≤100	100.0	18.2	100.0	0.2:1

Tables for

the $3.75/Day 2005 PPP Poverty Line

Figure 3 ($3.75/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	96.5
15–19	93.6
20–24	87.9
25–29	81.6
30–34	69.3
35–39	51.4
40–44	37.3
45–49	29.9
50–54	20.3
55–59	12.9
60–64	8.4
65–69	2.6
70–74	0.9
75–79	0.4
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($3.75/day line): Average differences between estimated and true poverty likelihoods for households from 1,000 bootstraps of n = 16,384 with confidence intervals by score range, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	**Diff.**	**90-percent**	**95-percent**	**99-percent**
0–4	+0.0	0.0	0.0	0.0
5–9	+5.9	5.1	6.5	8.4
10–14	+2.7	2.5	3.0	4.1
15–19	+4.6	2.4	2.8	3.8
20–24	–0.8	1.4	1.7	2.1
25–29	+6.4	2.0	2.5	3.3
30–34	+2.1	2.0	2.4	3.3
35–39	+0.6	2.1	2.5	3.2
40–44	–6.6	4.4	4.5	4.9
45–49	+2.1	1.9	2.2	3.0
50–54	+2.1	1.7	2.0	2.6
55–59	+3.0	1.6	1.8	2.4
60–64	+3.2	1.2	1.3	1.8
65–69	+1.4	0.5	0.6	0.8
70–74	–0.4	0.9	1.0	1.4
75–79	+0.4	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 7 ($3.75/day line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.7	66.0	69.7	88.6
4	+1.6	34.2	39.3	51.9
8	+1.3	23.7	28.4	37.2
16	+1.0	17.4	20.5	25.7
32	+1.0	12.2	14.3	18.9
64	+0.8	8.3	9.8	13.4
128	+0.7	5.9	7.2	10.1
256	+0.8	4.3	5.0	6.7
512	+0.8	3.1	3.6	4.5
1,024	+0.8	2.1	2.6	3.2
2,048	+0.9	1.5	1.8	2.3
4,096	+0.9	1.0	1.3	1.7
8,192	+0.9	0.8	0.9	1.2
16,384	+0.9	0.5	0.7	0.8

Figure 10 ($3.75/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	40.9	0.0	59.1	59.1	–100.0
≤9	0.2	40.7	0.0	59.0	59.3	–98.9
≤14	1.6	39.4	0.1	58.9	60.5	–91.9
≤19	4.1	36.8	0.5	58.6	62.7	–78.7
≤24	11.2	29.8	1.4	57.7	68.8	–42.1
≤29	17.3	23.6	3.5	55.5	72.9	–6.7
≤34	23.8	17.1	6.8	52.3	76.1	+33.1
≤39	30.1	10.9	12.9	46.2	76.2	+68.5
≤44	35.2	5.8	19.8	39.3	74.5	+51.7
≤49	38.0	3.0	26.8	32.2	70.2	+34.5
≤54	39.8	1.2	34.2	24.9	64.6	+16.5
≤59	40.5	0.5	40.2	18.9	59.3	+1.8
≤64	40.8	0.1	45.8	13.2	54.1	–11.9
≤69	40.9	0.0	50.5	8.6	49.5	–23.3
≤74	40.9	0.0	53.3	5.7	46.7	–30.3
≤79	40.9	0.0	56.7	2.3	43.3	–38.6
≤84	40.9	0.0	57.7	1.3	42.3	–41.0
≤89	40.9	0.0	58.6	0.5	41.4	–43.1
≤94	40.9	0.0	59.0	0.1	41.0	–44.1
≤100	40.9	0.0	59.1	0.0	40.9	–44.2

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

Figure 11 ($3.75/day line): Share of all households who are targeted (that is, score at or below the cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	91.7	0.0	11.0:1
≤9	0.2	91.7	0.5	11.0:1
≤14	1.7	92.5	3.9	12.4:1
≤19	4.6	90.2	10.1	9.2:1
≤24	12.5	89.0	27.3	8.1:1
≤29	20.9	83.1	42.3	4.9:1
≤34	30.6	77.8	58.2	3.5:1
≤39	43.0	70.0	73.4	2.3:1
≤44	55.0	64.0	85.9	1.8:1
≤49	64.8	58.6	92.8	1.4:1
≤54	73.9	53.8	97.1	1.2:1
≤59	80.7	50.2	98.9	1.0:1
≤64	86.6	47.1	99.7	0.9:1
≤69	91.4	44.8	99.9	0.8:1
≤74	94.3	43.4	100.0	0.8:1
≤79	97.7	41.9	100.0	0.7:1
≤84	98.7	41.5	100.0	0.7:1
≤89	99.5	41.1	100.0	0.7:1
≤94	99.9	41.0	100.0	0.7:1
≤100	100.0	40.9	100.0	0.7:1

Tables for

the $5.00/Day 2005 PPP Poverty Line

Figure 3 ($5.00/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	99.5
15–19	98.4
20–24	96.3
25–29	94.1
30–34	87.6
35–39	77.8
40–44	65.7
45–49	57.7
50–54	42.6
55–59	30.3
60–64	23.8
65–69	13.2
70–74	6.8
75–79	2.8
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($5.00/day line): Average differences between estimated and true poverty likelihoods for households from 1,000 bootstraps of n = 16,384 with confidence intervals by score range, scorecard applied to the validation sample

	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	–0.5	0.3	0.3	0.3
15–19	–0.2	0.9	1.0	1.4
20–24	–0.5	0.8	0.9	1.3
25–29	+2.4	1.3	1.5	2.0
30–34	–0.5	1.4	1.6	2.1
35–39	+0.1	1.6	1.9	2.6
40–44	–3.9	2.8	3.0	3.3
45–49	+5.2	2.1	2.6	3.6
50–54	–1.1	2.3	2.8	3.7
55–59	+4.1	2.2	2.6	3.3
60–64	+8.0	1.9	2.2	2.9
65–69	+6.8	1.3	1.6	2.0
70–74	+4.1	1.3	1.5	2.0
75–79	+0.7	1.1	1.2	1.7
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	–3.5	3.3	3.7	4.5
95–100	+0.0	0.0	0.0	0.0

Figure 7 ($5.00/day line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.9	67.6	77.0	88.8
4	+2.1	31.4	37.6	52.0
8	+1.7	22.5	27.4	35.1
16	+1.5	16.9	19.8	26.0
32	+1.6	12.3	14.4	19.2
64	+1.5	8.5	10.3	12.8
128	+1.4	6.0	7.2	9.2
256	+1.3	4.1	5.0	6.5
512	+1.3	3.0	3.5	4.6
1,024	+1.3	2.1	2.4	3.1
2,048	+1.3	1.5	1.7	2.2
4,096	+1.3	1.1	1.3	1.7
8,192	+1.3	0.7	0.9	1.1
16,384	+1.3	0.5	0.6	0.8

Figure 10 ($5.00/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	59.0	0.0	41.0	41.0	–100.0
≤9	0.2	58.7	0.0	41.0	41.3	–99.2
≤14	1.7	57.3	0.0	41.0	42.7	–94.2
≤19	4.5	54.4	0.0	41.0	45.5	–84.5
≤24	12.2	46.8	0.3	40.7	52.9	–58.0
≤29	19.8	39.2	1.0	40.0	59.8	–31.1
≤34	28.4	30.6	2.2	38.8	67.2	+0.1
≤39	38.0	21.0	5.0	36.0	74.0	+37.2
≤44	46.1	12.9	8.9	32.2	78.2	+71.3
≤49	51.2	7.8	13.7	27.4	78.5	+76.8
≤54	55.3	3.6	18.6	22.4	77.8	+68.5
≤59	57.3	1.7	23.3	17.7	75.0	+60.4
≤64	58.4	0.6	28.3	12.8	71.1	+52.1
≤69	58.8	0.2	32.6	8.4	67.2	+44.7
≤74	58.9	0.1	35.4	5.6	64.5	+40.0
≤79	59.0	0.0	38.7	2.3	61.3	+34.3
≤84	59.0	0.0	39.7	1.3	60.3	+32.7
≤89	59.0	0.0	40.6	0.5	59.4	+31.2
≤94	59.0	0.0	41.0	0.1	59.0	+30.5
≤100	59.0	0.0	41.0	0.0	59.0	+30.4

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

Figure 11 ($5.00/day line): Share of all households who are targeted (that is, score at or below the cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.2	100.0	0.4	Only poor targeted
≤14	1.7	100.0	2.9	Only poor targeted
≤19	4.6	99.0	7.7	94.8:1
≤24	12.5	97.3	20.7	36.6:1
≤29	20.9	95.0	33.6	18.9:1
≤34	30.6	92.7	48.2	12.7:1
≤39	43.0	88.4	64.3	7.6:1
≤44	55.0	83.9	78.1	5.2:1
≤49	64.8	78.9	86.8	3.7:1
≤54	73.9	74.9	93.8	3.0:1
≤59	80.7	71.1	97.2	2.5:1
≤64	86.6	67.4	99.0	2.1:1
≤69	91.4	64.3	99.7	1.8:1
≤74	94.3	62.5	99.8	1.7:1
≤79	97.7	60.4	100.0	1.5:1
≤84	98.7	59.8	100.0	1.5:1
≤89	99.5	59.2	100.0	1.5:1
≤94	99.9	59.0	100.0	1.4:1
≤100	100.0	59.0	100.0	1.4:1