Simple Poverty Scorecard® Poverty-Assessment Tool Madagascar

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19 February 2015

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This document is English is at `SimplePovertyScorecard.com`.

Abstract

The Simple Poverty Scorecard-brand poverty-assessment tool for Madagascar estimates the likelihood that a household has consumption below a given poverty line using ten straightforward indicators drawn from Madagascar's 2010 Periodic Household Survey. Field workers can collect responses in about ten minutes. The scorecard's bias and precision are reported for a range of poverty lines. The scorecard is a low-cost, practical, transparent way for pro-poor programs in Madagascar to measure poverty rates, to track changes in poverty rates over time, and to segment participants for targeted services.

Acknowledgements

This work was funded by Grameen Foundation (GF). Data are from Madagascar's *Institut National de la Statistique.* Thanks go to Julie Peachey, Sharada Ramanathan, Faly Hery Rakotomanana, Joel Raveloharimisy, Jean Paul Sossou, and David Stifel. The English scorecard was re-branded by GF as a Progress out of Poverty Index® tool. The PPI® is a performance-management tool that GF promotes to help organizations achieve their social objectives more effectively. "Progress out of Poverty Index" and "PPI" are Registered Trademarks of Innovations for Poverty Action. "Simple Poverty Scorecard" is a Registered Trademark of Microfinance Risk Management, L.L.C. for its brand of poverty-assessment tools.

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Simple Poverty Scorecard® Poverty-Assessment Tool

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

Indicator	Response	Points	Score
1. How many members does the household have?	A. Nine or more	0	
	B. Eight	5	
	C. Seven	6	
	D. Six	9	
	E. Five	13	
	F. Four	19	
	G. Three	25	
	H. Two	33	
	I. One	38	
2. Can the (oldest) female head/spouse read a simple message?	A. No	0	
	B. Yes	2	
	C. No female head/spouse	3	
3. What is the main material of the floor of the residence?	A. Other	0	
	B. Dirt (with or without mats)	5	
	C. Wood, stone, or brick	8	
	D. Cement, concrete, or fiberglass	11	
4. What is the main permanent ceiling material?	A. Bark, leaves, stems, dirt, or mud	0	
	B. No ceiling, or other	3	
	C. Matting, wood planks, plywood, particle board, cinder blocks, cement, concrete, or fiberglass	7	
5. How many tables does the household have?	A. None	0	
	B. One	2	
	C. Two or more	6	
6. How many beds does the household have?	A. None	0	
	B. One	2	
	C. Two	4	
	D. Three or more	9	
7. Does the household have a radio, radio/cassette player, or hi-fi stereo system?	A. No	0	
	B. Yes	5	
8. Does the household have a television?	A. No	0	
	B. Yes	14	
9. Does the household have a bicycle, motorcycle/scooter, tractor, or car of its own (not counting business vehicles)?	A. No	0	
	B. Yes	4	
10. Does the household have an agricultural storage shed?	A. No	0	
	B. Yes	3	

Score:

Back-page Worksheet: Household Members

Write down the name and identification number of the client and of yourself as the enumerator, as well as the service point that the client uses and the service point from which you work. Record the date of the interview and the date when the client first participated with the organization.

Then read to the respondent: *Who are the members of your household?* Household members *are those who normally eat their meals together, who sleep under the same roof, and who recognize the authority of a single person who has the final word on important decisions. Household members must have lived at least 6 months with the household. Exceptions to this six-month rule include newly-weds, newborns, and the household head, who is a member even if he/she has been absent for more than 6 months. Members of the household may or may not be related to each other by blood or marriage. Anyone who have lived elsewhere for more than 6 months is not a household member, even if he/she is a parent or a child of a household member.*

Write down the first name (or nickname) of each household member, noting for your own use the name of the (oldest) female head/spouse. Then write the total number of members in the scorecard header next to "# HH members:" and circle the response to the first indicator.

Keep in mind the full definition of *household* and *household member* in the "Guidelines for the Interpretation of Scorecard Indicators".

First name (or nickname)
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
14.
15.
Number of members:

Look-up table to convert scores to poverty likelihoods

	Poverty likelihood (%)								
	National poverty lines				Poorest half	Intl. 2005 PPP			
Score	Food	100%	150%	200%	below 100% Natl.	$1.25	$2.00	$2.50	$5.00
0–4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
5–9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
10–14	95.8	99.0	100.0	100.0	82.9	100.0	100.0	100.0	100.0
15–19	88.2	98.3	99.8	99.9	70.1	99.8	99.9	99.9	100.0
20–24	82.2	97.2	99.6	99.9	56.3	99.5	99.9	99.9	100.0
25–29	77.0	94.6	98.8	99.6	48.8	98.4	99.6	99.8	100.0
30–34	63.7	89.1	98.0	99.1	36.9	97.0	99.4	99.7	100.0
35–39	52.4	83.3	97.1	99.1	29.9	95.4	99.3	99.7	100.0
40–44	36.0	68.9	91.2	96.9	19.1	88.7	97.7	99.1	99.8
45–49	23.0	51.9	84.6	94.3	13.3	81.3	96.0	97.8	99.4
50–54	10.7	38.5	73.9	89.2	4.7	68.9	92.4	96.2	99.2
55–59	4.4	18.5	53.0	76.7	2.2	45.7	81.7	91.8	98.7
60–64	2.9	11.8	37.1	60.9	1.3	30.7	72.1	86.4	98.3
65–69	1.5	8.6	28.9	54.2	0.8	25.2	65.3	80.0	97.0
70–74	0.7	2.3	15.1	34.8	0.5	11.9	41.8	59.7	94.6
75–79	0.0	0.0	6.6	19.0	0.0	6.3	23.5	34.1	85.1
80–84	0.0	0.0	1.6	6.1	0.0	1.4	12.9	26.5	70.6
85–89	0.0	0.0	0.8	2.3	0.0	0.7	5.3	10.4	53.7
90–94	0.0	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	0.0

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1. Introduction

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

The direct approach to poverty measurement via consumption surveys is difficult and costly. As a case in point, Madagascar's 2010 *Enquête Périodique auprès des Ménages* (EPM, Periodic Household Survey) runs 45 pages. A given enumerator completed interviews at a rate of about six households every four days, asking each household about more than 250 consumption items, many of which are asked in reference to each household member or have multiple sub-questions, for example:

> "In the past 12 months, has the household bought or received as a gift any dried manioc? If so, has the household bought any dried manioc in the past seven days? If so, how much has the household spent in total on dried manioc in the past seven days? How much dried manioc—and in what unit of measurement—did the household buy? In the past 12 months, how much did the household spend in total on dried manioc? How much did the household spent on dried manioc per month? How much dried manioc—and in what unit of measurement—did the household buy per month? Finally, in the past 12 months, how much dried manioc (in the same units as the previous question) did the household receive as a gift?
>
> Now then, In the past 12 months, has the household bought or received as a gift any fresh manioc? . . . "

In comparison, the indirect approach via the scorecard is simple, quick, and inexpensive. It uses ten verifiable indicators (such as "What is the main material of the floor of the residence?" and "Does the household have a television?") to get a score that is highly correlated with poverty status as measured by the exhaustive EPM survey.

The scorecard differs from "proxy-means tests" (Coady, Grosh, and Hoddinott, 2004) in that it is transparent, it is freely available,[1] and it is tailored to the capabilities and purposes not of national governments but rather of local, pro-poor organizations. The feasible poverty-measurement options for such 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.

The scorecard 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 Madagascar can use scoring with the $1.25/day poverty line to report how many of

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

their participants are "very poor".[2] Scoring can also be used to measure net movement across a poverty line over time.

In all these applications, the scorecard provides a consumption-based, objective tool with known accuracy. While consumption surveys are costly even for governments, some pro-poor organizations may be able to implement a low-cost scorecard to help with poverty monitoring and (if desired) segmenting participants for targeted services.

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

[2] USAID defines a household as *very poor* if its daily per-capita consumption is less than the highest of $1.25 2005 PPP (MGA1,515 on average during the EPM 2010 fieldwork, Figure 1) or the line (MGA581) that marks the poorest half of people below Madagascar's national poverty line. USAID (2013, p. 7) has approved scorecards that are re-branded as Progress Out of Poverty Indexes® for use by their microenterprise partners.

approaches can rank households about as accurately as complex ones (Schreiner, 2012a; Caire and Schreiner, 2012).

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

The scorecard is based on data from the 2010 EPM done by Madagascar's *Institut National de la Statistique* (INSTAT). 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 in Madagascar

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

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

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

Third, the scorecard can estimate changes in the poverty rate for a group of households (or for two independent samples of households, 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).

The scorecard can also be used to target services to different client segments. 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 Madagascar's national poverty line. Scores from this one scorecard are calibrated to poverty likelihoods for nine poverty lines.

The scorecard is constructed and calibrated using half of the data from the 2010 EPM. 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 scorecard here is constructed

from a single sample and so misses the mark to some unknown extent when applied to a different population or when applied after 2010.[3]

Thus, while the indirect scoring approach is less costly than the direct survey approach, it is also biased when applied in practice. (The survey approach is unbiased by definition.) There is bias because the scorecard necessarily assumes that the future relationships between indicators and poverty in all possible groups of households will be 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 national poverty line is –1.7 percentage points. The average absolute difference across all nine poverty lines is about 0.7 percentage points, and the maximum absolute difference for any poverty line is 1.7 percentage points.[4]

The 90-percent confidence intervals for these estimates are ±0.6 percentage points or less. For $n =$ 1,024, the 90-percent intervals are ±2.3 percentage points or less.

[3] Important examples include nationally representative samples at a later point in time or sub-groups that are not nationally representative (Diamond *et al.*, 2016; Tarozzi and Deaton, 2009).

[4] These differences are due to sampling variation, not bias; the average difference would be zero if the whole 2010 EPM were to be repeatedly re-fielded and divided into sub-samples before repeating the entire process of constructing and validating scorecards.

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 related exercises for Madagascar. The last section is a summary.

2. Data and poverty lines

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

2.1 Data

The scorecard is based on data from the 12,460 households in the 2010 EPM. This is Madagascar's most recent national consumption survey.

For the purposes of the scorecard, the households in the 2010 EPM 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 of analysis is either the household itself or a person in the household. Each household member has the same poverty status (or estimated poverty likelihood) as the other household members.

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

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

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

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

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

As a final example, 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, organizations should explain who is counted as a *participant* and why.

Figure 1 reports poverty lines and poverty rates for both households and people in Madagascar in 2010. 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 discussed above—

household-level poverty likelihoods can be straightforwardly converted into poverty rates for other units of analysis. This is also the reason why the scorecard is constructed, calibrated, and validated with household weights.

2.3 Poverty lines

The derivation of Madagascar's national poverty line (sometimes called here "100% of the national line") follows the "cost-of-basic-needs" method of Ravallion (1998). It begins with a food-poverty line defined as the cost of 2,133 Calories from an average food basket consumed by households in the lowest three deciles of total consumption in the 2001 EPM (Stifel, Razafimanantena, and Rakotomanana, 2013). This cost is then converted to prices during the 2010 EPM fieldwork using Madagascar's Consumer Price Index,[5] giving an average food poverty line[6] of MGA760 per person per day (Figure 1). The corresponding poverty rates in the 2010 EPM are 47.6 percent for households and 56.5 percent for people.

The national poverty line is defined as this food line, plus a non-food component derived via the "Engel regression method" of Ravallion (1998). It is the non-food consumption estimated from data in the 2010 EPM for households whose total

[5] Madagascar's CPI covers only its seven major urban areas, but prices vary a lot across rural areas (World Bank, 2014). Nevertheless, a region-specific CPI based on data from the 2001 and 2010 EPM leads to a national poverty line that gives almost the same person-level poverty rate as that reported here.

[6] INSTAT (2011a) calls this the "extreme" poverty line.

consumption (not food consumption) is at the food line (World Bank, 2014; INSTAT, 2003, p. 114).

Both the food line and the national line (food-plus-non-food line) are adjusted for price differences in urban and rural areas across Madagascar's 22 regions. The average national line is MGA1,086 per person per day, giving poverty rates of 68.5 percent for households and 76.5 percent for people (Figure 1).[7]

The scorecard is constructed using the national poverty line. Because pro-poor programs in Madagascar may want to use different or various poverty lines, this paper calibrates scores from its single scorecard to poverty likelihoods for nine lines:

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

For each poverty-line region, the poverty line that marks the poorest half of people below the national line is the median per-capita consumption of people (not households) who are below 100% of the national line (United States Congress, 2004).

[7] The person-level poverty rates in Figure 1 for the food line (56.5 percent) and for the national line (76.5 percent) match those in INSTAT (2011a, p. 13).

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

- 2005 PPP exchange rate of MGA756.381 per $1.00 (World Bank, 2008)
- Consumer Price Index for Madagascar:[8]
  - — Average in 2005: 166.03
  - — Average during EPM fieldwork from 15 June to 15 October 2010: 266.06
- Average all-Madagascar national line: MGA1,085.7025 (Figure 1)
- The relevant value of the national line in urban and rural areas in each of Madagascar's 22 regions (Figure 2)

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

$$\left(\text{2005 PPP exchange rate}\right) \cdot \$1.25 \cdot \left(\frac{\text{CPI}_{\text{2010 EPM}}}{\text{CPI}_{\text{2005}}}\right) =$$

$$\left(\frac{\text{MGA756.381}}{\$1.00}\right) \cdot \$1.25 \cdot \left(\frac{266.06}{166.03}\right) = \text{MGA1,515.11.}$$

This line applies to Madagascar on average. In an urban or a rural area in a given region, the $1.25/day line is the all-Madagascar $1.25/day line, multiplied the national line in that particular (urban or rural) area, and then divided by Madagascar's average national line.

[8] Monthly price indexes (base average in 2000 = 100) are from `www.instat.mg/doc/nipc_madagascar_evolution_2001-2014.xls`, retrieved 18 February 2015.

For example, the $1.25/day 2005 PPP line in urban Analamanga is the all-Madagascar line of MGA1,515.11, multiplied by the national line in urban Analamanga of MGA1,182 (Figure 2), and divided by the average all-Madagascar national line of MGA1,085.7025. This gives a $1.25/day line in urban Analamanga of MGA1,649 (Figure 2).[9]

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

- $1.25/day 2005 PPP (MGA1,515, Figure 1)
- Line that marks the poorest half of people below the national line (MGA581).

[9] The person-level poverty rate reported by the World Bank's PovcalNet (`iresearch.worldbank.org/PovcalNet/index.htm`, retrieved 18 February 2015) for the 2010 EPM is 87.7 percent, which matches Figure 1. It does not match the 82.4 percent reported for this line by World Bank (2014), nor the 71.6 percent reported by INSTAT (2011b). PovcalNet, World Bank (2014), and INSTAT (2011b) do not document their price deflators nor how they adjust for price differences across regions.

3. Scorecard construction

For Madagascar, about 105 candidate indicators are initially prepared in the areas of:

- Household composition (such as number of members)
- Education (such as literacy of the female head/spouse and school attendance)
- Housing (such as the type of floor, exterior walls, and ceiling)
- Ownership of durable assets (such as tables or bicycles)
- Employment (such as the number of household members who work)
- Agriculture (such as ownership of an animal-drawn plow)

Figure 3 lists the candidate indicators, ordered by the entropy-based "uncertainty coefficient" (Goodman and Kruskal, 1979) that measures how well a given indicator predicts poverty on its own.[10]

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 tables or beds is probably more likely to change in response to changes in poverty than is the age of the male head/spouse.

The scorecard itself is built using the national poverty line and Logit regression 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).

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

One of these one-indicator scorecards is then selected based on several factors (Schreiner *et al.*, 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, tendency to have a slowly-changing relationship with poverty over time, relevance for distinguishing among households at in the distribution of consumption close to the national poverty line, 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 using judgment to balance "c" with the non-statistical criteria. These steps are repeated until the scorecard has 10 indicators that work well together.

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[11] and non-statistical criteria. The non-statistical criteria can improve

[11] The statistical criterion for selecting an indicator is not the p value of its coefficients 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 Madagascar. Tests for Indonesia (World Bank, 2012), Bangladesh (Sharif, 2009), India and Mexico (Schreiner, 2006 and 2005a), Sri Lanka (Narayan and Yoshida, 2005), and Jamaica (Grosh and Baker, 1995) suggest that segmenting scorecards by urban/rural does not improve targeting accuracy much. In general, segmentation may improve the bias and precision of estimates of poverty rates (Diamond *et al.*, 2016; Tarozzi and Deaton, 2009) at the risk of overfitting (Haslett, 2012).

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 on their own and use it properly. Of course, accuracy matters, but it must be balanced with simplicity, ease-of-use, and "face validity". Programs are more likely to collect data, compute scores, and pay attention to the results if, in their view, scoring does not imply a lot of additional work and if the whole process generally seems to make sense.

To this end, Madagascar'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)

A field worker using Madagascar's paper scorecard would:

- Record the names and identifiers of the participant, of the field worker, and of the relevant organizational service point
- Record the date that the participant first participated with the organization
- Record the date of the scorecard interview
- Complete the back-page worksheet with each household member's name
- Record household size in the scorecard header, and record the response to the scorecard's first indicator based on the back-page worksheet
- Read each of the remaining nine questions one-by-one from the scorecard, drawing a circle around the relevant responses and their points, and writing each point value in the far right-hand column
- Add up the points to get a total score
- Implement targeting policy (if any)
- Deliver the paper scorecard to a central office for data 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).[12] IRIS Center (2007a) and Toohig

[12] 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 to compute scores later at a central office. Schreiner (2012b) argues that hiding points in Colombia (Camacho and Conover, 2011) did little to deter

(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 these "Guidelines"—along with the "Backpage Worksheet"—are an integral part of the Simple Poverty Scorecard tool.[13]

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

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cheating and that, in any case, cheating by the user's central office was more damaging than cheating by field workers and respondents. Even if points are hidden, field workers and respondents can apply common sense to guess how response options are linked with poverty.

[13] The "Guidelines" here are the only ones that organizations should give to field workers. All other issues of interpretation should be left to the judgment of field workers and respondents, as this seems to be what Madagascar's INSTAT did in the 2010 EPM.

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 pro-poor organizations in Madagascar.

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 main goal should be to make sure that the sample is representative of a well-defined population and that the scorecard will inform an issue that matters to the organization.

The non-specialists who apply the scorecard as enumerators 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. To be clear, however, the focus should not be on having a sample size large enough to achieve some arbitrary level of statistical significance but rather to get a representative sample from a well-defined population so that the analysis of the results can meaningfully inform questions that matter to the organization.

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 tool for Bangladesh (Schreiner, 2013a) with a sample of about 25,000. Their design is that all loan officers in a random sample of branches score all participants each time they visit a homestead (about once a year) as part of their standard due diligence prior to loan disbursement. They record responses on paper in the field before sending the forms to a central office to be entered into a database and converted to poverty likelihoods.

5. Estimates of household poverty likelihoods

The sum of scorecard points for a household is called the *score*. For Madagascar, 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 the national line, scores of 45–49 have a poverty likelihood of 51.9 percent, and scores of 50–54 have a poverty likelihood of 38.5 percent (Figure 4).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 45–49 are associated with a poverty likelihood of 51.9 percent for the national line but of 81.3 percent for the $1.25/day 2005 PPP line.[14]

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.

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

For the example of the national line (Figure 5), there are 9,070 (normalized) households in the calibration sub-sample with a score of 45–49. Of these, 4,708 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 45–49 is then 51.9 percent, because 4,708 ÷ 9,070 = 51.9 percent.

To illustrate with the national line and a score of 50–54, there are 7,575 (normalized) households in the calibration sample, of whom 2,913 (normalized) are below the line (Figure 5). The poverty likelihood for this score range is then 2,913 ÷ 7,575 = 38.5 percent.

The same method is used to calibrate scores with estimated poverty likelihoods for the other eight poverty lines.[15]

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

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

For example, the probability that a household with a score of 45–49 falls between two adjacent poverty lines is:

- 13.3 percent below the "poorest half below national" line
- 9.7 percent between the "poorest half below national" line and the food line
- 28.9 percent between the food line and 100% of the national line
- 29.4 percent between 100% of the national line and $1.25/day
- 3.3 percent between $1.25/day and 150% of the national line
- 9.7 percent between 150% and 200% of the national line
- 1.7 percent between 200% of the national line and $2.00/day
- 1.9 percent between $2.00/day and $2.50/day
- 1.5 percent between $2.50/day and $5.00/day
- 0.6 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 Madagascar scorecard are transformed coefficients from a Logit regression, (untransformed) scores are not converted to poverty likelihoods via the Logit formula of 2.718281828^{score} x $(1 + 2.718281828^{score})^{-1}$. This is because the Logit formula is esoteric and difficult to compute by hand. Non-specialists find it more intuitive to define the poverty likelihood as the share of households with a given score in the calibration sample who are below a poverty line. Going from scores to poverty likelihoods in this way requires no arithmetic at all, just a look-up table. This approach to calibration can also improve accuracy, especially with large samples.

5.2 Accuracy of estimates of households' poverty likelihoods

As long as the relationships between indicators and poverty do not change over time, and as long as the scorecard is applied to households that are representative of the same population from which the scorecard was originally constructed, then this calibration process produces unbiased estimates of poverty likelihoods. *Unbiased* means that in repeated samples from the same population, the average estimate matches the true value. The scorecard also produces unbiased estimates of poverty rates at a point in time and unbiased estimates of changes in poverty rates between two points in time.[16]

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

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

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

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

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

For the national line, the average poverty likelihood across bootstrap samples for scores of 45–49 in the validation sample is too low by 2.0 percentage points. For scores of 50–54, the estimate is too low by 5.8 percentage points.[17]

The 90-percent confidence interval for the differences for scores of 45–49 is ±2.4 percentage points (national line, Figure 7). This means that in 900 of 1,000 bootstraps, the difference between the estimate and the true value is between –4.4 and +0.4 percentage points (because –2.0 – 2.4 = –4.4, and –2.0 + 2.4 = +0.4). In 950 of 1,000 bootstraps (95 percent), the difference is –2.0 ± 2.9 percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is –2.0 ± 3.9 percentage points.

Most differences between estimated poverty likelihoods and true values in Figure 7 are small. There are differences because the validation sample is a single sample that—thanks to sampling variation—differs in distribution from the construction/calibration sub-sample and from Madagascar'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.

[17] 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 EPM fieldwork in October 2010. That is, it may fit the data from the 2010 EPM 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 2010 EPM but not in the overall population of Madagascar. Or the scorecard may be overfit in the sense that it is not robust when relationships between indicators and poverty change over time or when the scorecard is applied to 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 2015 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 97.2, 89.1, and 68.9 percent (national line, Figure 4). The group's estimated poverty rate is the households' average poverty likelihood of $(97.2 + 89.1 + 68.9) \div 3 = 85.1$ 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 89.1 percent. This differs from the 85.1 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 Madagascar 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 1.7 percentage points (Figure 9, summarizing Figure 8 across all nine poverty lines). The average absolute difference across poverty lines is 0.7 percentage points.

When estimating poverty rates at a point in time, the bias reported in Figure 9 should be subtracted from the average poverty likelihood to make the estimate unbiased. For the Madagascar scorecard and the national line, bias is –1.7 percentage points, so the unbiased estimate in the three-household example above is 85.1 – (–1.7) = 86.8 percent.

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

For example, suppose that the average poverty likelihood in a sample of $n = 16{,}384$ with the Madagascar scorecard and the national line is 85.1 percent. Then estimates in 90 percent of such samples would be expected to fall in the range of 85.1 – (–1.7) – 0.6 = 86.2 percent to 85.1 – (–1.7) + 0.6 = 87.4 percent, with the most likely true value being the unbiased estimate in the middle of this range (85.1 – (–1.7) = 86.8 percent). This is because the original (biased) estimate is 85.1 percent, bias is –1.7

percentage points, and the 90-percent confidence interval for the national line and this sample size is ±0.6 percentage points (Figure 9).

6.2 Formula for standard errors for estimates of poverty rates

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

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, Madagascar's 2010 EPM gives a direct-measure estimate of the household-level poverty rate for the national line of $\hat{p} = 68.5$ percent (Figure 1). If this estimate came from a sample of $n = 16{,}384$ households from a population N of 4,176,188 (the number of households in Madagascar in 2010), then the finite population correction ϕ is $\sqrt{\frac{4{,}176{,}188 - 16{,}384}{4{,}176{,}188 - 1}} = 0.9980$, 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

$$\pm z \cdot \sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}} = \pm 1.64 \cdot \sqrt{\frac{0.685 \cdot (1 - 0.685)}{16{,}384}} \cdot 1 = \pm 0.595 \text{ percentage points.}$$

Scorecards, however, do not measure poverty directly, so this formula is not applicable. To derive a formula for the Madagascar scorecard, consider Figure 8, 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 the national line, the 90-percent confidence interval is ± 0.488 percentage points.[18]

Thus, the 90-percent confidence interval with $n = 16{,}384$ is ± 0.488 percentage points for the Madagascar scorecard and ± 0.595 percentage points for direct measurement. The ratio of the two intervals is $0.488 \div 0.595 = 0.82$.

[18] Due to rounding, Figure 8 displays 0.5, not 0.488.

Now consider the same exercise, but with $n = 8{,}192$. The confidence interval under direct measurement and the national line is $\pm 1.64 \cdot \sqrt{\frac{0.685 \cdot (1 - 0.685)}{8{,}192}} \cdot 1 =$ ± 0.842 percentage points. The empirical confidence interval with the Madagascar scorecard (Figure 8) is ± 0.703 percentage points. Thus for $n = 8{,}192$, the ratio of the two intervals is $0.703 \div 0.842 = 0.83$.

This ratio of 0.83 for $n = 8{,}192$ is close to the ratio of 0.82 for $n = 16{,}384$. Across all sample sizes of 256 or more in Figure 8, the average ratio turns out to be 0.84, implying that confidence intervals for indirect estimates of poverty rates via the Madagascar scorecard and the national poverty line are—for a given sample size—about 16-percent narrower than confidence intervals for direct estimates via the 2010 EPM. This 0.84 appears in Figure 9 as the "α factor" because if $\alpha = 0.84$, then the formula for confidence intervals $\pm c$ for the Madagascar 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 is the cases for all but one of the nine poverty lines in Figure 9.

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

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

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

To illustrate how to use this, suppose the population N is 4,176,188 (the number of households in Madagascar in 2010), suppose $c = 0.04026$, $z = 1.64$ (90-percent confidence), and the relevant poverty line is the national line so that the most sensible expected poverty rate $\widetilde{p}$ is Madagascar's overall poverty rate for that line in 2010 of 68.5 percent at the household level (Figure 1). The α factor is 0.84 (Figure 9). Then the sample-size formula gives

$$n = 4{,}176{,}188 \cdot \left(\frac{1.64^2 \cdot 0.84^2 \cdot 0.685 \cdot (1 - 0.685)}{1.64^2 \cdot 0.84^2 \cdot 0.685 \cdot (1 - 0.685) + 0.04026^2 \cdot (4{,}176{,}188 - 1)} \right) = 253,$$

which close to the sample size of 256 observed for these parameters in Figure 8 for the national line. Taking the finite population correction factor ϕ as one (1) gives the same answer, as $n = \left(\frac{0.84 \cdot 1.64}{0.04026} \right)^2 \cdot 0.685 \cdot (1 - 0.685) = 253$.[19]

[19] Although USAID has not specified confidence levels nor intervals, IRIS Center (2007a and 2007b) says that a sample size of $n = 300$ is sufficient for USAID reporting. USAID microenterprise partners in Madagascar should report using the \$1.25/day 2005 PPP line. Given the α factor of 0.81 for this line (Figure 9), an expected before-measurement household-level poverty rate of 82.1 percent (the all-Madagascar rate for 2010, Figure

Of course, the α factors in Figure 9 are specific to Madagascar, 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 EPM in October 2010, a program would select a poverty line (say, 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 the national line for Madagascar of 68.5 percent in the 2010 EPM from Figure 1), look up α (here, 0.84 in Figure 9), assume that the scorecard will still work in the future and for non-nationally representative sub-groups,[20] and then compute the required sample size. In this illustration, $n = 10{,}000 \cdot \left(\frac{1.64^2 \cdot 0.84^2 \cdot 0.685 \cdot (1 - 0.685)}{1.64^2 \cdot 0.84^2 \cdot 0.685 \cdot (1 - 0.685) + 0.02^2 \cdot (10{,}000 - 1)} \right) = 929.$

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1), and a confidence level of 90 percent ($z = 1.64$), then $n = 300$ implies a confidence interval of $\pm 1.64 \cdot 0.81 \cdot \sqrt{\frac{0.821 \cdot (1 - 0.821)}{300}} = \pm 2.9$ percentage points.

[20] 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 October 2010 will resemble that in the 2010 EPM 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. With data only from the 2010 EPM, this paper cannot test estimates of change over time for Madagascar, and it can only suggest approximate formulas for standard errors. Nevertheless, the relevant concepts are presented here because, in practice, pro-poor organizations in Madagascar can apply the scorecard to collect their own data and measure change through time.

7.1 Warning: Change is not impact

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

7.2 Estimating changes in poverty rates over time

Consider the illustration begun in the previous section. On 1 January 2015, an organization samples three households who score 20, 30, and 40 and so have poverty likelihoods of 97.2, 89.1, and 68.9 percent (national line, Figure 4). Adjusting for the known bias of –1.7 percentage points (Figure 9), the group's baseline estimated poverty rate is the households' average poverty likelihood of [(97.2 + 89.1 + 68.9) ÷ 3] – (–1.7) = 86.8 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 2017, 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 94.6, 83.3, and 51.9 percent, national line, Figure 4). Adjusting for the known bias, the average poverty likelihood at follow-up is [(94.6 + 83.3 + 51.9) ÷ 3] – (–1.7) = 78.3 percent, an improvement of 86.8 – 78.3 = 8.5 percentage points.[21]

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

Thus, about one in 12 participants in this hypothetical example cross the poverty line in 2015/7.[22] Among those who start below the line, about one in ten (8.5 ÷ 86.8 = 9.8 percent) on net end up above the line.[23]

7.3 Accuracy for estimated change in two independent samples

With only the 2010 EPM, it is not possible to measure the accuracy of scorecard estimates of changes in groups' poverty rates over time. In practice, of course, pro-poor organizations in Madagascar can still use the scorecard to estimate change. The rest of this section suggests approximate formulas for standard errors that may be used until there is additional data.

7.4 Precision for estimates of change in two samples

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

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

Here, z, c, $\hat{p}$ and N are defined as above, n is the sample size at both baseline and follow-up,[24] and α is the average (across a range of bootstrap samples of various

[22] This is a net figure; some start above the line and end below it, and vice versa.
[23] The scorecard does not reveal the reasons for this change.

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 $\widetilde{p}$ is based on previous measurements and is assumed equal at both baseline and follow-up: $n = 2 \cdot N \cdot \left(\frac{z^2 \cdot \alpha^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p})}{z^2 \cdot \alpha^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p}) + c^2 \cdot (N - 1)} \right)$. If ϕ can be taken as one, then the formula becomes $n = 2 \cdot \left(\frac{\alpha \cdot z}{c} \right)^2 \cdot \widetilde{p} \cdot (1 - \widetilde{p})$.

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 rough figure is as reasonable as any to use for Madagascar.

To illustrate the use of this formula to determine sample size for estimating changes in poverty rates across two independent samples, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is ± 2 percentage points ($\pm c = \pm 0.02$), the poverty line is the national line, $\alpha = 1.15$, $\hat{p} = 0.685$ (the household-level poverty rate in 2010 for the national line in Figure 1), and the population N is large enough relative to the expected sample size n that the finite

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

population correction ϕ can be taken as one. Then the baseline sample size is

$n = 2 \cdot \left(\frac{1.15 \cdot 1.64}{0.02} \right)^2 \cdot 0.685 \cdot (1 - 0.685) \cdot 1 = 3{,}838$, and the follow-up sample size is also 3,838.

7.5 Precision for estimated change for one sample, scored twice

Analogous to previous derivations, the general formula relating the confidence interval $\pm c$ to the standard error σ when using a scorecard to estimate change for a single group of households, all of whom are scored at two points in time, is:[25]

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

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

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

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

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

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:

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

Given this, a sample-size formula for a group of households to whom the Madagascar scorecard is applied twice (once after October 2010 and then again later) is

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

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

To illustrate the use of this formula, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is ±2.0 percentage points ($\pm c = \pm 0.02$), the poverty line is the national line, the sample will first be scored in 2015 and then again in 2018 ($y = 3$), 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_{2010} is taken as 68.5 percent (Figure 1), and α is assumed to be 1.30. Then the baseline sample size is

$n = 2 \cdot \left(\frac{1.30 \cdot 1.64}{0.02} \right)^2 \cdot \{-0.02 + 0.016 \cdot 3 + 0.47 \cdot [0.685 \cdot (1 - 0.685)]\} \cdot 1 = 2{,}942$. The same group of 2,942 households is scored at follow-up as well.

8. Targeting

When an organization uses the scorecard for targeting, households with scores at or below a cut-off are labeled *targeted* and treated—for program purposes—as if they were below a given poverty line. Households with scores above a cut-off are labeled *non-targeted* and treated—for program purposes—as if they were 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 10 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 11 shows the distribution of households by targeting outcome for Madagascar. For an example cut-off of 49 or less, outcomes for the national line in the validation sample are:

- Inclusion: 63.2 percent are below the line and correctly targeted
- Undercoverage: 5.3 percent are below the line and mistakenly not targeted
- Leakage: 12.6 percent are above the line and mistakenly targeted
- Exclusion: 18.9 percent are above the line and correctly not targeted

Increasing the cut-off to 54 or less improves inclusion and undercoverage but worsens leakage and exclusion:

- Inclusion: 66.1 percent are below the line and correctly targeted
- Undercoverage: 2.3 percent are below the line and mistakenly not targeted
- Leakage: 17.3 percent are above the line and mistakenly targeted
- Exclusion: 14.3 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 11 for a given poverty line
- Select the cut-off with the highest total net benefit

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

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

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

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

Figure 11 shows the hit rate for all cut-offs for the Madagascar scorecard. For the national line in the validation sample, total net benefit is greatest (82.1) for a cut-off of 49 or less, with more than four in five households in Madagascar correctly classified.

The hit rate weighs successful inclusion of households below the line the same as successful exclusion of households above the line. If a program values inclusion more (say, twice as much) than exclusion, then it can reflect this by setting the benefit for inclusion to 2 and the benefit for exclusion to 1. Then the chosen cut-off will maximize (2 x Households correctly included) + (1 x Households correctly excluded).[26]

[26] Figure 11 also reports "BPAC", discussed in the next section.

As an alternative to assigning benefits and costs to targeting outcomes and then choosing a cut-off to maximize total net benefits, a program could set a cut-off to achieve a desired poverty rate among targeted households. The third column of Figure 12 ("% targeted HHs who are poor") shows, for the Madagascar scorecard applied to the validation sample, the expected poverty rate among households who score at or below a given cut-off. For the example of the national line, targeting households who score 49 or less would target 75.8 percent of all households (second column) and produce a poverty rate among those targeted of 83.3 percent (third column).

Figure 12 also reports two other measures of targeting accuracy. The first is a version of coverage ("% poor HHs who are targeted"). For the example of the national line with the validation sample and a cut-off of 49 or less, 92.3 percent of all poor households are covered.

The final targeting measure in Figure 12 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For the national line with the validation sample and a cut-off of 49 or less, covering 5.0 poor households means leaking to 1 non-poor household.

9. Context of poverty-assessment tools in Madagascar

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

- Use of data from the latest nationally representative consumption survey
- Use of a definition of *poverty* that is simple to understand and used by government
- Targeting accuracy that probably is similar to that of alternative approaches
- Reporting of bias and precision from out-of-sample tests, including formulas for standard errors
- 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 Madagascar with an approach that they use in 56 countries with Demographic and Health Surveys (Rutstein and Johnson, 2004). They use Principal Components Analysis to make an asset index from simple, low-cost indicators available for the 7,171 households in Madagascar's 1997 DHS.[27] The PCA index is like the scorecard here except that, because the DHS does not collect data on consumption, the index is based on a different conception of *poverty*, its accuracy vis-à-vis consumption-based poverty is unknown, and it can only be assumed to be a proxy for long-term wealth/econgomic status.[28]

[27] All DHS datasets for Madagascar since 1997 include each household's score on the asset index (`dhsprogram.com/topics/wealth-index/`, retrieved 18 February 2015).
[28] Nevertheless, the indicators are similar and the "flat maximum" is important, so carefully built PCA indexes and consumption-based poverty-assessment tools may pick

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).

The 13 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:
  - — Presence of electricity
  - — Type of floor
  - — Source of drinking water
  - — Type of toilet arrangement
- Ownership of consumer durables:
  - — Radios
  - — Televisions
  - — Telephones
  - — Refrigerators
  - — Bicycles
  - — Motorcycles
  - — Cars
- Whether members of the household work their own or family's agricultural land
- Number of household members per sleeping room

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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 scorecards include Filmer and Scott (2012), Lindelow (2006), Sahn and Stifel (2003), Wagstaff and Watanabe (2003), and Montgomery *et al.* (2000).

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

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

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

Still, the Gwatkin *et al.* index is more difficult and costly than the scorecard. While the scorecard requires adding up 10 integers (some of which are usually zeroes), Gwatkin *et al.*'s asset index requires adding up 71 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 estimates consumption-based poverty status.

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

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

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

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 Zeller, Sharma, Henry, and Lapenu

Like this paper and like Gwatkin *et al.*, Zeller *et al.* (2006) seek to develop a practical, low-cost, accurate way to assess the poverty of participants in local, pro-poor organizations. Their benchmark for comparison is not absolute poverty status by a consumption-based poverty line but rather relative poverty compared with other households in the area.

Like Gwatkin *et al.*, Zeller *et al.* use PCA to combine indicators in an index, testing their approach with microfinance organizations in four countries. In Madagascar, they apply a special-purpose survey to a random sample of 200 members of a rural credit union and to a comparison group of 300 non-members in the area. They then compare the indexes' distributions by terciles to see which group tends to be poorer.

Zeller *et al.* start the construction process with a long list of potential indicators and narrow it down based on the indicators' correlation with the value of the household's consumption of clothing. In the PCA analysis, they select 17 indicators based on the statistical significance of their coefficients:

- Characteristics of the residence:
  - Presence of electricity
  - Type of roof
  - Number of rooms per person
  - Source of drinking water
  - Type of toilet arrangement
- Education of the household head
- Share of adults who are wage laborers
- Ownership of consumer durables:
  - Number of fans
  - Value of electrical devices
  - Value of assets per adult
- Food security:
  - Episodes of hunger in the past 12 months
  - Use of cooking oil
  - Number of days with "luxury food 1"
  - Number of days with "luxury food 2"
  - Number of days with "inferior food"
  - Frequency of purchase of "staple food 1"
  - Frequency of purchase of "staple food 2"

Like all asset indexes (and like the scorecard here), Zeller *et al.*'s index can rank households and can be applied in diverse contexts. Its small sample, however, is not nationally representative, so a local comparison group of non-participants must be surveyed with each application.

Most important, the indicators in Madagascar's index are difficult and costly to collect. For example, most households cannot easily estimate the value of their electrical devices, let alone the per-capita value of their assets. Furthermore, the food-security indicators relate to historical events and so are non-verifiable. Even if all these indicators could be collected accurately, they probably would not rank households much better—thanks to the "flat maximum"—than indexes with indicators that are simpler, lower-cost, and more-verifiable.

Zeller *et al.* do not report the wording of their indicators nor their points, so a pro-poor organization in Madagascar cannot just pick up their index and use it.

9.3 Sahn and Stifel (2003)

Sahn and Stifel (2003) seek a low-cost, practical way to measure poverty. Using the 4,800 households in Madagascar's 1993 EPM, they—like Gwatkin *et al.* and Zeller *et al.*—build an asset index using factor analysis (a sister of PCA). They seek "to see if there exist simpler and less demanding alternatives to collecting data on expenditure for purposes of measuring economic welfare and ranking households" (p. 484). Their motivation is similar to that of the scorecard here: they want tools that are affordable

and feasible given constraints on budgets and non-specialists' technical resources, and they want to make comparisons over time and across countries without the complications and assumptions required for direct measurement via consumption surveys. Like this paper, they also seek a tool for targeting.

Sahn and Stifel's (2003) nine indicators are simple, low-cost, and verifiable:

- Characteristics of the residence:
  - Type of floor
  - Source of drinking water
  - Type of toilet arrangement
- Education of the household head
- Ownership of consumer durables:
  - Radio
  - Television
  - Refrigerator
  - Bicycle
  - Motorized transport

To check coherence between their asset index and consumption in the 1993 EPM[29] and between their asset index and child nutrition, Sahn and Stifel (2003) rank households in Madagascar based on the index, on consumption, and on height-for-age. They judge the coherence between pairs of rankings by the distance between a given household's decile ranks. They conclude that the asset index predicts long-term nutritional status no worse than does current consumption and that the index does so more simply and inexpensively. They also report that their asset index predicts consumption worse than does a scorecard (that is, a least-squares regression that

[29] Sahn and Stifel (2003) check the index against consumption because it is a common proxy for living standards, not because they believe it should be the benchmark.

predicts consumption based on household demographics, education, residence quality, and access to public services). Finally, they find that measurement error is worse for consumption than for their index.

Sahn and Stifel (2003) report only *in-sample* tests; that is, they check accuracy with the same data that is used to construct the index in the first place. In-sample tests overstate accuracy. In contrast, this paper reports only *out-of-sample* tests with data that is not used to construct the scorecard. This is the most stringent—and most appropriate—way to test accuracy.

9.4 Sahn and Stifel (2000)

Like Sahn and Stifel (2003), Sahn and Stifel (2000) use factor analysis to construct an asset index meant to measure poverty in Madagascar in terms of long-term wealth. Their purpose relates to assessment (to inform governments and donors about the broad progress of poverty-reduction efforts in Africa) rather than operations (to provide a tool to help local, pro-poor organizations improve their products and services).

Sahn and Stifel (2000) construct their index by pooling Madagascar's 1992 and 1997 DHS. Defining poverty status according to lines set at the 25^{th} and 40^{th} percentiles of their index, they then compare the distribution of the index and poverty rates over time within Madagascar.

The nine indicators in Sahn and Stifel (2000) are identical to those in Sahn and Stifel (2003), even though the data sources differ.

Like the other asset indexes reviewed here, Sahn and Stifel (2000) shares many of the strengths of the poverty-scoring approach in that it can be used for targeting and in that it is flexible, low-cost, and adaptable to diverse contexts. An asset index is more adaptable than the scorecard in that it does not require price adjustments over time and in that it does not require consumption data.

9.5 IRIS Center

IRIS Center (2011) was commissioned to build a poverty-assessment tool (called a "Poverty Assessment Tool", or PAT) for use by USAID's microenterprise partners in Madagascar for reporting the share of their participants who are "very poor". IRIS does not report what data it uses, but it is probably 4,938 households from Madagascar's 2001 EPM. The "very poor" are defined as those having per-capita consumption less than the $1.25/day 2005 PPP. This line gives a household-level poverty rate of 74.4 percent.[30] In deriving this, IRIS seems to have used a single $1.25/line of about MGF3,060.70 per person per day, without adjusting for regional price differences.

After comparing several statistical approaches,[31] IRIS settles on a one-step quantile regression that estimates the 60th percentile of per-capita household consumption, conditional on the PAT indicators. A household is counted as *very poor* if this estimate is less than the $1.25/day line.

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

- Uses older data (2001 rather than 2010)
- Has a more indicators (16 rather than 10)
- When estimating poverty rates, assigns a household a poverty likelihood of either 0 or 100 percent, rather than using a likelihood that is usually between 0 and 100
- Non-intuitively compares the 60th percentile of estimated consumption (rather than the estimated expected value of consumption) with a poverty line

[30] PovcalNet gives a (lightly documented) rate of 76.3 percent (`iresearch.worldbank.org/PovcalNet/index.htm`, retrieved 18 February 2015).
[31] Thanks to the "flat maximum", all methods have similar hit rates.

The PAT's 16 indicators are simple and verifiable:

- Location:
  - Province
  - Urban/rural
- Characteristics of residence:
  - Number of rooms
  - Type of roof
  - Type of cooking fuel
  - Source of drinking water
- Demographics:
  - Number of household members
  - Age of the head of the household
  - Sex of the head of the household
- Highest level of education completed by the household head
- Ownership of consumer durables:
  - Tables
  - Stoves
  - Stereos
  - Televisions
  - Bicycles
  - Cars

In terms of accuracy, IRIS reports out-of-sample results—that is, based on applying the PAT to data that was not used to construct the PAT in the first place—in terms of:

- Bias of estimated poverty rates at a point in time[32]
- Targeting (inclusion, undercoverage, leakage, and exclusion)
- The Balanced Poverty Accuracy Criterion, USAID's standard for certifying PATs

IRIS Center (2005) introduced BPAC. It considers accuracy in terms of inclusion and in terms of the absolute difference between undercoverage and leakage (which,

[32] IRIS (2005) calls bias the "Poverty Incidence Error" (PIE). Under IRIS' approach in which estimated poverty likelihoods are either 0 or 100 based on a single cut-off, it turns out that bias is equivalent to the difference between undercoverage and leakage.

under the PAT approach, is equal to the absolute value of the bias of the estimated poverty rate). The formula is $\text{BPAC} = 100 \cdot \left(\frac{\text{Inclusion} - \mid \text{Undercoverage} - \text{Leakage} \mid}{\text{Inclusion} + \text{Undercoverage}} \right)$.

Because bias (in the PAT approach) is the difference between undercoverage and leakage, and because the normalization term $\frac{100}{\text{Inclusion} + \text{Undercoverage}}$ matters only when comparing tools across populations with different poverty rates (an irrelevant consideration when selecting among alternative tools for a given country in a given year), the formula boils down to $\text{BPAC} = \text{Inclusion} - \mid \text{Bias} \mid$.

Expressing BPAC as $\text{Inclusion} - \mid \text{Bias} \mid$ helps to show why BPAC is not useful for comparing the PAT with the scorecard (Schreiner, 2014). Regardless of whether undercoverage differs from leakage (and given the assumptions discussed earlier in this paper), the scorecard produces unbiased estimates of poverty rates. While BPAC can be used to compare alternative tools under the PAT's approach, it does not make sense to apply BPAC to the scorecard's poverty-likelihood approach. This is because the scorecard does not use a single cut-off to classify households as either 100-percent poor or 100-percent non-poor. Instead, households have an estimated poverty likelihood somewhere between 0 to 100 percent. If a user of a scorecard sets a targeting cut-off, then that cut-off matters only for targeting, without affecting the estimation of poverty rates at all.

In any case, both the PAT and the scorecard give unbiased estimates of poverty rates (after subtracting off known bias), so any distinction between their accuracy must

hinge on targeting or on the precision of estimated poverty rates. A clean comparison along these dimensions for Madagascar is difficult, as IRIS uses 2001 data (versus 2010 data here) and partly-out-of-sample tests (versus fully out-of-sample here).[33] To hold the underlying poverty-rate constant, this paper multiplies its national line (applied to the 2010 EPM) by a factor of 0.9710 so that its household-level poverty rate by the national line matches the approximate 67.0 percent of the PAT (in the 2001 EPM).[34] It then re-estimates the scorecard's points, keeping its original indicators, and re-runs the bootstrap accuracy tests.

In terms of precision, the alpha factor for the scorecard in this scenario is 0.85, while for the PAT, it is 1.03.

In terms of targeting, when the PAT targets the 66.7 percent of households with th lowest indexes, inclusion is 61.2 percent, exclusion is 25.5 percent, and the hit rate is 86.7 percent. When the scorecard targets this same share of households, inclusion is 57.3 percent, exclusion is 24.6 percent, and the hit rate is 81.9 percent. In sum, the PAT targets better. The difference—about 5 more households correctly classified per 100—may be due to the PAT's testing partly in-sample as well as to the nine-year data gap.

[33] IRIS tests are partly out-of-sample because they use all the data to select indicators.
[34] IRIS reports a household-level poverty rate for $1.25/day 2005 PPP of 74.3 percent (p. 2) or 74.4 percent (p. 3), and they compare this supposedly household-level rate to PovcalNet's person-level estimate of 76.3 percent, suggesting that the 74.3 figure is for people, not households. Furthermore, IRIS' Table 1 and Table 7 imply a household-level rate betweeen 66.7 percent (validation sample) and 67.1 (construction sample), implying a full-sample household-level poverty rate of about 67.0 percent.

Although IRIS reports the PAT's targeting accuracy and although the BPAC formula considers targeting accuracy, IRIS says that the PAT should not be used for targeting.[35] IRIS also doubts that the PAT can be useful for measuring change, noting that "it is unclear that the tools will be able to identify real changes in poverty over time due to their inherent measurement errors. Unless the changes in the poverty rate are exceptionally large and the tools exceptionally accurate, the changes identified are likely to be contained within the margin of error."[36]

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

9.6 Mistiaen *et al.*

In one of the first uses of "poverty mapping" (Elbers, Lanjouw, and Lanjouw, 2003), Mistiaen *et al.* (2002) estimate poverty rates at the level of Madagascar's six former provinces (*Faritany*), 111 districts (*Fivondronas*), and 1,248 communes (*Firaisanas*).[37] The goals are to help decentralize government, to allocate development assistance, and inform Madagascar's Poverty Reduction Strategy Paper.

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[35] `povertytools.org/faq/faq.html#11`, retrieved 19 February 2009.
[36] `povertytools.org/faq/faq2.html`, retrieved 7 December 2012.
[37] Mistiaen *et al.*'s poverty map for Madagascar also appears in Demombynes *et al.* (2004), Elbers *et al.* (2007), and Elbers *et al.* (2005).

For each of 12 strata (urban and rural in each of Madagascar's six former provinces), Mistiaen *et al.* use stepwise least-squares regression of the logarithm of per-capita consumption against indicators found both in the 1993 EPM and in the 1993 Census, district- and commune-level census means, and district-level environmental indicators from a CARE database. The 12 tools are then applied to the Census data with the national poverty line[38] to estimate poverty rates for smaller areas (districts and communes) than would be possible with only the 1993 EPM. Finally, Mistiaen *et al.* make "poverty maps" that quickly show how estimated poverty rates vary across small areas in a way that makes sense to lay people.

Poverty mapping in Mistiaen *et al.* has much in common with the the scorecard here in that they both:

- Build poverty-assessment tools with data that is representative of a population (all-Madagascar for the scorecard, and the 12 survey strata for Mistiaen *et al.*) and then apply the tools to other data on groups that are not, in general, representative of the same populations
- Estimate poverty rates for groups
- Test accuracy empirically
- Report bias and standard errors
- Seek to be useful in practice and so aim to be understood by non-specialists

Strengths of poverty mapping include that it:

- Has formally established theoretical properties
- Can be applied straightforwardly to distributional measures of well-being (such as the poverty gap or the Gini coefficient) that go beyond head-count poverty rates

[38] The national poverty line in prices in urban Anatananarivo during fieldwork for the 1993 EPM is MGF11,638 per person per day, giving an all-Madagascar person-level poverty rate of 70.0 percent (Paternostro, Razafindravonona, Stifel, 2001).

- Accounts for uncertainty in the estimation of tool points when estimating standard errors
- Requires data on fewer households for construction and calibration
- Includes district and commune-level indicators, including some not found in the EPM, increasing accuracy and precision
- Uses only indicators that appear in a census or in a tertiary database

Strengths of the scorecard include that it:

- Uses simple, verifiable indicators that are quick and inexpensive to collect
- Is simpler in terms of both construction and application
- Associates poverty likelihoods with scores non-parametrically
- Surfaces estimates of poverty likelihoods for individual households
- Provides unbiased estimates when its assumptions hold
- Reduces overfitting by selecting indicators with statistical and non-statistical criteria
- Reports confidence intervals and simple formulas for standard errors
- Aims to be transparent to non-specialists

The basic difference between the two approaches is that poverty mapping seeks to help governments to target pro-poor policies, while the scorecard seeks to help local, pro-poor organizations to manage their social performance.[39] On a technical level, Mistiaen *et al.* estimate consumption directly, whereas the scorecard estimates poverty likelihoods.[40]

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

[40] Haslett and Jones (2006, p. 61) say that "the benefits of [poverty mapping] accrue when interest is in several non-linear functions of the same target variable [such as the poverty gap] . . . or in distributional properties. If only a single measure were of interest, it might be worthwhile to consider direct modelling of this. For example, small-area estimates of poverty incidence could be derived by estimating a logistic regression model for incidence in the survey data". This is what the scorecard here does.

Mistiaen *et al.*'s 12 tools use an average of about eight indicators from among the following 19:

- Demographics:
  - — Logarithm of the number of household members
  - — Sex of the head of the household
  - — Marital status of the head of the household
- Education:
  - — Share of household members who ever attended school
  - — Share of household members who ever attended secondary school or higher
- Characteristics of the residence:
  - — Number of living spaces
  - — Type of floors
  - — Type of outer walls
  - — Type of cooking fuel
  - — Source of energy for lighting
  - — Source of drinking water
  - — Type of toilet arrangement
- Commune-level census means:
  - — Number of household members
  - — Number of household members who ever attended school
  - — Type of floors
  - — Type of outer walls
  - — Source of drinking water
- District-level environment:
  - — Flood risk
  - — Frequency of cyclones

Mistiaen *et al.*'s poverty map is not designed for use by local, pro-poor organizations. For example, there are 12 tools, complicating administration unless an organization works in only a single survey stratum. Also, field workers cannot compute indexes, and an organization's back-office must match up a household and its location with average census values for its district and commune.

While Mistiaen *et al.* report standard errors for estimated poverty rates at the level of the 12 strata for which they construct tools, comparisons with the standard

errors (or α factors) for the scorecard here are not possible because Mistiaen *et al.* do not report person-level sample sizes.

Madagascar's 1993 Census does not measure consumption, so Mistiaen *et al.* cannot use Census data to test the poverty map's accuracy out-of-sample. They do, however, compare the poverty map's person-level estimates of the poverty rate by 100% of the national poverty line with the directly-measured poverty rates in the 1993 EPM (Figure 13). For comparison, the same test is applied with the scorecard here to the same 12 strata in the 2010 EPM. Of course, the test is imperfect because it uses data from two surveys 17 years apart.

In the 12 strata corresponding to the 12 cards in Mistiaen *et al.*'s poverty map, the maximum absolute difference between an estimate and a true value is 12.9 percentage points in urban Antsiranana (versus 17.4 percentage points for the scorecard, also in urban Antsiranana, Figure 13). Across the 12 strata, mean absolute bias is 3.8 percentage points for the poverty map and 6.3 percentage points for the scorecard. Thus, the poverty map's average error is about half that of the scorecard.

Consistent with Elbers, Lanjouw, and Leite (2008), the poverty map's lower bias probably is due to its use of 12 tools (rather than one) and its use of district- and commune-level indicators (rather than only household-level indicators).

Are the poverty-map estimates accurate enough? As a benchmark for *accurate enough*, Mistiaen *et al.*—like Elbers *et al.* (2005) and Demombynes *et al.* (2004)—use the direct-measure estimates in the 12 strata in the 1993 EPM, assuming that their

sample sizes lead to estimates accurate enough to be informative for policy. They say that the poverty-map's point estimates of poverty rates are comparable to the survey's estimates because the null hypothesis of equality is not rejected with more than 95-percent confidence.[41] They also point out that the poverty-map estimates have smaller standard errors than the survey estimates. They thus reason that if the survey's accuracy is adequate, then so is the poverty map's accuracy.

Mistiaen *et al.* (p. 17) conclude that "if researchers and policy-makers are content to use the 1993 EPM in Madagascar to make comparative statements about welfare at the provincial level, then they should be equally comfortable utilising our estimates at the [district] and even [commune] levels, provided that they pay proper attention to the standard errors." But this is overstated, being based only on standard errors and ignoring that bias in poverty-rate estimates for districts and communes is both unknown and likely to be higher than for provinces. Of course, the scorecard has more bias than the poverty map for provinces, and the scorecard is likely to have more bias for districts and communes as well.

[41] This is a weak standard for comparability. For example, it implies that estimates are comparable even with a 90-percent risk of being different. The equally valid null hypothesis that the estimates differ would not be rejected either, implying the opposite of Mistiaen *et al.*'s conclusion. To a lay person, the 8.2-percentage-point difference in urban Antananarivo and the 12.9-percentage point difference in urban Antsiranana would suggest that at least in those two strata, estimates do differ from true values.

10. Conclusion

The scorecard for can be used by pro-poor programs in Madagascar to estimate the likelihood that a given household has consumption below a given poverty line, to estimate the poverty rate of a group of households at a point in time, and to estimate changes in the poverty rate of a group of households between two points in time. The scorecard can also be used to segment clients for targeted services.

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

The scorecard is constructed with half of the data from Madagascar's 2010 EPM, calibrated to nine poverty lines, and tested on data from the other half of the 2010 EPM. Bias and precision are reported for estimates of households' poverty likelihoods, groups' poverty rates at a point in time, and changes in groups' poverty rates over time. Of course, the scorecard's estimates of change are not the same as estimates of program impact. Accuracy for targeting is also reported.

When the scorecard is applied to the validation sample, the maximum absolute difference between estimates versus true poverty rates for groups of households at a point in time is 1.7 percentage points. The average absolute bias across the nine poverty lines is about 0.7 percentage points. Unbiased estimates may be had by subtracting the known bias for a given poverty line from the original estimates.

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

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

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

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

In summary, the scorecard is a practical, transparent, low-cost, objective way for pro-poor programs in Madagascar 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 comes from:

Institut National de la Statistique. (2010) "Manuel des Agents de Terrain (Enquêteur, Contrôleur, et Superviseur)", Antananarivo: Ministère de l'Economie et de l'Industrie, Secrétariat General. [the *Manual*]

and

Institut National de la Statistique. (2010) "Questionnaire Ménage : Enquête Périodique Auprès de Ménages 2010", Antananarivo: Ministère de l'Economie et de l'Industrie, Secrétariat General. [the *Questionnaire*]

General advice for conducting the interview

When an issue arises that is not addressed here, its resolution should be left to the unaided judgment of the enumerator because this apparently is what was done in Madagascar's 2010 EPM. That is, an organization using the scorecard should not promulgate any definitions or rules (other than those in these "Guidelines" here) to be used by all its field agents. Anything not explicitly addressed in these "Guidelines" is to be left to the unaided judgment of the individual enumerator.

In general, the enumerator should accept the responses given by the respondent. Nevertheless, if the respondent says something—or the enumerator sees or senses something—that suggests that the response may not reflect reality or that the respondent is uncertain about his/her response or that the respondent desires assistance in figuring out how to respond, then the enumerator should read the question again and provide whatever assistance he/she deems appropriate based on these "Guidelines". The enumerator does not need to verify responses unless something suggests to him/her that the response may not reflect reality.

In general, the application of the scorecard should mimic as closely as possible the application of Madagascar's 2010 EPM. For example, the poverty-scoring interview should be conducted in the respondent's homestead because the 2010 EPM was conducted in respondents' homesteads.

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

Apparently, INSTAT in Madagascar's 2010 EPM left it up to each individual enumerator (or to local translators) to translate the survey instrument on the fly when needed to a local language or dialect. While the application of the scorecard should, in general, mimic the application of the 2010 EPM, it is ridiculous not to have a standard, well-done, cross-checked translation of the scorecard to languages and dialects that are common in Madagascar. Without a standard translation, the variation in translations and interpretations across enumerators could greatly harm data quality. A translation of the scorecard and its related documentation to French and Malagasy is available at `microfinance.com/#Madagascar`. Organizations that use the scorecard should modify these translations so that the meaning of the original questions and responses (that is, the meaning as expressed in French, the original language of the 2010 EPM) is maintained in the local dialect of Malagasy or in the local non-Malagasy language. Ideally, all organizations using the scorecard in a given dialect or language would coordinate and use a single translation.

Responsibilities of the enumerator

According to p. 3 of the *Manual,* "You [the enumerator] are the most important person in the survey. The quality of the data that is collected depends on your care and effort.

"Follow the guidelines here. In particular, you must read the questions—and record responses—in the same way as do all the other enumerators."

According to p. 4 of the *Manual*, "While interviewing, follow the instructions here. Be careful not to change the meaning of the questions."

According to p. 4 of the *Manual*, "At the end of each interview, make sure that there is a response to all survey questions. . . . Do this verification immediately after the interview [and before leaving the residence of the responding household]."

Who should be the respondent?

According to p. 9 and p. 28 of the *Manual*, "The ideal respondent is the head of the household. If the head is absent at the time of the interview, then another household member—designated by the other members who are present—can be the respondent. The respondent should always be someone who knows the required information. Other household members can help the respondent."

How to establish a good rapport with the respondent

The following is excerpted from pp. 6–8 of the *Manual*.

"*Make a good first impression*. From the moment when you first meet the respondent, you should work to build a good rapport and to inspire confidence. The household's willingness to cooperate with the survey will depend on how well you do this. Your conduct with the household must always be beyond reproach. You must:

- Greet the household with respect
- Ask to speak with whoever is in charge of the household
- Show your identification and—if necessary—your letter from [your organization] that explains the purpose of [the scorecard survey]
- Introduce the survey and its purpose
- Discuss the interview process

"For example, here is an introductory script:

> "Good day. My name is <your name>. I am an enumerator working with <your organization>. Here is my badge. We are doing a survey of clients of <your organization>, and your household, among others, has been selected to participate. The purpose of the survey is to [understand better how clients of <your organization> live]. <Your organization> will use the results to inform what they do. . . . If you would be so kind, I would like to ask you and your household some questions."

"If the respondent is reluctant, then add:

> "The data from the survey will be kept strictly confidential, and nothing will link your responses to you or your household. Your responses to the survey will not be used for tax purposes. . . . Your name and address will not be included in any reports."

"Even if the respondent has no questions and is willing to start the interview without any additional convincing or reassurance, you still should read the above script to them before commencing with the interview proper.

"Maintain a positive attitude right from when you first meet the household. Avoid timid, self-excusing questions such as 'I am sorry, are you busy?' or 'Do you have a few moments to help me out?' Instead, be non-aggressively assertive, saying, for example, 'I would like to speak with you' or 'I would like to ask you some questions'.

"In most cases, the respondent will have questions for you, and you should respond clearly and frankly. For example, the respondent might ask, 'Why was my

household selected?', 'How long will the interview last?', or 'What type of questions are there?' Tell them that the length of the interview varies. . . .

"Be respectful of the customs and culture of the people in the place where you are visiting.

"Be scrupulously on-time for your appointments. If you know you will be late (for example, because the interview with another household is lasting longer than planned), then let the household know you will be late before the appointed hour arrives. That way, you will not need to make excuses afterwards. . . .

"Do not give or receive any gifts to/from the household, and do not promise them anything. . . .

"As the enumerator, you should:

- Carry yourself with confidence and kindness, and always be polite
- Be careful to put your best foot forward when you first meet the household. First impressions are key; they will go a long way in determining how well the household cooperates with the survey
- Avoid all comments—whether positive or negative—in response to what the household says. Such comments could affect how the household responds later
- Try not to get confused nor to show confusion, as it may cause the respondent to lose confidence in you and then to make less effort in his/her responses

"As an enumerator, you must never:

- Smoke in the household's residence
- Interrupt the respondent, nor attempt to hurry him/her up
- Be disrespectful
- Make facial expressions, gestures, or have body language in response to any information furnished by the household

"After introducing yourself, explain the following points to the household:

- The goal of [this survey] is to measure and monitor the living standards of households [who are clients of <your organization>]. As such, your responses will play help inform decisions related to [how <your organization> does things] . . .
- Interviewed households are selected at random. The selection has nothing to do with their opinions/views nor with their characteristics
- All data will be kept strictly confidential

"Once you have explained the survey process and received the permission of the household head, you may proceed to fill out the questionnaire. . . .

Additional general guidelines for interviewing

"Keep all data collected from the household strictly confidential. Reassure the respondents by reminding them that all information that they provide will be kept confidential. . . .

"This implies that you as the enumerator must never:

- Bring along to the interview a third party who has no business being there. . . .
- Delegate tasks to someone who is not a trained member of your organization and who is not supposed to be working with you on the survey
- Allow completed or partially completed questionnaires to fall into the hands of third parties who are not involved in the survey

"The interview should be private, and the information obtained should be treated as confidential. The presence of a third party during the interview who is not a member of the sampled household may affect the quality of the household's responses.

"In the interview proper, follow the guidelines in the questionnaire and in these "Guidelines".

"*Read each question word-for-word exactly as it is in the survey instrument.* Then wait for the respondent to answer. If the respondent answers slowly, do not show any sign of impatience or irritation. If the respondent does not understand the question, then restate it in your own words, being careful not to stray from the original meaning.

"*Try to avoid responses of 'I don't know'.* In such cases, try to help the respondent to find an approximate response that is faithful to the household's reality.

"*Keep the conversation on-track.* Try not to argue or disagree with a respondent. If he/she gives an inappropriate or irrelevant response or simply digresses off-topic, do not suddenly interrupt. Instead, listen patiently to what he/she has to say and then try to politely bring him/her back to the original question that you had asked.

"*Stay neutral.* Do not express surprise, nor approval, nor disapproval in response to anything that the respondent says.

"If you yourself do not understand a question or a procedure, please refer back to these 'Guidelines'." If these "Guidelines" are not relevant, then use your own judgment. In particular, your organization should not promulgate any rules or guidelines for the interpretation of scorecard indicators or responses other than those contained here.

Guidelines relating to specific indicators in the scorecard

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

According to p. 4 of the *Questionnaire*, the enumerator should define *household* for the respondent by reading the following:

"*Household members* are those who normally eat their meals together, who sleep under the same roof, and who recognize the authority of a single person who has the final word on important decisions. Household members must have lived at least 6 months with the household. Exceptions to this six-month rule include newly-weds, newborns, and the household head, who is a member even if he/she has been absent for more than six months. Members of the household may or may not be related to each other by blood or marriage. Someone who has lived elsewhere for more than 6 months is not a household member, even if he/she is a parent or a child of a household member."

According to pages 3–4 of the *Manual*, "A *household* is a group of persons—with or without a blood/marital relationship—who:

- Normally live together (usually eating the mid-day meal together and sleeping in the same compound), and who
- Recognize the authority of a single person known as the *head of the household*

"*Normally living together* means usually eating and sleeping in the same accomodation or residence. This might be a detached house, an apartment, one or more rooms that together comprise a residence, or a set of rooms arranged around a courtyard. . . ."

"All people who meet the first two criteria for at least six months preceding the interview are to be counted as *members of the household*.

"That is, only people who fulfill all three criteria [normally eating together and sleeping in the same residence, recognizing the same household head, and doing these two things for at least six months before the interview] are counted as *members of the household*.

"Nevertheless, there are some exceptions:

- The household head, even if he/she has been away for more than six months
- Newborns who are less than six-months-old
- Newly-weds who have joined/formed the household less than six months ago
- Any other person who—in spite of being away for more than six months—has not in that time been a member of some other household (for example, an apprentice, intern, seasonal migrant worker, soldier, prisoner, etc.)

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, students who do not live, eat, and sleep with the household for more than six months because they are away at school are not to be counted as household members, even if they recognize the head of the household or are supported by the household financially.

2. Can the (oldest) female head/spouse read a simple message?
    A. No
    B. Yes
    C. No female head/spouse

"A person is considered to be *literate*—that is, to be able to read—regardless of language, be it Malagasy or some other language."

According to p. 16 of the *Manual*, "Carry with you a short, simple message to show—if you think it is called for—to the female head/spouse to verify her [ability to read]."

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, enumerators are to ask whether the female head/spouse can read, and they are to accept the respondent's response. If the respondent cannot respond with certainty, then the enumerator should show the female head/spouse a card upon which is written a simple subject-verb-object sentence in the respondent's preferred language. It is up the enumerator to come up with the simple subject-verb-object sentence, as INSTAT did not provide enumerators with a standardized one.

According to p. 3 of the *Manual*, "the *head of the household* is—in principal—chosen by the members of the household. The head is the person who makes major decisions within the household, such as what to consume and when, whether to send children to school, where to send children to school, where to go and what to do when someone falls ill, etc. His/her authority is acknowledged by all other members of the household."

For the purposes of the scorecard, the *(oldest) female head/spouse* is defined as:

- The household head, if the head is a woman
- The oldest spouse/partner/companion of the household head, if the head is a man
- Non-existent, if neither of the previous two criteria are met (that is, if the head is a man but he has no female spouse/partner/companion living in the same household).

3. What is the main material of the floor of the residence?
    A. Other
    B. Dirt (with or without mats)
    C. Wood, stone, or brick
    D. Cement, concrete, or fiberglass

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

4. What is the main permanent ceiling material?
    A. Bark, leaves, stems, dirt, or mud
    B. No ceiling, or other
    C. Matting, wood planks, plywood, particle board, cinder blocks, cement, concrete, or fiberglass

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

5. How many tables does the household have?
    A. None
    B. One
    C. Two or more

According to p. 33 of the *Manual*, "Only count tables that are in working order. Count also tables with only light damage."

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a table that is repairable should be counted. A table is considered to be repairable if the replacement parts required to put it in working order are available for sale in the marketplace.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, any and all tables should be counted, including, for example, tables for specific purposes such as sewing-machine tables, computer tables, or low tables in the living room.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a household is considered to have a table even if it does not currently have it in its possession—for example, if the table has been lent or rented to someone else outside of the household—as long as the household has the right to recall the table from its current user.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a household is considered to have a table even if the table is used partly or completely in a business owned by the household.

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

According to p. 33 of the *Manual*, "Only count beds that are in working order. Count also beds with only light damage."

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a bed that is repairable should be counted. A bed is considered to be repairable if the replacement parts required to put it in working order are available for sale in the marketplace.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a household is considered to have a bed even if it does not have it currently in its possession—for example, if the bed has been lent or rented to someone else outside of the household—as long as the household has the right to recall the bed from its current user.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a household is considered to have a bed even if the bed is used partly or completely in a business owned by the household.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a bunk bed should be counted as two beds.

7. Does the household have a radio, radio/cassette player, or hi-fi stereo system?
    A. No
    B. Yes

According to p. 33 of the *Manual*, "Only count radios, radio/cassette players, or hi-fi stereo systems that are in working order. Count also radios, radio/cassette players, or hi-fi stereo systems with only light damage."

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a radio, radio/cassette player, or hi-fi stereo system that is repairable should be counted. A radio, radio/cassette player, or hi-fi stereo system is considered to be repairable if the replacement parts required to put it in working order are available for sale in the marketplace.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a household is considered to have a radio, radio/cassette player, or hi-fi stereo system even if it does not currently have it in its possession—for example, if the radio, radio/cassette player, or hi-fi stereo system has been lent or rented to someone else outside of the household—as long as the household has the right to recall the radio, radio/cassette player, or hi-fi stereo system from its current user.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a household is considered to have a radio, radio/cassette player, or hi-fi stereo system even if the radio, radio/cassette player, or hi-fi stereo system is used partly or completely in a business owned by the household.

8. Does the household have a television?
    A. No
    B. Yes

According to p. 33 of the *Manual*, "Only count televisions that are in working order. Count also televisions with only light damage."

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a television that is repairable should be counted. A television is considered to be repairable if the replacement parts required to put it in working order are available for sale in the marketplace.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a household is considered to have a television even if it does not currently have it in its possession—for example, if the television has been lent or rented to someone else outside of the household—as long as the household has the right to recall the television from its current user.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a household is considered to have a television even if the television is used partly or completely in a business owned by the household.

9. Does the household have a bicycle, motorcycle/scooter, tractor, or car of its own (not counting business vehicles)?
    A. No
    B. Yes

According to p. 33 of the *Manual*, "Only count bicycles, motorcycles/scooters, tractors, or cars (not counting business vehicles) that are in working order. Count also bicycles, motorcycles/scooters, tractors, or cars (not counting business vehicles) with only light damage."

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a bicycle, motorcycle/scooter, tractor, or car (not counting business vehicle) that is repairable should be counted. A bicycle, motorcycle/scooter, tractor, or car (not counting business vehicle) is considered to be repairable if the replacement parts required to put it in working order are available for sale in the marketplace.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a household is considered to have a bicycle, motorcycle/scooter, tractor, or car (not counting business vehicle) even if it does not currently have it in its possession—for example, if the bicycle, motorcycle/scooter, tractor, or car (not counting business vehicle) has been lent or rented to someone else outside of the household—as long as the household has the right to recall the bicycle, motorcycle/scooter, tractor, or car (not counting business vehicle) from its current user.

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a household is considered to have a bicycle, motorcycle/scooter, tractor, or car (not counting business vehicle) even if the bicycle, motorcycle/scooter, tractor, or car (not counting business vehicle) is used partly or completely in a business owned by the household.

10. Does the household have an agricultural storage shed?
    A. No
    B. Yes

According to p. 33 of the *Manual*, "Only count agricultural storage sheds that are in working order. Count also agricultural storage sheds with only light damage."

According to Faly Hery Rakotomanana, the National Director of Household Surveys at INSTAT, a household is considered to have an agricultural storage shed even if the agricultural storage shed is used partly or completely in a business owned by the household.

Figure 1: Poverty lines and poverty rates for Madagascar and for construction/validation samples, by poverty line, and by households and people

Sample	Line or rate	Level	n	Poverty rates (% with consumption below a given poverty line) and poverty lines (MGA/day/person)								
				National poverty lines				Poorest half	Intl. 2005 PPP			
				Food	100%	150%	200%	below 100% Natl.	$1.25	$2.00	$2.50	$5.00
All Madagascar												
	Line	People		760	1,086	1,629	2,171	581	1,515	2,424	3,030	6,060
	Rate	HHs	12,460	47.6	68.5	84.2	90.9	30.8	82.1	92.8	95.7	99.0
		People		56.5	76.5	89.3	94.3	38.3	87.7	95.4	97.4	99.4
Construction and calibration (Selecting indicators and points, and associating scores with likelihoods)												
	Rate	HHs	6,216	47.6	68.6	84.2	90.9	30.8	82.0	92.7	95.5	99.0
Validation (measuring accuracy)												
	Rate	HHs	6,244	47.5	68.5	84.1	90.9	30.7	82.1	92.8	95.9	99.0

Source: 2010 EPM. Poverty lines in prices for Antananarivo on average from 15 June to 15 October 2010.

Figure 2 (All Madagascar): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	6,320	772	1,103	1,655	2,206	671	1,540	2,463	3,079	6,158
	Rate (households)		26.5	44.3	64.6	78.0	20.1	61.1	82.2	88.5	97.6
	Rate (people)		34.6	54.2	73.3	84.5	27.1	70.3	87.6	92.5	98.7
Rural	Line	6,140	757	1,081	1,622	2,162	559	1,509	2,414	3,018	6,036
	Rate (households)		53.5	75.3	89.7	94.6	33.7	87.9	95.7	97.7	99.4
	Rate (people)		62.1	82.2	93.4	96.8	41.1	92.1	97.4	98.7	99.6
Overall	Line	12,460	760	1,086	1,629	2,171	581	1,515	2,424	3,030	6,060
	Rate (households)		47.6	68.5	84.2	90.9	30.8	82.1	92.8	95.7	99.0
	Rate (people)		56.5	76.5	89.3	94.3	38.3	87.7	95.4	97.4	99.4

Figure 2 (Antananarivo: Analamanga): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	600	827	1,182	1,773	2,364	760	1,649	2,639	3,299	6,598
	Rate (households)		16.7	33.5	53.2	70.3	15.8	49.5	75.6	84.9	97.4
	Rate (people)		23.6	44.2	64.2	78.9	22.1	61.3	82.9	90.6	98.7
Rural	Line	480	787	1,124	1,686	2,248	757	1,568	2,509	3,137	6,273
	Rate (households)		25.6	53.5	75.9	84.8	24.1	72.8	87.1	93.1	97.8
	Rate (people)		32.5	61.7	82.1	89.1	30.8	79.5	90.7	95.1	98.3
Overall	Line	1,080	803	1,148	1,722	2,296	758	1,602	2,563	3,204	6,407
	Rate (households)		21.9	45.1	66.4	78.7	20.7	63.0	82.3	89.6	97.6
	Rate (people)		28.9	54.5	74.8	84.9	27.2	72.0	87.5	93.2	98.5

Figure 2 (Antananarivo: Vakinankaratra): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	300	661	944	1,416	1,887	619	1,317	2,107	2,634	5,268
	Rate (households)		26.1	48.7	68.1	80.9	23.2	65.0	84.0	88.0	97.2
	Rate (people)		34.3	59.5	76.0	86.6	29.8	73.5	89.0	92.0	98.4
Rural	Line	300	674	963	1,445	1,927	572	1,345	2,151	2,689	5,378
	Rate (households)		48.8	74.5	89.0	94.3	34.9	87.6	95.5	97.8	98.9
	Rate (people)		55.7	80.1	91.7	96.2	40.0	90.6	96.7	98.2	99.2
Overall	Line	600	672	959	1,439	1,919	582	1,339	2,142	2,678	5,356
	Rate (households)		43.5	68.4	84.1	91.2	32.1	82.3	92.8	95.5	98.5
	Rate (people)		51.3	75.8	88.5	94.3	37.9	87.1	95.1	96.9	99.0

Figure 2 (Antananarivo: Itasy): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	240	751	1,073	1,610	2,146	577	1,497	2,396	2,995	5,990
	Rate (households)		41.9	64.6	78.6	87.6	26.9	74.9	89.9	92.8	99.1
	Rate (people)		52.2	73.0	84.2	91.1	36.5	81.9	92.7	94.7	99.5
Rural	Line	260	622	889	1,333	1,777	537	1,240	1,984	2,480	4,961
	Rate (households)		47.3	74.1	90.4	95.1	33.1	89.0	96.4	98.3	100.0
	Rate (people)		54.3	80.6	93.2	96.5	40.3	92.3	97.1	98.4	100.0
Overall	Line	500	635	906	1,360	1,813	540	1,265	2,024	2,530	5,060
	Rate (households)		46.8	73.1	89.2	94.3	32.5	87.6	95.7	97.8	99.9
	Rate (people)		54.1	79.9	92.3	96.0	40.0	91.3	96.7	98.1	100.0

Figure 2 (Antananarivo: Bongolava): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	240	730	1,042	1,564	2,085	689	1,455	2,327	2,909	5,819
	Rate (households)		25.2	46.3	71.0	80.5	21.2	66.6	84.1	89.8	97.0
	Rate (people)		32.0	55.2	77.9	85.0	27.6	73.3	88.4	93.7	98.7
Rural	Line	260	713	1,019	1,529	2,038	599	1,422	2,276	2,845	5,689
	Rate (households)		46.6	73.4	91.0	94.2	32.4	87.7	95.5	96.9	99.2
	Rate (people)		56.1	80.1	93.7	96.5	40.1	91.3	97.2	98.3	99.5
Overall	Line	500	716	1,022	1,533	2,045	611	1,427	2,283	2,853	5,707
	Rate (households)		43.8	69.8	88.4	92.5	31.0	85.0	94.0	96.0	98.9
	Rate (people)		52.9	76.8	91.6	95.0	38.4	88.9	96.0	97.7	99.4

Figure 2 (Fianarantsoa: Matsiatra Ambony): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	Food	100%	150%	200%	below 100% Natl.	$1.25	$2.00	$2.50	$5.00
Urban	Line	280	691	987	1,480	1,973	609	1,377	2,203	2,754	5,508
	Rate (households)		32.5	49.7	70.8	80.4	23.1	66.8	84.0	90.4	96.8
	Rate (people)		37.4	55.6	75.2	83.6	27.8	71.4	86.7	91.8	97.4
Rural	Line	260	803	1,147	1,720	2,294	500	1,600	2,561	3,201	6,402
	Rate (households)		71.2	86.5	96.6	97.7	39.5	95.7	98.5	99.4	100.0
	Rate (people)		77.5	91.1	98.5	98.8	45.6	98.3	99.2	99.7	100.0
Overall	Line	540	783	1,118	1,677	2,236	520	1,560	2,496	3,120	6,240
	Rate (households)		63.5	79.1	91.4	94.2	36.2	90.0	95.6	97.6	99.4
	Rate (people)		70.3	84.7	94.3	96.1	42.4	93.4	97.0	98.3	99.5

Figure 2 (Fianarantsoa: Amoron'i Mania): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	260	717	1,025	1,537	2,049	664	1,430	2,288	2,859	5,719
	Rate (households)		27.8	54.8	71.4	86.3	25.2	68.3	89.7	92.7	98.5
	Rate (people)		33.1	61.0	76.7	89.5	30.5	73.7	93.0	95.4	99.3
Rural	Line	260	683	976	1,463	1,951	502	1,361	2,178	2,723	5,445
	Rate (households)		55.9	81.2	91.2	94.9	34.6	90.3	96.2	97.7	99.2
	Rate (people)		66.2	88.2	95.3	97.6	44.1	94.7	98.0	99.0	99.8
Overall	Line	520	687	981	1,471	1,962	521	1,369	2,190	2,738	5,476
	Rate (households)		52.4	78.0	88.8	93.8	33.5	87.6	95.4	97.1	99.1
	Rate (people)		62.5	85.2	93.2	96.7	42.6	92.4	97.4	98.6	99.7

Figure 2 (Fianarantsoa: Vatovavy Fitovinany): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	Food	100%	150%	200%	below 100% Natl.	$1.25	$2.00	$2.50	$5.00
Urban	Line	280	724	1,035	1,552	2,070	470	1,444	2,311	2,889	5,777
	Rate (households)		48.0	62.7	78.8	86.3	25.8	77.2	89.3	93.5	98.9
	Rate (people)		57.4	71.1	85.9	91.0	35.5	84.4	93.0	95.9	99.5
Rural	Line	280	835	1,194	1,790	2,387	546	1,666	2,665	3,331	6,662
	Rate (households)		73.0	89.9	97.8	98.6	40.1	97.3	99.3	100.0	100.0
	Rate (people)		78.7	92.8	98.5	99.1	46.4	98.1	99.5	100.0	100.0
Overall	Line	560	821	1,173	1,759	2,346	536	1,637	2,619	3,274	6,547
	Rate (households)		69.8	86.4	95.4	97.0	38.3	94.7	98.1	99.2	99.9
	Rate (people)		75.9	90.0	96.8	98.0	45.0	96.3	98.7	99.5	99.9

Figure 2 (Fianarantsoa: Ihorombe): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	240	721	1,029	1,544	2,059	468	1,437	2,298	2,873	5,746
	Rate (households)		51.4	66.0	81.7	90.4	29.7	77.1	93.1	96.1	99.1
	Rate (people)		57.6	72.0	85.3	92.9	36.0	81.6	94.8	97.5	99.8
Rural	Line	240	764	1,091	1,637	2,183	613	1,523	2,437	3,046	6,093
	Rate (households)		52.1	76.1	92.9	96.3	32.9	91.7	97.2	98.7	99.5
	Rate (people)		61.8	82.6	95.6	97.9	41.3	94.6	98.2	99.3	99.8
Overall	Line	480	756	1,080	1,620	2,160	586	1,507	2,412	3,014	6,029
	Rate (households)		51.9	74.3	90.9	95.3	32.4	89.1	96.5	98.3	99.4
	Rate (people)		61.1	80.7	93.7	96.9	40.3	92.2	97.5	99.0	99.8

Figure 2 (Fianarantsoa: Atsimo Atsinanana): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	240	707	1,010	1,516	2,021	565	1,410	2,256	2,820	5,640
	Rate (households)		34.9	56.7	78.8	90.1	25.7	75.6	91.4	94.3	99.1
	Rate (people)		41.2	63.1	84.2	92.7	31.6	82.3	93.4	96.1	99.2
Rural	Line	260	737	1,052	1,578	2,104	450	1,468	2,349	2,937	5,873
	Rate (households)		81.4	94.9	98.6	99.1	42.2	97.3	99.4	100.0	100.0
	Rate (people)		86.1	97.5	99.5	99.7	48.8	98.9	99.8	100.0	100.0
Overall	Line	500	734	1,049	1,573	2,097	460	1,463	2,341	2,927	5,853
	Rate (households)		76.4	90.8	96.5	98.2	40.4	94.9	98.6	99.4	99.9
	Rate (people)		82.1	94.5	98.1	99.1	47.3	97.4	99.3	99.7	99.9

Figure 2 (Toamasina: Atsinanana): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	380	843	1,205	1,807	2,410	688	1,681	2,690	3,363	6,725
	Rate (households)		31.6	49.2	70.4	83.8	22.2	64.7	87.6	91.7	97.4
	Rate (people)		41.2	60.2	78.7	90.1	30.1	74.4	92.6	95.4	98.8
Rural	Line	280	831	1,187	1,780	2,374	542	1,656	2,650	3,313	6,625
	Rate (households)		64.3	83.0	93.0	95.3	37.2	91.1	95.8	97.3	99.3
	Rate (people)		72.8	88.7	96.5	97.8	44.3	95.0	98.2	99.0	99.8
Overall	Line	660	834	1,191	1,787	2,382	576	1,662	2,659	3,324	6,648
	Rate (households)		56.0	74.4	87.3	92.4	33.4	84.4	93.8	95.9	98.9
	Rate (people)		65.5	82.1	92.4	96.0	41.0	90.2	96.9	98.2	99.6

Figure 2 (Toamasina: Analanjirofo): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	260	867	1,239	1,858	2,478	694	1,729	2,766	3,457	6,915
	Rate (households)		37.7	53.1	69.9	82.9	24.2	69.1	85.2	91.7	96.2
	Rate (people)		44.0	59.4	76.2	87.6	29.7	75.7	89.5	94.5	97.4
Rural	Line	280	818	1,169	1,753	2,338	526	1,631	2,610	3,262	6,524
	Rate (households)		65.6	82.5	92.2	96.8	35.8	90.4	97.5	98.8	100.0
	Rate (people)		74.6	89.1	95.9	99.1	44.6	94.8	99.3	99.7	100.0
Overall	Line	540	827	1,182	1,773	2,364	558	1,650	2,639	3,299	6,598
	Rate (households)		59.9	76.5	87.6	93.9	33.4	86.0	95.0	97.4	99.2
	Rate (people)		68.8	83.5	92.2	96.9	41.7	91.2	97.4	98.7	99.5

Figure 2 (Toamasina: Alaotra Mangoro): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	260	701	1,002	1,503	2,003	643	1,398	2,237	2,796	5,592
	Rate (households)		19.5	38.2	59.3	70.9	16.7	56.3	75.7	82.1	96.5
	Rate (people)		27.1	47.5	68.2	77.3	23.8	65.8	81.2	85.9	97.9
Rural	Line	260	682	975	1,462	1,950	605	1,360	2,177	2,721	5,442
	Rate (households)		36.0	66.1	85.9	93.6	28.0	84.8	94.5	97.5	99.0
	Rate (people)		44.7	72.2	89.4	95.9	36.1	88.7	96.5	97.8	98.8
Overall	Line	520	685	979	1,469	1,958	611	1,367	2,186	2,733	5,466
	Rate (households)		33.3	61.5	81.6	90.0	26.2	80.2	91.4	95.0	98.6
	Rate (people)		41.8	68.2	86.0	92.9	34.1	85.0	94.0	95.8	98.6

Figure 2 (Mahajanga: Boeny): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	340	716	1,023	1,534	2,045	693	1,427	2,283	2,854	5,709
	Rate (households)		19.1	37.4	64.7	77.4	17.8	58.0	80.2	86.4	96.5
	Rate (people)		25.0	45.2	71.9	83.9	22.6	65.3	86.0	90.9	97.7
Rural	Line	280	692	989	1,483	1,978	602	1,380	2,208	2,760	5,520
	Rate (households)		35.0	59.6	83.4	92.4	27.3	78.8	93.2	96.1	99.2
	Rate (people)		44.7	69.9	88.5	95.2	35.0	85.5	95.8	97.5	99.6
Overall	Line	620	699	999	1,498	1,998	629	1,394	2,231	2,788	5,576
	Rate (households)		29.8	52.4	77.3	87.6	24.2	72.1	89.0	93.0	98.4
	Rate (people)		38.8	62.6	83.6	91.8	31.3	79.5	92.9	95.6	99.1

Figure 2 (Mahajanga: Sofia): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	280	699	999	1,498	1,998	664	1,394	2,231	2,788	5,576
	Rate (households)		21.0	41.5	59.5	77.4	18.4	55.4	82.7	87.6	95.5
	Rate (people)		29.8	52.8	71.4	85.8	26.4	66.6	89.5	92.3	97.3
Rural	Line	340	607	867	1,301	1,734	531	1,210	1,936	2,420	4,840
	Rate (households)		36.3	66.1	86.9	94.0	29.6	84.0	95.5	97.1	99.3
	Rate (people)		44.0	73.8	90.8	96.1	36.9	88.3	97.1	98.2	99.6
Overall	Line	620	617	881	1,322	1,763	546	1,230	1,968	2,460	4,921
	Rate (households)		34.6	63.5	84.0	92.3	28.4	80.9	94.1	96.0	98.9
	Rate (people)		42.4	71.5	88.7	94.9	35.8	85.9	96.2	97.6	99.4

Figure 2 (Mahajanga: Betsiboka): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	240	763	1,090	1,636	2,181	740	1,522	2,435	3,044	6,087
	Rate (households)		29.2	57.2	83.1	91.5	26.3	78.2	93.8	94.3	100.0
	Rate (people)		36.3	66.4	88.0	94.7	33.2	84.4	96.3	96.6	100.0
Rural	Line	240	768	1,097	1,645	2,193	586	1,530	2,448	3,060	6,121
	Rate (households)		58.9	79.2	93.1	97.7	36.9	91.7	97.7	98.7	99.2
	Rate (people)		66.0	84.7	94.7	98.1	42.3	93.9	98.1	98.7	99.6
Overall	Line	480	767	1,096	1,644	2,191	606	1,529	2,447	3,058	6,116
	Rate (households)		54.6	76.0	91.6	96.8	35.4	89.8	97.1	98.1	99.4
	Rate (people)		62.0	82.2	93.8	97.6	41.1	92.6	97.8	98.5	99.7

Figure 2 (Mahajanga: Melaky): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	240	700	1,000	1,500	2,000	652	1,396	2,233	2,791	5,582
	Rate (households)		25.7	49.9	74.8	84.2	21.0	70.9	87.9	92.5	98.5
	Rate (people)		35.3	60.5	82.5	89.1	30.3	79.6	91.7	94.9	99.1
Rural	Line	240	771	1,101	1,652	2,202	607	1,537	2,459	3,074	6,147
	Rate (households)		57.4	79.3	93.1	97.1	35.6	91.6	97.5	98.9	99.7
	Rate (people)		66.7	85.8	96.0	98.4	42.9	94.8	98.5	99.4	99.9
Overall	Line	480	755	1,079	1,618	2,158	617	1,506	2,409	3,011	6,022
	Rate (households)		49.9	72.4	88.8	94.0	32.2	86.7	95.3	97.3	99.4
	Rate (people)		59.8	80.2	93.0	96.4	40.1	91.5	97.0	98.4	99.8

Figure 2 (Toliara: Atsimo Andrefana): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	280	816	1,166	1,750	2,333	661	1,628	2,604	3,255	6,511
	Rate (households)		35.4	54.8	77.9	88.8	24.6	75.4	92.2	94.9	99.2
	Rate (people)		46.4	65.9	84.0	92.7	32.9	82.1	95.2	96.7	99.8
Rural	Line	360	904	1,292	1,938	2,584	513	1,803	2,884	3,606	7,211
	Rate (households)		62.8	81.7	91.9	97.4	36.7	91.7	97.4	98.3	99.5
	Rate (people)		71.0	87.4	95.0	98.3	43.7	94.7	98.3	99.1	99.8
Overall	Line	640	883	1,261	1,892	2,522	549	1,760	2,816	3,520	7,039
	Rate (households)		55.9	74.9	88.4	95.3	33.7	87.6	96.1	97.5	99.4
	Rate (people)		65.0	82.1	92.3	97.0	41.1	91.6	97.6	98.5	99.8

Figure 2 (Toliara: Androy): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	240	878	1,255	1,882	2,509	335	1,751	2,801	3,502	7,003
	Rate (households)		83.9	93.7	98.5	99.0	38.5	98.5	99.7	100.0	100.0
	Rate (people)		85.6	94.4	98.2	99.3	47.2	98.2	99.6	100.0	100.0
Rural	Line	240	804	1,149	1,723	2,297	334	1,603	2,564	3,206	6,411
	Rate (households)		81.3	92.4	96.5	98.8	42.3	96.5	99.5	100.0	100.0
	Rate (people)		84.8	94.3	97.0	98.6	47.2	97.0	99.0	100.0	100.0
Overall	Line	480	817	1,167	1,750	2,333	334	1,628	2,605	3,256	6,512
	Rate (households)		81.7	92.6	96.8	98.8	41.6	96.8	99.5	100.0	100.0
	Rate (people)		84.9	94.4	97.2	98.8	47.2	97.2	99.1	100.0	100.0

Figure 2 (Toliara: Anosy): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	280	767	1,096	1,645	2,193	618	1,530	2,448	3,060	6,120
	Rate (households)		29.0	44.6	65.7	78.6	19.2	62.5	81.9	89.9	97.9
	Rate (people)		38.6	55.1	72.5	82.9	27.5	70.8	85.3	92.6	98.7
Rural	Line	240	818	1,169	1,754	2,338	526	1,632	2,610	3,263	6,526
	Rate (households)		68.3	83.3	93.0	96.3	36.7	91.8	96.7	97.7	100.0
	Rate (people)		76.8	87.6	95.6	98.2	43.8	94.5	98.4	98.7	100.0
Overall	Line	520	812	1,160	1,740	2,320	538	1,619	2,590	3,238	6,475
	Rate (households)		63.5	78.5	89.6	94.1	34.6	88.2	94.9	96.7	99.8
	Rate (people)		72.0	83.5	92.7	96.3	41.8	91.5	96.8	98.0	99.8

Figure 2 (Toliara: Menabe): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	280	618	884	1,325	1,767	562	1,233	1,973	2,466	4,932
	Rate (households)		19.2	33.7	52.4	67.6	15.7	48.1	73.2	80.8	97.8
	Rate (people)		23.4	38.9	57.4	72.0	19.5	53.3	77.3	83.5	98.4
Rural	Line	240	646	923	1,385	1,847	572	1,288	2,061	2,577	5,154
	Rate (households)		41.9	67.7	84.5	91.3	32.2	83.4	93.8	98.3	100.0
	Rate (people)		46.7	72.5	88.5	93.6	36.2	87.6	95.6	99.1	100.0
Overall	Line	520	639	913	1,370	1,827	569	1,275	2,040	2,549	5,099
	Rate (households)		36.2	59.1	76.4	85.4	28.1	74.5	88.6	93.9	99.5
	Rate (people)		40.9	64.2	80.8	88.2	32.1	79.1	91.0	95.2	99.6

Figure 2 (Antsiranana: Diana): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	280	855	1,221	1,832	2,443	952	1,704	2,727	3,409	6,817
	Rate (households)		7.7	23.6	47.8	63.8	10.9	44.6	71.2	82.5	96.7
	Rate (people)		11.8	31.7	58.7	73.7	15.9	55.3	80.5	89.2	98.9
Rural	Line	240	867	1,238	1,857	2,476	720	1,728	2,764	3,455	6,910
	Rate (households)		35.6	56.2	79.3	90.8	25.9	75.8	94.1	95.9	99.1
	Rate (people)		46.0	69.2	89.3	95.8	34.6	86.2	97.5	98.6	99.6
Overall	Line	520	862	1,231	1,847	2,463	812	1,718	2,749	3,437	6,874
	Rate (households)		24.7	43.5	67.0	80.2	20.0	63.6	85.1	90.7	98.1
	Rate (people)		32.5	54.4	77.2	87.1	27.2	74.0	90.8	94.9	99.4

Figure 2 (Antsiranana: Sava): Poverty lines and poverty rates by poverty line and by households and people

			National poverty line				Poorest half	International 2005 PPP			
		n	**Food**	**100%**	**150%**	**200%**	**below 100% Natl.**	**$1.25**	**$2.00**	**$2.50**	**$5.00**
Urban	Line	280	796	1,137	1,706	2,275	700	1,587	2,539	3,174	6,348
	Rate (households)		19.5	34.0	57.7	73.9	15.5	53.7	79.1	88.1	97.8
	Rate (people)		23.9	38.9	65.6	80.1	19.4	62.0	84.2	93.1	99.0
Rural	Line	300	769	1,098	1,648	2,197	600	1,533	2,453	3,066	6,131
	Rate (households)		50.8	70.5	89.4	94.2	30.9	87.0	96.8	98.6	99.5
	Rate (people)		59.9	78.7	93.7	96.9	39.4	91.6	98.5	99.7	99.9
Overall	Line	580	771	1,102	1,653	2,204	609	1,538	2,461	3,076	6,152
	Rate (households)		47.3	66.4	85.9	92.0	29.2	83.3	94.9	97.4	99.3
	Rate (people)		56.5	74.9	91.0	95.3	37.5	88.8	97.1	99.1	99.8

Figure 3: Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
16,199	What is the main source of lighting for the residence? (Kerosene, or other; Candles; Electricity (grid or generator))
15,688	How many household members are 18-years-old or younger? (Six or more; Five; Four; Three; Two; One; None)
15,659	How many household members are 15-years-old or younger? (Cinq or more; Five; Four; Three; Two; One; None)
15,589	How many household members are 16-years-old or younger? (Cinq or more; Five; Four; Three; Two; One; None)
15,493	How many household members are 14-years-old or younger? (Cinq or more; Five; Four; Three; Two; One; None)
15,395	How many household members are 17-years-old or younger? (Cinq or more; Five; Four; Three; Two; One; None)
15,131	What is the main type of fuel used by the household for cooking? (Collected firewood; Purchased firewood, kerosene, or other; Charcoal, LPG, or electricity)
15,057	How many household members are 13-years-old or younger? (Cinq or more; Five; Four; Three; Two; One; None)
14,980	How many household members are 12-years-old or younger? (Cinq or more; Five; Four; Three; Two; One; None)
14,872	Does the household have a television and a CD player, VCD, DVD or other digital play-back device? (None; Only television; Only CD player, VCD, DVD or other digital play-back device; Both)
14,685	How many landline and cellular telephones does the household have? (None; One; Two or more)
14,526	How many household members are 11-years-old or younger? (Four or more; Four; Three; Two; One; None)
13,888	Does the household have a television? (No; Yes)
12,791	In their main occupation, how many household members are skilled agricultural and fishery workers or are in elementary occupations? (Six or more; Five; Four; Three; Two; One; None)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
12,405	How many members does the household have? (Nine or more; Eight; Seven; Six; Five; Four; Three; Two; One)
12,319	How many chairs does the household have? (None; One or two; Three; Four or more)
12,293	Does the household have any home-made kerosene lamps (*kapoaka*)? (Yes; No)
12,260	Does the household have a CD player, VCD, DVD or other digital play-back device? (No; Yes)
12,076	In their main occupation, how many household members are skilled agricultural and fishery workers? (Four or more; Three; Two; One; None)
11,489	How many household members are 6-years-old or younger? (Three or more; Two; One; None)
10,742	What is the main material of the floor of the residence? (Other; Dirt (with or without mats); Wood, stone, or brick; Cement, concrete, or fiberglass)
9,896	How many tables does the household have? (None; One; Two or more)
9,279	What does the (oldest) female head/spouse do in her main occupation? (Skilled agricultural and fishery workers; Elementary occupations; Craft and related trades workers; No male head/spouse; Does not work; Other)
8,930	What is the main source of drinking water for the household? (River, dam, lake, pond, river, canal, rainwater, tanker truck, water seller, or other; Unprotected spring; Well with a manual pump, unprotected well without a pump, or protected or covered spring; Bore-hole with a manual pump, or protected well without a pump; Public standpipe; Shared tap in the yard, tap inside the residence, private tap in the yard, or bottled water)
8,800	What is the highest grade that the male head/spouse has completed? (No male head/spouse; None, or pre-school; T1 or CP, or T2 or CE1; T3 or CE2; T4 or CM1; T5 or CM2, or T6 or sixth; T7 or fifth, or T8 or fourth; T9 or third, T10 or second, T11 or first, T12 or final, U1, U2, U3, U4, U5 or plus, or professional training)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
8,254	What is the highest grade that the (oldest) female head/spouse has completed? (No female head/spouse; None, pre-school, T1 or CP, or T2 or CE1; T3 or CE2, T4 or CM1, T5 or CM2, T6 or sixth, or T7 or fifth; T8 or fourth, T9 or third, T10 or second, T11 or first, T12 or final, U1, U2, U3, U4, U5 or more, or professional training)
7,440	What is the main material of the external walls of the main building of the residence? (Bark, leaves, stems, or other; Dirt or mud; Wooden planks; Bricks; Corrugated metal sheets, plywood, particle board, drums/barrels, stones, cinder blocks, cement, concrete, or fiberglass)
7,253	What is the main material of the external walls of the main building? (Bark, leaves, stems, or other; Dirt or mud; Wooden planks; Bricks; Corrugated metal sheets, plywood, particle board, drums/barrels, stones, cinder blocks, cement, concrete, or fiberglass)
7,237	What does the male head/spouse do in his main occupation? (Skilled agricultural and fishery worker; No male head/spouse; Elementary occupations; Does not work; Other)
7,174	What is the main permanent ceiling material? (Bark, leaves, stems, dirt, or mud; No ceiling, or other; Matting, wood planks, plywood, particle board, cinder blocks, cement, concrete, or fiberglass)
7,098	Does the household have a animal-drawn plow? (No; Yes)
6,960	What type of toilet arrangement does the household use, and is it shared with other households? (Bush, or other; Non-shared open pit; Shared latrine with a floor of wood, dirt, . . .; Non-shared latrine with a floor of wood, dirt, . . .; Shared open pit; English-style flush toilet (shared or not), squat toilet (shared or not), or toilet on a floor of smooth concrete, porcelain, or fiberglass (shared or not)
6,831	If the household used agricultural land in the past 12 months, does it now have any draft zebus, beef cattle/zebus, dairy cattle, pigs, chickens, geese, sheep, goats, rabbits, or turkeys/ducks? (There is farming, but no livestock; There is farming, and there is livestock; There is no farming)
6,788	If the household used agricultural land in the past 12 months, does it now have any dairy cattle? (There is farming, but no dairy cattle; There is farming, and there is dairy cattle; There is no farming)
6,733	If the household used agricultural land in the past 12 months, does it now have any chickens? (There is farming, but no chickens; There is farming, and there is chickens; There is no farming)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
6,697	If the household used agricultural land in the past 12 months, does it now have any geese, sheep, goats, rabbits, or turkeys/ducks? (There is farming, but no geese, sheep, goats, rabbits, or turkeys/ducks; There is farming, and there is geese, sheep, goats, rabbits, or turkeys/ducks; There is no farming)
6,680	Did all household members ages 6 to 14 going to school in the previous school year? (Attendance for at least 3 months) (No; Yes; No members are ages 6 to 14)
6,671	If the household used agricultural land in the past 12 months, does it now have ay draft zebus, beef cattle/zebus, or dairy cattle? (There is farming, but no draft zebus, beef cattle/zebus, or dairy cattle; There is farming, and there is draft zebus, beef cattle/zebus, or dairy cattle; There is no farming)
6,653	Did all household members ages 6 to 16 going to school in the previous school year? (Attendance for at least 3 months) (No; Yes; No members are ages 6 to 16)
6,650	If the household used agricultural land in the past 12 months, does it now have any beef cattle/zebus? (There is farming, but no cattle/zebus; There is farming, and there is cattle/zebus; There is no farming)
6,649	If the household used agricultural land in the past 12 months, does it now have any draft zebus? (There is farming, but no draft zebus; There is farming, and there is draft zebus; There is no farming)
6,645	If the household used agricultural land in the past 12 months, does it now have any pigs? (There is farming, but no pigs; There is farming, and there is pigs; There is no farming)
6,641	Did all household members ages 6 to 15 going to school in the previous school year? (Attendance for at least 3 months) (No; Yes; No members are ages 6 to 15)
6,632	Has the household used agricultural land in the past 12 months? (Yes; No)
6,552	What is the employment status of the (oldest) female head/spouse her main occupation? (Unpaid family worker, unskilled salaried laborer, or self-employed; Unskilled salaried laborer, paid intern, non-salaried owner with employees, or apprentice; No (oldest) female head/spouse; Does not work; Salaried upper management, salaried middle management or manager, or skilled blue-collar or white-collar salaried worker)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
6,359	Did all household members ages 6 to 13 going to school in the previous school year? (Attendance for at least 3 months) (No; Yes; No members are ages 6 to 13)
6,258	Did all household members ages 6 to 12 going to school in the previous school year? (Attendance for at least 3 months) (No; Yes; No members are ages 6 to 12)
6,145	Can the (oldest) female head/spouse read a simple message? (No; Yes; No female head/spouse)
6,046	Did all household members ages 6 to 11 going to school in the previous school year? (Attendance for at least 3 months) (No; Yes; No members are ages 6 to 11)
6,045	Did all household members ages 6 to 18 going to school in the previous school year? (Attendance for at least 3 months) (No; Yes; No members are ages 6 to 18)
5,981	Did all household members ages 6 to 17 going to school in the previous school year? (Attendance for at least 3 months) (No; Yes; No members are ages 6 to 17)
5,811	How does the household dispose of its trash? (Thrown on the ground by the household without public or private collection; Burned by the household; Buried by the household, or other; Public or private collection)
5,489	How many beds does the household have? (None; One; Two; Three or more)
5,175	What is the employment status of the male head/spouse his main occupation? (Does not work, unskilled salaried laborer, paid intern, apprentice, or unpaid family worker; No male head/spouse; Unskilled salaried laborer; Self-employed; Non-salaried owner with employees; Salaried upper management, salaried middle management or manager, or skilled blue-collar or white-collar salaried worker)
5,008	In their main occupation, how many household members are salaried upper managers, salaried middle managers, salaried managers, salaried skilled blue-collar or white-collar workers, or non-salaried business owners with employees? (None; One or more)
4,610	In their main occupation, how many household members are unskilled salaried laborers or paid interns? (None; One or more)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
4,480	What is the tenancy status of the household in its residence? (Owner, provided for free by some other person or household, makeshift dwelling not intended for human habitation, or other; Renter, or employer-provided housing)
4,402	What is the marital status of the (oldest) female head/spouse? (Married under tribal customs (monogamous or polygamous); Co-habiting (monogamous or polygamous); Divorced, separated, or widowed; Single, never-married; Married with legal documentation; No (oldest) female head/spouse)
4,389	Does the household have a bicycle, motorcycle/scooter, tractor, or car of its own (not counting business vehicles)? (No; Yes))
4,239	How many mats does the household have? (Five or more; Four; Three; Two, One; None)
4,146	How many household members worked for at least one hour during the past seven days? (Three or more; Two; One; None)
3,984	What is the marital status of the male head/spouse? (Married under tribal customs (monogamous or polygamous); Co-habiting (monogamous or polygamous); Divorced, separated, or widowed; Single, never-married; Married with legal documentation; No male head/spouse)
3,973	Does the household have a radio, radio/cassette player, or hi-fi stereo system? (No; Yes)
3,933	What type of dwelling does the household live in? (Traditional detached house; Apartment, studio apartment, rented room, modern detached house, or other)
3,687	In their main occupation, how many household members are self-employed? (Two or more; One; None)
3,352	Did any household members go to a private school (charter, private for-profit, private non-profit, or private religious) in the previous school year? (Attendance for at least 3 months)? (Yes; No)
3,321	Does the household have a hi-fi stereo system? (No; Yes)
3,243	Does the household have a house? (Yes; No)
3,144	Does the household have any real estate (property, beachfront, lake)? (Yes; No)
3,045	Does the household have a refrigerator or freezer? (No; Yes)
2,863	Can the male head/spouse read a simple message? (No male head/spouse; No; Yes)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
2,537	Does the household have a bicycle? (No; Yes)
2,535	How many hand tools does the household have? (Six or more; Five; Four; Three; Two; One; None)
2,450	Did the (oldest) female head/spouse work for at least one hour during the past seven days? (Yes; No; No (oldest) female head/spouse)
2,386	Does the household have a sewing machine? (No; Yes)
2,217	Does the household now have any draft zebus, beef cattle/zebus, dairy cattle, pigs, chickens, geese, sheep, goats, rabbits, or turkeys/ducks? (Yes; No)
2,152	What is the area of the rooms occupied by the household occupy? (Do not include kitchens, bathrooms, hallways, nor balconies) (0 to 9; 10 to 15; 16 to 19; 20 to 24; 25 to 29; 30 to 39; 40 to 49; 50 ou plus)
1,991	Does the household have a computer? (No; Yes)
1,841	In their main occupation, is the male or female head/spouse self-employed in non-agriculture? (No; Yes)
1,821	How many rooms does the household occupy? (Do not count kitchens, bathrooms, hallways, nor balconies) (One; Two; Three or more)
1,781	Does the household have a radio/cassette player? (No; Yes)
1,712	Does the household have any chickens? (Yes; No)
1,566	Does the household have a camera (still or video)? (No; Yes)
1,437	Does the household have a gas stove? (No; Yes)
1,422	Does the household have a motorcycle or scooter? (No; Yes)
1,383	In their main occupation, how many household members are in elementary occupations? (Three or more; Two; One; None)
1,201	What is the structure of household headship? (Both male and female heads/spouses; Only female head/spouse; Only male head/spouse)
1,120	Does the household have a tractor or car of its own (not counting business vehicles) (No; Yes)
983	In their main occupation, are any household members unskilled salaried laborers or paid interns? (Yes; No)
800	Does the household have a radio? (Non; Oui)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
773	Does the household have a VCR? (No; Yes)
514	Does the household treat its drinking water? (No; Yes)
496	Does the household have any geese, sheep, goats, and rabbits? (Yes; Non)
427	Does the household have any draft zebus, beef cattle/zebus, or dairy cattle? (Yes; Non)
348	Does the household have any geese, sheep, goats, or rabbits? (Yes; No)
174	Does the household have any draft zebus? (Yes; Non)
133	Does the household have a animal-drawn plow and cart/carriage? (None; Only cart/carriage; Only plow; Plow, and cart/carriage)
114	Did the male head/spouse work for at least one hour during the past seven days? (No male head/spouse; Yes; No)
113	Does the household have any pigs? (Yes; No)
52	Does the household have any dairy cattle? (No; Yes)
40	Does the household have a animal-drawn plow? (No; Yes)
9	Does the household have an agricultural storage shed? (No; Yes)
3	Does the household have a animal-drawn cart or carriage? (No; Yes)
0	Does the household have any agricultural buildings? (Non; Oui)

Source: 2010 EPM and the national poverty line

Tables for
100% of the National Poverty Line

(and Tables Pertaining to All Nine Poverty Lines)

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	99.0
15–19	98.3
20–24	97.2
25–29	94.6
30–34	89.1
35–39	83.3
40–44	68.9
45–49	51.9
50–54	38.5
55–59	18.5
60–64	11.8
65–69	8.6
70–74	2.3
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

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

Score	Households at score and < poverty line		All households at score		Poverty likelihood (%)
0–4	74	÷	74	=	100.0
5–9	847	÷	847	=	100.0
10–14	3,063	÷	3,095	=	99.0
15–19	6,074	÷	6,182	=	98.3
20–24	10,167	÷	10,455	=	97.2
25–29	10,289	÷	10,872	=	94.6
30–34	10,366	÷	11,640	=	89.1
35–39	10,574	÷	12,689	=	83.3
40–44	7,515	÷	10,901	=	68.9
45–49	4,708	÷	9,070	=	51.9
50–54	2,913	÷	7,575	=	38.5
55–59	1,049	÷	5,661	=	18.5
60–64	575	÷	4,874	=	11.8
65–69	221	÷	2,574	=	8.6
70–74	46	÷	2,039	=	2.3
75–79	0	÷	915	=	0.0
80–84	0	÷	324	=	0.0
85–89	0	÷	156	=	0.0
90–94	0	÷	57	=	0.0
95–100	0	÷	0	=	0.0

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

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

	Likelihood (%) that daily per-capita consumption is in a range demarcated by adjacent poverty lines									
Score	<Poorest half below natl. <MGA581	≥Poorest half and <Food ≥MGA581 and <MGA760	≥Food and <100% Natl. ≥MGA760 and <MGA1,086	≥100% Natl. and <$1.25/day ≥MGA1,086 and <MGA1,515	≥$1.25/day and <150% Natl. ≥MGA1,515 and <MGA1,629	≥150% Natl. and <200% Natl. ≥MGA1,629 and <MGA2,171	≥200% Natl. and <$2.00/day ≥MGA2,171 and <MGA2,424	≥$2.00/day and <$2.50/day ≥MGA2,424 and <MGA3,030	≥$2.50/day and <$5.00/day ≥MGA3,030 and <MGA6,060	≥$5.00/day ≥MGA6,060
0–4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5–9	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10–14	82.9	12.8	3.2	1.0	0.0	0.0	0.0	0.0	0.0	0.0
15–19	70.1	18.1	10.0	1.5	0.0	0.2	0.0	0.0	0.0	0.0
20–24	56.3	26.0	15.0	2.3	0.1	0.3	0.0	0.0	0.1	0.0
25–29	48.8	28.2	17.6	3.7	0.5	0.8	0.0	0.1	0.2	0.0
30–34	36.9	26.8	25.4	7.9	1.0	1.1	0.3	0.3	0.3	0.0
35–39	29.9	22.5	31.0	12.0	1.8	1.9	0.2	0.4	0.3	0.0
40–44	19.1	16.9	33.0	19.8	2.5	5.8	0.8	1.4	0.7	0.2
45–49	13.3	9.7	28.9	29.4	3.3	9.7	1.7	1.9	1.5	0.6
50–54	4.7	6.0	27.7	30.4	5.1	15.3	3.2	3.8	3.0	0.8
55–59	2.2	2.2	14.1	27.2	7.3	23.7	5.0	10.1	6.9	1.3
60–64	1.3	1.5	8.9	18.9	6.3	23.8	11.2	14.3	11.9	1.7
65–69	0.8	0.8	7.1	16.6	3.6	25.4	11.1	14.8	17.0	3.0
70–74	0.5	0.2	1.6	9.6	3.2	19.8	6.9	18.0	34.9	5.4
75–79	0.0	0.0	0.0	6.3	0.3	12.4	4.6	10.6	50.9	14.9
80–84	0.0	0.0	0.0	1.4	0.2	4.5	6.8	13.6	44.1	29.4
85–89	0.0	0.0	0.0	0.7	0.1	1.6	3.0	5.1	43.3	46.3
90–94	0.0	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	0.0	100.0

Figure 7 (100% of the national line): Average differences by score range between estimated and true poverty likelihoods for households, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of $n = 16{,}384$

	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	+3.5	2.3	2.7	3.6
10–14	+1.2	1.0	1.3	1.6
15–19	+0.5	0.8	1.0	1.2
20–24	+0.8	0.7	0.8	1.1
25–29	–2.1	1.4	1.4	1.6
30–34	–0.6	1.3	1.5	2.1
35–39	+0.2	1.5	1.7	2.2
40–44	–0.9	1.9	2.3	3.0
45–49	–2.0	2.4	2.9	3.9
50–54	–5.8	4.2	4.5	5.0
55–59	–12.7	8.0	8.3	8.6
60–64	–6.8	4.7	5.0	5.5
65–69	+3.8	2.1	2.5	3.3
70–74	–1.0	1.6	1.9	2.6
75–79	–7.8	6.4	6.8	7.6
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 (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, scorecard applied to the validation sample with 1,000 bootstraps of various sample sizes

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.8	65.2	82.4	92.7
4	–0.7	33.3	39.9	54.0
8	–1.3	22.7	27.9	37.2
16	–1.4	16.4	19.4	24.7
32	–1.6	11.9	14.1	18.5
64	–1.7	8.4	10.0	13.9
128	–1.7	5.5	6.4	8.8
256	–1.7	4.0	4.7	5.8
512	–1.7	2.8	3.4	4.3
1,024	–1.7	2.0	2.4	3.2
2,048	–1.7	1.5	1.7	2.2
4,096	–1.7	1.0	1.2	1.6
8,192	–1.7	0.7	0.8	1.2
16,384	–1.7	0.5	0.6	0.8

Figure 9 (All poverty lines): Average differences between estimates and true values for poverty rates of a group of households at a point in time, precision, and the α factor for precision, scorecard applied to the validation sample

	Poverty line								
	National poverty lines				Poorest half	Intl. 2005 PPP			
	Food	100%	150%	200%	below 100% Natl.	$1.25	$2.00	$2.50	$5.00
Estimate minus true value	–1.5	–1.7	–1.0	–0.3	+0.1	–1.2	–0.2	–0.3	+0.3
Precision of difference	0.6	0.5	0.4	0.3	0.6	0.4	0.3	0.2	0.1
α factor for precision	0.89	0.84	0.82	0.82	0.97	0.81	0.83	0.82	1.05

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

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

Differences and precision estimated from 1,000 bootstraps with n = 16,384.

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

Figure 10 (All poverty lines): Possible targeting outcomes

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

Figure 11 (100% of the national line): Shares of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.1	68.4	0.0	31.5	31.6	–99.8
≤9	0.9	67.6	0.0	31.5	32.4	–97.4
≤14	3.9	64.6	0.1	31.4	35.3	–88.4
≤19	9.9	58.5	0.3	31.3	41.2	–70.6
≤24	19.9	48.6	0.8	30.7	50.6	–40.8
≤29	30.3	38.2	1.3	30.3	60.6	–9.7
≤34	40.6	27.9	2.6	29.0	69.5	+22.3
≤39	51.0	17.5	4.9	26.7	77.6	+56.0
≤44	58.4	10.0	8.3	23.2	81.7	+82.9
≤49	63.2	5.3	12.6	18.9	82.1	+81.5
≤54	66.1	2.3	17.3	14.3	80.4	+74.7
≤59	67.5	0.9	21.6	10.0	77.5	+68.5
≤64	68.2	0.2	25.7	5.8	74.0	+62.4
≤69	68.3	0.1	28.2	3.4	71.7	+58.8
≤74	68.4	0.1	30.1	1.4	69.8	+56.0
≤79	68.5	0.0	31.0	0.5	69.0	+54.7
≤84	68.5	0.0	31.3	0.2	68.7	+54.2
≤89	68.5	0.0	31.5	0.1	68.5	+54.0
≤94	68.5	0.0	31.5	0.0	68.5	+53.9
≤100	68.5	0.0	31.5	0.0	68.5	+53.9

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

Figure 12 (100% of the national line): Share of all households who are targeted (that is, score at or below a 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	0.1	100.0	0.1	Only poor targeted
≤9	0.9	95.7	1.3	22.2:1
≤14	4.0	96.9	5.7	31.6:1
≤19	10.2	97.4	14.5	37.1:1
≤24	20.7	96.2	29.0	25.0:1
≤29	31.5	96.0	44.2	24.1:1
≤34	43.2	94.0	59.3	15.7:1
≤39	55.9	91.2	74.4	10.4:1
≤44	66.8	87.6	85.4	7.0:1
≤49	75.8	83.3	92.3	5.0:1
≤54	83.4	79.3	96.6	3.8:1
≤59	89.1	75.8	98.6	3.1:1
≤64	93.9	72.6	99.7	2.7:1
≤69	96.5	70.8	99.8	2.4:1
≤74	98.5	69.4	99.9	2.3:1
≤79	99.5	68.8	100.0	2.2:1
≤84	99.8	68.6	100.0	2.2:1
≤89	99.9	68.5	100.0	2.2:1
≤94	100.0	68.5	100.0	2.2:1
≤100	100.0	68.5	100.0	2.2:1

Figure 13: Bias of estimated person-level poverty rates at a point in time for 100% of the national poverty line at the level of (former) provinces by urban and rural, for the poverty map from Mistaien *et al.* and for the scorecard here

Stratum	Bias (percentage points)	
	Mistiaen et al.	Poverty scorecard
Urban		
Antananarivo	–8.2	+1.6
Fianarantsoa	–2.8	+4.5
Toamasina	+0.0	–0.9
Mahajanga	+4.9	+11.2
Toliara	–0.2	+8.2
Antsiranana	–12.9	+17.4
Rural		
Antananarivo	–2.9	–5.1
Fianarantsoa	+5.1	–3.1
Toamasina	–2.4	–4.1
Mahajanga	+1.4	+5.5
Toliara	–1.7	–14.0
Antsiranana	–3.2	+0.1
Mean absolute bias:	3.8	6.3

Mistiaen et al.'s poverty map is based on 1993 EPM and 1993 census,
Poverty scorecard here is based on 2010 EPM.
All-Madagascar person-level poverty rate for the national poverty line was 70.0 percent in the 1993 EPM and 76.5 percent in the 2010 EPM.

Tables for

the Food Poverty Line

Figure 4 (Food line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	95.8
15–19	88.2
20–24	82.2
25–29	77.0
30–34	63.7
35–39	52.4
40–44	36.0
45–49	23.0
50–54	10.7
55–59	4.4
60–64	2.9
65–69	1.5
70–74	0.7
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 7 (Food line): Average differences by score range between estimated and true poverty likelihoods for households, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of n = 16,384

	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	+3.5	2.3	2.7	3.6
10–14	+2.0	1.8	2.2	3.0
15–19	–4.9	3.1	3.2	3.4
20–24	–6.4	3.8	3.9	4.2
25–29	–3.2	2.4	2.6	2.9
30–34	–0.2	2.1	2.5	3.2
35–39	+0.3	2.0	2.3	3.1
40–44	+1.5	2.0	2.4	3.4
45–49	+1.0	2.1	2.5	3.1
50–54	–5.2	3.7	3.9	4.3
55–59	–0.8	1.4	1.6	2.2
60–64	–3.4	2.6	2.9	3.4
65–69	+1.5	0.0	0.0	0.0
70–74	+0.7	0.0	0.0	0.0
75–79	–1.1	1.2	1.4	1.7
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

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

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.4	63.9	77.0	92.3
4	–0.2	35.9	41.7	57.2
8	–0.5	26.1	31.4	43.5
16	–0.9	18.5	22.3	27.9
32	–1.3	12.8	14.6	20.8
64	–1.4	8.9	10.8	14.7
128	–1.5	6.4	7.5	9.4
256	–1.6	4.3	5.5	6.8
512	–1.6	3.3	3.8	5.1
1,024	–1.5	2.3	2.6	3.5
2,048	–1.5	1.6	1.9	2.5
4,096	–1.5	1.1	1.4	1.8
8,192	–1.5	0.8	1.0	1.4
16,384	–1.5	0.6	0.7	0.9

Figure 11 (Food line): Shares of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.1	47.5	0.0	52.5	52.5	–99.7
≤9	0.9	46.7	0.0	52.4	53.3	–96.2
≤14	3.8	43.8	0.2	52.2	56.0	–83.6
≤19	9.5	38.1	0.7	51.7	61.2	–58.7
≤24	18.4	29.1	2.2	50.2	68.7	–17.8
≤29	26.9	20.6	4.6	47.8	74.7	+22.9
≤34	34.1	13.5	9.1	43.4	77.4	+62.4
≤39	40.5	7.0	15.3	37.1	77.7	+67.8
≤44	44.2	3.3	22.5	29.9	74.1	+52.6
≤49	46.2	1.4	29.7	22.8	69.0	+37.6
≤54	47.1	0.5	36.3	16.1	63.2	+23.6
≤59	47.3	0.2	41.7	10.7	58.1	+12.3
≤64	47.5	0.0	46.4	6.1	53.6	+2.4
≤69	47.5	0.0	49.0	3.5	51.0	–3.0
≤74	47.5	0.0	51.0	1.4	49.0	–7.3
≤79	47.5	0.0	51.9	0.5	48.1	–9.2
≤84	47.5	0.0	52.2	0.2	47.8	–9.9
≤89	47.5	0.0	52.4	0.1	47.6	–10.2
≤94	47.5	0.0	52.5	0.0	47.5	–10.3
≤100	47.5	0.0	52.5	0.0	47.5	–10.3

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

Figure 12 (Food line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have expenditure below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the 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	0.1	100.0	0.2	Only poor targeted
≤9	0.9	95.7	1.9	22.2:1
≤14	4.0	94.0	7.9	15.6:1
≤19	10.2	92.8	19.9	12.8:1
≤24	20.7	89.3	38.8	8.4:1
≤29	31.5	85.3	56.6	5.8:1
≤34	43.2	78.9	71.7	3.7:1
≤39	55.9	72.6	85.3	2.6:1
≤44	66.8	66.2	93.0	2.0:1
≤49	75.8	60.9	97.1	1.6:1
≤54	83.4	56.4	99.0	1.3:1
≤59	89.1	53.2	99.6	1.1:1
≤64	93.9	50.6	100.0	1.0:1
≤69	96.5	49.3	100.0	1.0:1
≤74	98.5	48.2	100.0	0.9:1
≤79	99.5	47.8	100.0	0.9:1
≤84	99.8	47.7	100.0	0.9:1
≤89	99.9	47.6	100.0	0.9:1
≤94	100.0	47.5	100.0	0.9:1
≤100	100.0	47.5	100.0	0.9:1

Tables for

150% of the National Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	99.8
20–24	99.6
25–29	98.8
30–34	98.0
35–39	97.1
40–44	91.2
45–49	84.6
50–54	73.9
55–59	53.0
60–64	37.1
65–69	28.9
70–74	15.1
75–79	6.6
80–84	1.6
85–89	0.8
90–94	0.0
95–100	0.0

Figure 7 (150% of national line): Average differences by score range between estimated and true poverty likelihoods for households, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of n = 16,384

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+1.9	1.7	2.2	2.6
10–14	+1.5	0.9	1.1	1.5
15–19	–0.2	0.1	0.1	0.1
20–24	+0.1	0.2	0.3	0.4
25–29	–0.9	0.5	0.5	0.5
30–34	–0.0	0.6	0.7	0.9
35–39	+0.6	0.7	0.8	1.1
40–44	–0.9	1.1	1.3	1.8
45–49	+1.3	1.8	2.0	2.6
50–54	–3.1	2.6	2.9	3.6
55–59	–10.3	6.6	6.8	7.3
60–64	–6.7	5.0	5.3	6.1
65–69	+0.8	4.2	5.1	6.4
70–74	+1.3	3.3	4.0	5.2
75–79	–1.4	4.7	5.4	6.6
80–84	+1.0	0.9	1.0	1.4
85–89	+0.8	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 (150% of national line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of various sample sizes

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.2	60.5	73.7	81.2
4	–0.1	27.0	33.5	42.5
8	–0.8	17.5	21.8	28.5
16	–0.9	12.2	14.9	19.9
32	–1.1	9.0	10.9	13.6
64	–1.1	6.2	7.5	10.0
128	–1.0	4.3	5.0	6.8
256	–1.0	3.1	3.7	4.8
512	–0.9	2.1	2.5	3.2
1,024	–0.9	1.5	1.8	2.3
2,048	–0.9	1.1	1.2	1.6
4,096	–1.0	0.8	0.9	1.3
8,192	–1.0	0.5	0.7	0.8
16,384	–1.0	0.4	0.4	0.6

Figure 11 (150% of national line): Shares of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.1	84.1	0.0	15.9	15.9	–99.8
≤9	0.9	83.2	0.0	15.8	16.7	–97.8
≤14	3.9	80.2	0.1	15.8	19.7	–90.5
≤19	10.1	74.0	0.1	15.8	25.9	–75.8
≤24	20.5	63.6	0.2	15.7	36.2	–51.1
≤29	31.3	52.8	0.2	15.6	46.9	–25.3
≤34	42.7	41.4	0.4	15.4	58.1	+2.1
≤39	54.9	29.3	1.0	14.9	69.7	+31.6
≤44	64.8	19.3	1.9	13.9	78.8	+56.4
≤49	72.3	11.9	3.6	12.3	84.5	+76.0
≤54	77.9	6.3	5.5	10.3	88.2	+91.7
≤59	81.1	3.0	7.9	7.9	89.1	+90.6
≤64	83.1	1.0	10.8	5.1	88.2	+87.2
≤69	83.8	0.4	12.7	3.1	86.9	+84.9
≤74	84.1	0.1	14.5	1.4	85.5	+82.8
≤79	84.1	0.0	15.3	0.5	84.7	+81.8
≤84	84.1	0.0	15.6	0.2	84.4	+81.4
≤89	84.1	0.0	15.8	0.1	84.2	+81.2
≤94	84.1	0.0	15.9	0.0	84.1	+81.2
≤100	84.1	0.0	15.9	0.0	84.1	+81.2

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

Figure 12 (150% of national line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have expenditure below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the 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	0.1	100.0	0.1	Only poor targeted
≤9	0.9	97.7	1.1	43.2:1
≤14	4.0	98.2	4.7	56.1:1
≤19	10.2	99.3	12.0	143.9:1
≤24	20.7	99.2	24.4	131.6:1
≤29	31.5	99.3	37.2	139.3:1
≤34	43.2	99.0	50.8	96.2:1
≤39	55.9	98.2	65.2	56.0:1
≤44	66.8	97.1	77.1	33.9:1
≤49	75.8	95.3	85.9	20.2:1
≤54	83.4	93.4	92.6	14.1:1
≤59	89.1	91.1	96.4	10.2:1
≤64	93.9	88.5	98.8	7.7:1
≤69	96.5	86.8	99.6	6.6:1
≤74	98.5	85.3	99.9	5.8:1
≤79	99.5	84.6	100.0	5.5:1
≤84	99.8	84.3	100.0	5.4:1
≤89	99.9	84.2	100.0	5.3:1
≤94	100.0	84.1	100.0	5.3:1
≤100	100.0	84.1	100.0	5.3:1

Tables for

200% of the National Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	99.9
20–24	99.9
25–29	99.6
30–34	99.1
35–39	99.1
40–44	96.9
45–49	94.3
50–54	89.2
55–59	76.7
60–64	60.9
65–69	54.2
70–74	34.8
75–79	19.0
80–84	6.1
85–89	2.3
90–94	0.0
95–100	0.0

Figure 7 (200% of national line): Average differences by score range between estimated and true poverty likelihoods for households, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of n = 16,384

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+0.0	0.0	0.0	0.0
15–19	–0.1	0.0	0.0	0.0
20–24	–0.1	0.1	0.1	0.1
25–29	–0.3	0.2	0.2	0.2
30–34	–0.3	0.3	0.3	0.5
35–39	+0.7	0.5	0.6	0.8
40–44	–0.9	0.7	0.8	0.9
45–49	–0.6	1.0	1.2	1.6
50–54	+0.0	1.7	2.0	2.5
55–59	–3.2	2.8	3.0	3.9
60–64	–2.0	3.2	3.7	5.2
65–69	+8.4	4.8	5.7	7.5
70–74	–2.6	5.4	6.3	7.9
75–79	–7.1	7.2	8.4	10.8
80–84	–1.6	6.0	6.9	8.8
85–89	+2.3	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 (200% of national line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of various sample sizes

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.2	38.8	57.9	78.5
4	–0.0	20.4	25.5	40.3
8	–0.3	13.1	17.5	26.6
16	–0.2	9.8	11.4	15.6
32	–0.4	7.2	8.2	10.9
64	–0.4	4.8	5.7	7.3
128	–0.4	3.3	3.9	5.3
256	–0.4	2.3	2.8	3.9
512	–0.3	1.6	1.9	2.5
1,024	–0.3	1.2	1.4	1.9
2,048	–0.3	0.9	1.0	1.3
4,096	–0.3	0.6	0.7	1.0
8,192	–0.3	0.4	0.5	0.7
16,384	–0.3	0.3	0.4	0.5

Figure 11 (200% of national line): Shares of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.1	90.9	0.0	9.1	9.1	–99.8
≤9	0.9	90.0	0.0	9.1	10.0	–98.0
≤14	4.0	86.9	0.0	9.1	13.1	–91.2
≤19	10.2	80.7	0.0	9.1	19.3	–77.6
≤24	20.6	70.3	0.0	9.1	29.7	–54.6
≤29	31.5	59.5	0.0	9.0	40.5	–30.7
≤34	43.1	47.9	0.1	9.0	52.0	–5.2
≤39	55.5	35.4	0.3	8.7	64.3	+22.5
≤44	66.2	24.8	0.6	8.5	74.7	+46.2
≤49	74.7	16.3	1.1	7.9	82.6	+65.5
≤54	81.4	9.5	2.0	7.1	88.5	+81.2
≤59	85.7	5.2	3.4	5.7	91.4	+92.2
≤64	88.8	2.2	5.2	3.9	92.6	+94.3
≤69	90.0	1.0	6.5	2.5	92.5	+92.8
≤74	90.7	0.2	7.8	1.2	91.9	+91.4
≤79	90.9	0.0	8.6	0.5	91.4	+90.6
≤84	90.9	0.0	8.8	0.2	91.2	+90.3
≤89	90.9	0.0	9.0	0.1	91.0	+90.1
≤94	90.9	0.0	9.1	0.0	90.9	+90.0
≤100	90.9	0.0	9.1	0.0	90.9	+90.0

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

Figure 12 (200% of national line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have expenditure below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the 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	0.1	100.0	0.1	Only poor targeted
≤9	0.9	100.0	1.0	Only poor targeted
≤14	4.0	100.0	4.4	Only poor targeted
≤19	10.2	100.0	11.2	Only poor targeted
≤24	20.7	100.0	22.7	9,091.7:1
≤29	31.5	99.9	34.6	888.0:1
≤34	43.2	99.7	47.3	397.3:1
≤39	55.9	99.4	61.1	175.4:1
≤44	66.8	99.1	72.8	114.4:1
≤49	75.8	98.5	82.1	65.7:1
≤54	83.4	97.6	89.5	40.9:1
≤59	89.1	96.2	94.2	25.5:1
≤64	93.9	94.5	97.6	17.1:1
≤69	96.5	93.2	98.9	13.8:1
≤74	98.5	92.1	99.8	11.6:1
≤79	99.5	91.4	100.0	10.6:1
≤84	99.8	91.1	100.0	10.3:1
≤89	99.9	91.0	100.0	10.1:1
≤94	100.0	90.9	100.0	10.0:1
≤100	100.0	90.9	100.0	10.0:1

Tables for

the Poorest Half below the National Line

Figure 4 (Poorest half below 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	82.9
15–19	70.1
20–24	56.3
25–29	48.8
30–34	36.9
35–39	29.9
40–44	19.1
45–49	13.3
50–54	4.7
55–59	2.2
60–64	1.3
65–69	0.8
70–74	0.5
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 7 (Poorest half below national line): Average differences by score range between estimated and true poverty likelihoods for households, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of n = 16,384

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+31.7	22.5	26.0	34.5
5–9	+18.7	5.5	6.7	8.7
10–14	+1.8	2.9	3.5	4.6
15–19	–1.5	2.5	3.0	4.3
20–24	–2.0	2.1	2.5	3.3
25–29	–2.3	2.2	2.5	3.4
30–34	–1.2	2.1	2.5	3.5
35–39	–0.1	1.9	2.3	3.0
40–44	+3.3	1.6	1.9	2.3
45–49	+4.1	1.3	1.6	2.1
50–54	–3.0	2.2	2.4	2.8
55–59	+0.6	0.7	0.8	1.1
60–64	–0.0	0.8	1.0	1.4
65–69	+0.8	0.0	0.0	0.0
70–74	+0.5	0.0	0.0	0.0
75–79	–1.1	1.2	1.4	1.7
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

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

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.8	63.2	75.5	89.7
4	–0.3	36.0	41.5	53.0
8	+0.4	25.7	30.8	40.9
16	+0.3	17.9	21.2	26.0
32	+0.1	13.2	15.9	20.0
64	+0.1	9.2	10.6	13.3
128	+0.1	6.3	7.3	10.0
256	+0.0	4.5	5.5	7.0
512	+0.0	3.3	3.8	4.8
1,024	+0.1	2.3	2.8	3.6
2,048	+0.1	1.6	1.9	2.6
4,096	+0.1	1.1	1.3	1.8
8,192	+0.1	0.8	1.0	1.3
16,384	+0.1	0.6	0.7	0.9

Figure 11 (Poorest half below national line): Shares of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.0	30.5	0.0	69.1	69.2	–99.6
≤9	0.7	29.8	0.2	68.9	69.7	–94.6
≤14	3.2	27.3	0.8	68.3	71.5	–76.4
≤19	7.5	23.0	2.6	66.5	74.0	–42.2
≤24	13.6	16.9	6.9	62.3	75.9	+11.7
≤29	19.1	11.5	12.3	56.9	75.9	+59.8
≤34	23.5	7.1	19.5	49.7	73.1	+36.2
≤39	27.2	3.3	28.4	40.7	67.9	+7.0
≤44	29.0	1.6	37.5	31.7	60.6	–22.7
≤49	29.9	0.7	45.6	23.5	53.4	–49.4
≤54	30.4	0.2	52.7	16.4	46.8	–72.5
≤59	30.5	0.1	58.2	10.9	41.4	–90.7
≤64	30.5	0.0	63.1	6.1	36.6	–106.6
≤69	30.5	0.0	65.7	3.5	34.0	–115.0
≤74	30.5	0.0	67.7	1.4	32.0	–121.7
≤79	30.5	0.0	68.6	0.5	31.1	–124.6
≤84	30.5	0.0	68.9	0.2	30.8	–125.7
≤89	30.5	0.0	69.1	0.1	30.6	–126.2
≤94	30.5	0.0	69.1	0.0	30.5	–126.4
≤100	30.5	0.0	69.1	0.0	30.5	–126.4

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

Figure 12 (Poorest half below national line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have expenditure below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the 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	0.1	67.2	0.2	2.1:1
≤9	0.9	78.9	2.4	3.7:1
≤14	4.0	79.7	10.5	3.9:1
≤19	10.2	73.6	24.6	2.8:1
≤24	20.7	66.0	44.6	1.9:1
≤29	31.5	60.5	62.5	1.5:1
≤34	43.2	54.3	76.8	1.2:1
≤39	55.9	48.7	89.1	0.9:1
≤44	66.8	43.4	94.9	0.8:1
≤49	75.8	39.4	97.8	0.6:1
≤54	83.4	36.4	99.5	0.6:1
≤59	89.1	34.2	99.8	0.5:1
≤64	93.9	32.5	100.0	0.5:1
≤69	96.5	31.6	100.0	0.5:1
≤74	98.5	31.0	100.0	0.4:1
≤79	99.5	30.7	100.0	0.4:1
≤84	99.8	30.6	100.0	0.4:1
≤89	99.9	30.6	100.0	0.4:1
≤94	100.0	30.5	100.0	0.4:1
≤100	100.0	30.5	100.0	0.4:1

Tables for

the $1.25/day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	99.8
20–24	99.5
25–29	98.4
30–34	97.0
35–39	95.4
40–44	88.7
45–49	81.3
50–54	68.9
55–59	45.7
60–64	30.7
65–69	25.2
70–74	11.9
75–79	6.3
80–84	1.4
85–89	0.7
90–94	0.0
95–100	0.0

Figure 7 ($1.25/day line): Average differences by score range between estimated and true poverty likelihoods for households, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of n = 16,384

	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	+3.5	2.3	2.7	3.6
10–14	+1.5	0.9	1.1	1.5
15–19	–0.2	0.1	0.1	0.1
20–24	+0.1	0.3	0.3	0.4
25–29	–1.3	0.7	0.7	0.8
30–34	+1.1	0.9	1.1	1.4
35–39	–1.0	0.8	0.9	1.2
40–44	–1.0	1.2	1.4	2.0
45–49	+1.4	1.9	2.2	2.8
50–54	–4.2	3.2	3.4	4.0
55–59	–12.0	7.5	7.8	8.2
60–64	–8.0	5.5	5.9	6.8
65–69	+1.0	4.0	4.8	6.2
70–74	+4.3	2.3	2.8	3.7
75–79	–1.6	4.7	5.3	6.6
80–84	+0.8	0.9	1.0	1.4
85–89	+0.7	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 ($1.25/day line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of various sample sizes

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–1.1	61.6	75.3	81.7
4	–0.6	28.1	34.7	46.9
8	–1.2	18.2	22.6	30.1
16	–1.3	12.9	15.1	20.1
32	–1.4	9.3	11.0	14.8
64	–1.3	6.6	8.1	10.6
128	–1.3	4.5	5.4	6.9
256	–1.3	3.2	3.8	4.9
512	–1.2	2.2	2.6	3.3
1,024	–1.2	1.5	1.8	2.4
2,048	–1.2	1.1	1.3	1.7
4,096	–1.2	0.8	1.0	1.3
8,192	–1.2	0.6	0.7	0.9
16,384	–1.2	0.4	0.5	0.7

Figure 11 ($1.25/day line): Shares of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.1	82.0	0.0	17.9	18.0	–99.8
≤9	0.9	81.2	0.0	17.9	18.8	–97.8
≤14	3.9	78.2	0.1	17.8	21.8	–90.3
≤19	10.1	72.0	0.1	17.8	27.9	–75.3
≤24	20.5	61.6	0.2	17.7	38.2	–49.9
≤29	31.2	50.8	0.3	17.6	48.9	–23.5
≤34	42.5	39.6	0.7	17.2	59.7	+4.3
≤39	54.6	27.5	1.3	16.6	71.2	+34.5
≤44	64.2	17.8	2.5	15.4	79.6	+59.6
≤49	71.3	10.8	4.5	13.4	84.7	+79.3
≤54	76.6	5.5	6.8	11.1	87.7	+91.7
≤59	79.5	2.5	9.5	8.4	87.9	+88.4
≤64	81.3	0.8	12.7	5.3	86.5	+84.6
≤69	81.8	0.3	14.7	3.2	85.0	+82.1
≤74	82.0	0.1	16.5	1.4	83.4	+79.9
≤79	82.1	0.0	17.4	0.5	82.6	+78.8
≤84	82.1	0.0	17.7	0.2	82.3	+78.4
≤89	82.1	0.0	17.9	0.1	82.1	+78.2
≤94	82.1	0.0	17.9	0.0	82.1	+78.2
≤100	82.1	0.0	17.9	0.0	82.1	+78.2

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

Figure 12 ($1.25/day line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have expenditure below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the 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	0.1	100.0	0.1	Only poor targeted
≤9	0.9	95.7	1.1	22.2:1
≤14	4.0	97.8	4.8	44.0:1
≤19	10.2	99.1	12.3	113.3:1
≤24	20.7	99.1	24.9	109.3:1
≤29	31.5	99.1	38.1	113.2:1
≤34	43.2	98.4	51.7	61.4:1
≤39	55.9	97.7	66.5	42.8:1
≤44	66.8	96.2	78.3	25.5:1
≤49	75.8	94.1	86.9	15.8:1
≤54	83.4	91.8	93.3	11.3:1
≤59	89.1	89.3	96.9	8.4:1
≤64	93.9	86.5	99.0	6.4:1
≤69	96.5	84.8	99.7	5.6:1
≤74	98.5	83.2	99.9	5.0:1
≤79	99.5	82.5	100.0	4.7:1
≤84	99.8	82.3	100.0	4.6:1
≤89	99.9	82.1	100.0	4.6:1
≤94	100.0	82.1	100.0	4.6:1
≤100	100.0	82.1	100.0	4.6:1

Tables for

the $2.00/day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	99.9
20–24	99.9
25–29	99.6
30–34	99.4
35–39	99.3
40–44	97.7
45–49	96.0
50–54	92.4
55–59	81.7
60–64	72.1
65–69	65.3
70–74	41.8
75–79	23.5
80–84	12.9
85–89	5.3
90–94	0.0
95–100	0.0

Figure 7 ($2.00/day line): Average differences by score range between estimated and true poverty likelihoods for households, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of n = 16,384

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+0.0	0.0	0.0	0.0
15–19	–0.1	0.0	0.0	0.0
20–24	–0.1	0.1	0.1	0.1
25–29	–0.3	0.2	0.2	0.2
30–34	–0.1	0.3	0.3	0.5
35–39	+0.5	0.4	0.5	0.7
40–44	–1.2	0.8	0.8	0.9
45–49	–1.4	1.0	1.1	1.3
50–54	+0.3	1.5	1.7	2.3
55–59	–2.8	2.4	2.7	3.3
60–64	+3.9	3.1	3.5	4.5
65–69	+5.9	4.7	5.7	7.4
70–74	–4.4	5.1	6.4	8.6
75–79	–5.6	7.1	8.6	11.0
80–84	+5.2	6.0	6.9	8.8
85–89	+5.3	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

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

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.4	46.6	50.0	75.3
4	+0.2	17.9	24.5	38.8
8	–0.1	11.9	16.7	25.4
16	–0.3	8.9	11.0	14.4
32	–0.4	6.4	7.7	10.1
64	–0.3	4.3	5.3	7.1
128	–0.3	3.0	3.4	4.5
256	–0.3	2.2	2.5	3.1
512	–0.2	1.5	1.7	2.3
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 11 ($2.00/day line): Shares of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.1	92.7	0.0	7.2	7.3	–99.8
≤9	0.9	91.9	0.0	7.2	8.1	–98.0
≤14	4.0	88.8	0.0	7.2	11.2	–91.3
≤19	10.2	82.6	0.0	7.2	17.4	–78.0
≤24	20.6	72.1	0.0	7.2	27.9	–55.5
≤29	31.5	61.3	0.0	7.2	38.7	–32.1
≤34	43.1	49.7	0.1	7.1	50.2	–7.1
≤39	55.6	37.2	0.2	7.0	62.6	+20.1
≤44	66.4	26.4	0.4	6.8	73.2	+43.5
≤49	75.1	17.7	0.7	6.5	81.6	+62.7
≤54	82.1	10.7	1.3	5.9	88.0	+78.4
≤59	86.7	6.1	2.3	4.9	91.6	+89.5
≤64	90.1	2.7	3.8	3.4	93.5	+95.9
≤69	91.6	1.2	4.9	2.3	94.0	+94.7
≤74	92.5	0.3	6.0	1.2	93.7	+93.5
≤79	92.8	0.0	6.7	0.5	93.3	+92.8
≤84	92.8	0.0	7.0	0.2	93.0	+92.5
≤89	92.8	0.0	7.2	0.1	92.8	+92.3
≤94	92.8	0.0	7.2	0.0	92.8	+92.2
≤100	92.8	0.0	7.2	0.0	92.8	+92.2

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

Figure 12 ($2.00/day line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have expenditure below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the 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	0.1	100.0	0.1	Only poor targeted
≤9	0.9	100.0	1.0	Only poor targeted
≤14	4.0	100.0	4.3	Only poor targeted
≤19	10.2	100.0	11.0	Only poor targeted
≤24	20.7	100.0	22.3	9,091.7:1
≤29	31.5	99.9	33.9	888.0:1
≤34	43.2	99.8	46.4	402.3:1
≤39	55.9	99.6	59.9	223.7:1
≤44	66.8	99.4	71.5	166.6:1
≤49	75.8	99.1	81.0	105.4:1
≤54	83.4	98.4	88.5	63.2:1
≤59	89.1	97.4	93.5	37.3:1
≤64	93.9	96.0	97.1	23.7:1
≤69	96.5	94.9	98.8	18.8:1
≤74	98.5	93.9	99.7	15.4:1
≤79	99.5	93.3	100.0	13.8:1
≤84	99.8	93.0	100.0	13.3:1
≤89	99.9	92.8	100.0	13.0:1
≤94	100.0	92.8	100.0	12.9:1
≤100	100.0	92.8	100.0	12.9:1

Tables for

the $2.50/day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	99.9
20–24	99.9
25–29	99.8
30–34	99.7
35–39	99.7
40–44	99.1
45–49	97.8
50–54	96.2
55–59	91.8
60–64	86.4
65–69	80.0
70–74	59.7
75–79	34.1
80–84	26.5
85–89	10.4
90–94	0.0
95–100	0.0

Figure 7 ($2.50/day line): Average differences by score range between estimated and true poverty likelihoods for households, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of n = 16,384

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+0.0	0.0	0.0	0.0
15–19	–0.1	0.0	0.0	0.0
20–24	–0.1	0.0	0.0	0.0
25–29	–0.1	0.1	0.1	0.2
30–34	–0.3	0.1	0.1	0.1
35–39	+0.1	0.2	0.3	0.4
40–44	–0.3	0.3	0.4	0.5
45–49	–1.3	0.8	0.9	0.9
50–54	+1.5	1.3	1.6	2.0
55–59	–3.5	2.3	2.4	2.6
60–64	+0.9	2.2	2.6	3.3
65–69	+2.4	4.2	5.0	6.8
70–74	–2.1	5.2	6.2	7.5
75–79	–16.0	11.8	12.6	13.7
80–84	+4.0	10.3	12.0	16.2
85–89	+9.4	1.5	1.8	2.7
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 8 ($2.50/day line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of various sample sizes

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.1	6.8	39.9	78.8
4	–0.0	13.4	18.5	35.7
8	–0.3	9.7	12.8	21.4
16	–0.4	6.4	8.5	13.4
32	–0.4	4.6	5.6	7.7
64	–0.4	3.5	4.0	5.0
128	–0.4	2.4	2.7	3.6
256	–0.4	1.7	2.0	2.7
512	–0.4	1.1	1.4	1.8
1,024	–0.3	0.8	1.0	1.3
2,048	–0.3	0.6	0.7	0.9
4,096	–0.3	0.4	0.5	0.7
8,192	–0.3	0.3	0.4	0.5
16,384	–0.3	0.2	0.2	0.4

Figure 11 ($2.50/day line): Shares of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.1	95.8	0.0	4.1	4.2	–99.8
≤9	0.9	95.0	0.0	4.1	5.0	–98.1
≤14	4.0	91.9	0.0	4.1	8.1	–91.6
≤19	10.2	85.7	0.0	4.1	14.3	–78.7
≤24	20.7	75.2	0.0	4.1	24.8	–56.9
≤29	31.5	64.4	0.0	4.1	35.6	–34.3
≤34	43.1	52.7	0.0	4.1	47.2	–10.0
≤39	55.8	40.1	0.1	4.0	59.8	+16.4
≤44	66.6	29.3	0.1	4.0	70.6	+39.1
≤49	75.6	20.3	0.3	3.8	79.4	+57.9
≤54	82.8	13.1	0.6	3.5	86.3	+73.3
≤59	88.1	7.8	1.0	3.1	91.2	+84.7
≤64	92.2	3.7	1.7	2.4	94.6	+94.1
≤69	94.2	1.7	2.3	1.8	96.0	+97.6
≤74	95.4	0.5	3.2	1.0	96.3	+96.7
≤79	95.8	0.1	3.7	0.5	96.3	+96.2
≤84	95.9	0.0	3.9	0.2	96.1	+95.9
≤89	95.9	0.0	4.1	0.1	95.9	+95.8
≤94	95.9	0.0	4.1	0.0	95.9	+95.7
≤100	95.9	0.0	4.1	0.0	95.9	+95.7

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

Figure 12 ($2.50/day line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have expenditure below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the 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	0.1	100.0	0.1	Only poor targeted
≤9	0.9	100.0	1.0	Only poor targeted
≤14	4.0	100.0	4.2	Only poor targeted
≤19	10.2	100.0	10.6	Only poor targeted
≤24	20.7	100.0	21.5	Only poor targeted
≤29	31.5	99.9	32.9	1,222.9:1
≤34	43.2	99.9	45.0	1,486.0:1
≤39	55.9	99.9	58.2	788.6:1
≤44	66.8	99.8	69.5	458.3:1
≤49	75.8	99.6	78.8	275.9:1
≤54	83.4	99.3	86.3	133.3:1
≤59	89.1	98.9	91.8	87.7:1
≤64	93.9	98.2	96.2	53.1:1
≤69	96.5	97.6	98.2	40.4:1
≤74	98.5	96.8	99.5	30.2:1
≤79	99.5	96.3	99.9	26.2:1
≤84	99.8	96.1	100.0	24.5:1
≤89	99.9	95.9	100.0	23.6:1
≤94	100.0	95.9	100.0	23.3:1
≤100	100.0	95.9	100.0	23.3:1

Tables for

the $5.00/day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	100.0
20–24	100.0
25–29	100.0
30–34	100.0
35–39	100.0
40–44	99.8
45–49	99.4
50–54	99.2
55–59	98.7
60–64	98.3
65–69	97.0
70–74	94.6
75–79	85.1
80–84	70.6
85–89	53.7
90–94	0.0
95–100	0.0

Figure 7 ($5.00/day line): Average differences by score range between estimated and true poverty likelihoods for households, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of n = 16,384

	Difference between estimate and true value			
		Confidence interval (±percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+0.0	0.0	0.0	0.0
15–19	–0.0	0.0	0.0	0.0
20–24	–0.0	0.0	0.0	0.0
25–29	+0.0	0.0	0.0	0.0
30–34	–0.0	0.0	0.0	0.0
35–39	+0.3	0.2	0.3	0.4
40–44	–0.1	0.1	0.1	0.1
45–49	–0.3	0.3	0.3	0.4
50–54	+1.6	1.0	1.1	1.6
55–59	–0.6	0.5	0.6	0.8
60–64	+0.6	1.0	1.2	1.7
65–69	+3.4	3.0	3.6	4.6
70–74	+2.6	2.8	3.3	4.3
75–79	+1.8	5.9	7.0	8.8
80–84	+11.9	12.5	14.7	17.8
85–89	+5.3	18.1	22.5	28.3
90–94	–2.7	4.6	5.4	8.8
95–100	+0.0	0.0	0.0	0.0

Figure 8 ($5.00/day line): Average differences between estimated poverty rates and true values for a group at a point in time, with confidence intervals, scorecard applied to the validation sample with 1,000 bootstraps of various sample sizes

Sample Size	Difference between estimate and true value			
		Confidence interval (±percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.1	1.5	2.7	57.3
4	+0.3	1.0	5.6	29.0
8	+0.3	3.1	7.5	15.2
16	+0.3	3.9	5.1	9.0
32	+0.3	2.6	3.9	5.0
64	+0.3	2.0	2.3	3.1
128	+0.2	1.4	1.7	2.3
256	+0.2	1.1	1.3	1.7
512	+0.2	0.7	0.9	1.1
1,024	+0.3	0.5	0.7	0.8
2,048	+0.3	0.4	0.5	0.6
4,096	+0.3	0.3	0.3	0.4
8,192	+0.3	0.2	0.2	0.3
16,384	+0.3	0.1	0.2	0.2

Figure 11 ($5.00/day line): Shares of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Hit rate Inclusion + Exclusion	BPAC See text
≤4	0.1	98.9	0.0	1.0	1.1	–99.9
≤9	0.9	98.0	0.0	1.0	2.0	–98.1
≤14	4.0	94.9	0.0	1.0	5.1	–91.9
≤19	10.2	88.8	0.0	1.0	11.2	–79.4
≤24	20.7	78.3	0.0	1.0	21.7	–58.3
≤29	31.5	67.4	0.0	1.0	32.5	–36.3
≤34	43.2	55.8	0.0	1.0	44.2	–12.8
≤39	55.8	43.2	0.0	1.0	56.8	+12.8
≤44	66.7	32.3	0.1	1.0	67.7	+34.9
≤49	75.7	23.2	0.1	0.9	76.7	+53.2
≤54	83.2	15.8	0.2	0.8	84.1	+68.4
≤59	88.8	10.1	0.2	0.8	89.6	+79.7
≤64	93.6	5.4	0.4	0.7	94.2	+89.5
≤69	96.1	2.9	0.4	0.6	96.7	+94.6
≤74	97.9	1.0	0.6	0.4	98.4	+98.5
≤79	98.7	0.3	0.8	0.3	99.0	+99.2
≤84	98.9	0.1	0.9	0.1	99.0	+99.1
≤89	99.0	0.0	1.0	0.1	99.0	+99.0
≤94	99.0	0.0	1.0	0.0	99.0	+98.9
≤100	99.0	0.0	1.0	0.0	99.0	+98.9

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

Figure 12 ($5.00/day line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have expenditure below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the 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	0.1	100.0	0.1	Only poor targeted
≤9	0.9	100.0	0.9	Only poor targeted
≤14	4.0	100.0	4.1	Only poor targeted
≤19	10.2	100.0	10.3	Only poor targeted
≤24	20.7	100.0	20.9	Only poor targeted
≤29	31.5	100.0	31.8	3,628.7:1
≤34	43.2	100.0	43.6	3,609.0:1
≤39	55.9	99.9	56.4	1,188.1:1
≤44	66.8	99.9	67.4	1,163.9:1
≤49	75.8	99.9	76.5	843.7:1
≤54	83.4	99.8	84.1	431.1:1
≤59	89.1	99.7	89.7	359.8:1
≤64	93.9	99.6	94.6	258.4:1
≤69	96.5	99.5	97.1	216.2:1
≤74	98.5	99.4	99.0	159.3:1
≤79	99.5	99.2	99.7	127.7:1
≤84	99.8	99.1	99.9	109.6:1
≤89	99.9	99.0	100.0	100.2:1
≤94	100.0	99.0	100.0	95.2:1
≤100	100.0	99.0	100.0	95.2:1