

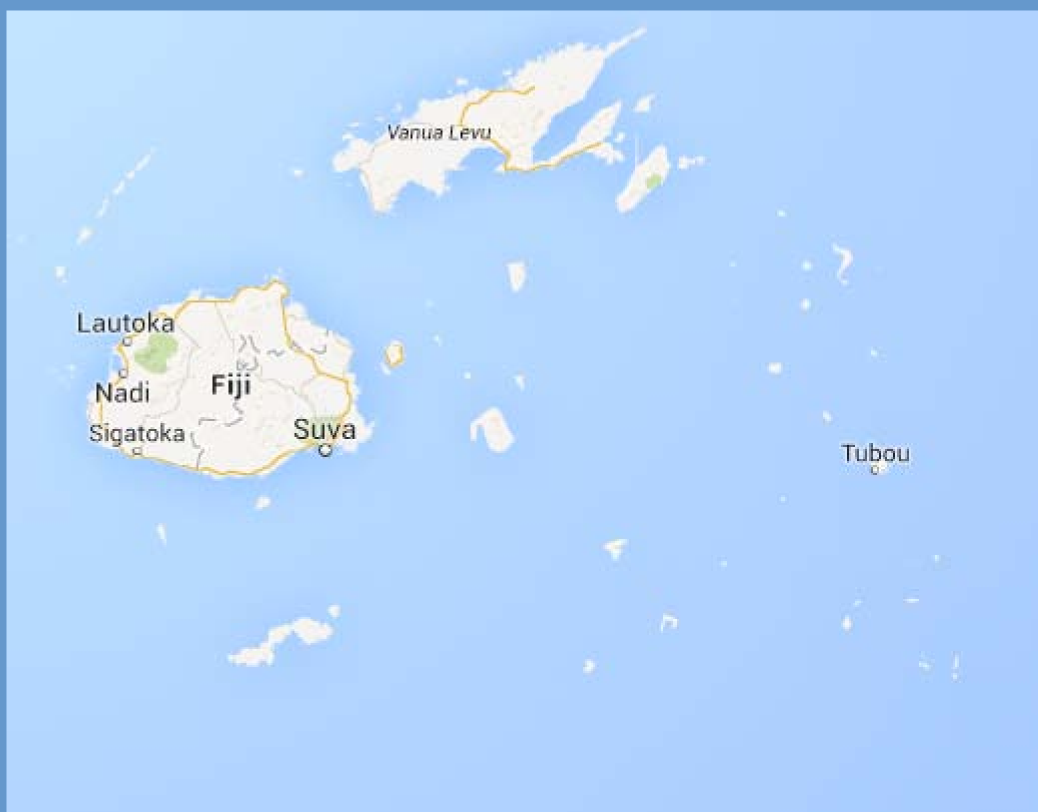


Progress out of Poverty Index® (PPI®)

A Simple Poverty Scorecard

for

Fiji



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A Simple Poverty Scorecard for Fiji

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Abstract

This study uses Fiji's 2008/9 Household Income and Expenditure Survey to construct a simple, easy-to-use scorecard that estimates the likelihood that a household has income below a given poverty line. Field workers can collect responses to the scorecard's ten indicators and tally scores on paper in about ten minutes. The scorecard's bias and precision are reported for a range of poverty lines. The simple poverty scorecard is a practical way for pro-poor programs in Fiji to measure poverty rates, to track changes in poverty rates over time, and to target services.

Acknowledgements

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Author

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Simple Poverty Scorecard for Fiji

Entity	Name	ID	Date (DD/MM/YY)	
Participant:			Date joined:	
Field agent:			Date scored:	
Service point:			# HH members:	

Indicator	Response	Points	Score
1. How many members does the household have?	A. Eight or more	0	
	B. Seven	5	
	C. Six	8	
	D. Five	12	
	E. Four	15	
	F. Three	20	
	G. One or two	29	
2. In the last 30 days, how many household members 10-years-old or older worked for money?	A. None	0	
	B. One	7	
	C. Two	12	
	D. Three or more	17	
3. In the last 30 days, did the male head/spouse work for money?	A. No	0	
	B. Yes	2	
	C. No male head/spouse	7	
4. In the last 30 days, did the female head/spouse work for money?	A. No	0	
	B. No female head/spouse	2	
	C. Yes	4	
5. What is the highest level of education attained by the male head/spouse?	A. None, kindergarten, primary Class 1 to 3, special education, or not recognized	0	
	B. No male head/spouse	0	
	C. Primary class 4 to 6, or secondary form 1 to 3	4	
	D. Secondary form 4	7	
	E. Secondary form 5 or 6	11	
	F. Form 7, certificate, diploma, degree, post-graduate certificate or diploma, master's, or Ph.D	19	
6. Are the outer walls of the dwelling constructed with . . .?	A. Permanent walls of tin or corrugated iron, traditional bure materials, makeshift or improvised materials, or other	0	
	B. Wood	1	
	C. Concrete, brick, or cement	6	
7. Are any gas/electric stoves available for use by any members of the household?	A. No	0	
	B. Yes	3	
8. What does the household mainly use for cooking?	A. Wood	0	
	B. Kerosene	1	
	C. LPG, or electricity	6	
9. Are any washing machines available for use by any members of the household?	A. No	0	
	B. Yes	4	
10. Are any videos/TVs available for use by any members of the household?	A. No	0	
	B. Yes	5	

By Mark Schreiner of Microfinance Risk Management, L.L.C., developer of the PPI. Score:

Back-page Worksheet: Household Members and Work Status

Write down the name and identification number of the client and of yourself 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: Please tell me the first name and the age of each member of your household. A household is a person or a group of people who share a dwelling, share food, and who depend on the household or contribute towards its support. A household member must normally stay at least four nights per week with the household now and have been (or plan to be) with the household for at least six weeks. Someone who contributes financially to the household and is not a member of another household is considered to be a member even if his/her work prevents his/her staying with the household at least four nights per week. Write down the first name and the age of each household member, noting who is the male head/spouse and who is the 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 scorecard indicator.

For each household member 10-years-old or older, ask: In the last 30 days, has <name> worked for money? Count those marked "Yes", and circle the corresponding response for the second indicator. Working for money means working in a wage or salary job; working in a business, shop, taxi/carrier business, or repair shop; growing things for sale; raising animals for sale; catching fish or collecting shells for sale; or providing services for money.

Determine who is the male head/spouse (if he exists), and circle the response to the third indicator based on whether he is recorded as having worked for money.

Determine who is the female head/spouse (if she exists), and circle the response to the fourth indicator based on whether she is recorded as having worked for money.

Keep in mind the full definitions of household, working for money, male head/spouse, and female head/spouse in the "Guidelines for the Interpretation of Scorecard Indicators".

First name	Age	If <name> is 10-years-old or older, did he/she work for money in the last 30 days?
1.		Not ≥10 No Yes
2.		Not ≥10 No Yes
3.		Not ≥10 No Yes
4.		Not ≥10 No Yes
5.		Not ≥10 No Yes
6.		Not ≥10 No Yes
7.		Not ≥10 No Yes
8.		Not ≥10 No Yes
9.		Not ≥10 No Yes
10.		Not ≥10 No Yes
11.		Not ≥10 No Yes
12.		Not ≥10 No Yes
# members:		# "Yes":

Look-up table to convert scores to poverty likelihoods

	Poverty likelihood (%)						
	National				Intl. 2005 PPP		
Score	100%	150%	200%	Median	$1.25	$2.00	$2.50
0–4	100.0	100.0	100.0	100.0	100.0	100.0	100.0
5–9	84.6	100.0	100.0	71.4	71.4	82.8	93.7
10–14	84.6	100.0	100.0	67.6	44.5	80.4	93.7
15–19	84.3	98.2	99.1	58.3	21.5	62.1	78.6
20–24	76.3	91.9	97.6	51.1	18.0	53.8	69.8
25–29	59.1	87.4	95.6	31.6	5.9	34.2	57.1
30–34	52.1	84.8	94.1	24.6	4.6	28.1	49.3
35–39	40.6	75.2	89.3	16.3	1.7	18.0	30.5
40–44	24.1	60.2	81.1	7.2	0.0	9.2	19.4
45–49	17.3	45.8	68.6	3.4	0.0	2.5	11.0
50–54	11.9	37.1	59.5	1.1	0.0	1.6	5.6
55–59	5.9	23.9	48.8	0.8	0.0	0.6	3.9
60–64	1.8	12.6	29.4	0.3	0.0	0.2	2.2
65–69	0.4	7.0	14.5	0.0	0.0	0.0	0.6
70–74	0.0	1.6	8.3	0.0	0.0	0.0	0.0
75–79	0.0	0.0	3.7	0.0	0.0	0.0	0.0
80–84	0.0	0.0	2.7	0.0	0.0	0.0	0.0
85–89	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90–94	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95–100	0.0	0.0	0.0	0.0	0.0	0.0	0.0

A Simple Poverty Scorecard for Fiji

1. Introduction

This paper presents a simple poverty scorecard that local, pro-poor programs in Fiji can use to estimate the likelihood that a household has income 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 target services.

The direct approach to poverty measurement via income surveys is difficult and costly. As a case in point, Fiji's 2008/9 Household Income and Expenditure Survey (HIES) runs 44 pages. Enumerators completed interviews at a rate of about two households per day, asking—in addition to non-income/expenditure items—about 150 income/expenditure items. Responding households also tracked their expenditure for 14 days in a diary.

In comparison, the indirect approach via poverty scoring is simple, quick, and inexpensive. It uses ten verifiable indicators (such as "What does the household mainly use for cooking?" and "In the last 30 days, how many household members 10-years-old or older worked for money?") to get a score that is highly correlated with poverty status as measured by the exhaustive HIES survey.

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

[1] Fiji's simple poverty scorecard is not, however, in the public domain. Copyright is held by the sponsor and by Microfinance Risk Management, L.L.C.

land-ownership or housing quality) or subjective and relative (such as participatory wealth ranking facilitated by skilled field workers). Estimates from these approaches may be costly, their accuracy is unknown, and they are not comparable across places, organizations, nor time.

Poverty scoring can be used to measure the share of a program's participants who are below a given poverty line, for example, the Millennium Development Goals' $1.25/day line at 2005 purchase-power parity (PPP). USAID microenterprise partners in Fiji can use scoring with the median poverty line to report how many of their participants are "very poor".[2] Scoring can also be used to measure net movement across a poverty line over time. In all these cases, the poverty scorecard provides an income-based, objective tool with known accuracy. While income surveys are costly even for governments, some local pro-poor organizations may be able to implement an inexpensive scorecard to help with poverty monitoring and (if desired) targeting.

The statistical approach here aims to be understood by non-specialists. After all, if managers are to adopt poverty scoring on their own and apply it to inform their decisions, then they 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 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

[2] USAID defines a household as very poor if its daily per-capita income is less than the highest of the $1.25/day line (FJD2.07 on average, Figure 1) or the median line that divides people in households below Fiji's national line into two equal-size groups (FJD3.44).

scoring approaches can be about as accurate as complex ones (Schreiner, 2012a; Caire and Schreiner, 2012).

Beyond its simplicity and transparency, the poverty 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. These accuracy tests are simple and commonplace in statistical practice and in the for-profit field of credit-risk scoring, but they have rarely been applied to tools like poverty scorecards.

The scorecard is based on data from the 2008/9 HIES done by the Fiji Islands Bureau of Statistics). Indicators are selected to be:

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

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

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

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

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

Poverty scoring can also be used 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 income data and Fiji's national poverty line. Scores from this one scorecard are calibrated to poverty likelihoods for seven poverty lines.

The scorecard is constructed and calibrated using half of the data from the 2008/9 HIES. 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 2008/9.[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 0.0 percentage points. The average absolute difference across all seven poverty lines is about 0.5 percentage points, and the maximum absolute difference for any poverty line is 1.2 percentage points. These differences are due to sampling variation, not bias; the average difference would be zero if the whole 2008/9 HIES were to be repeatedly re-fielded and divided into sub-samples before repeating the entire process of constructing and validating scorecards.

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

Section 2 below documents data and poverty lines. Sections 3 and 4 describe scorecard construction and offer guidelines for use in practice. Sections 5 and 6 tell how to estimate

[3] Important examples include nationally representative samples at a later point in time or sub-groups that are not nationally representative (Tarozzi and Deaton, 2007).

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 a related exercise for Fiji. The last section is a summary.

2. Data and poverty lines

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

2.1 Data

The scorecard is based on data from the 3,573 households in the 2008/9 HIES. This is Fiji's most recent national income and expenditure survey.

The 2008/9 HIES was fielded from June 2008 to May 2009. For the purposes of poverty scoring, the households in the 2008/9 HIES 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 income (divided by the number of adult equivalents or the number of household members) is below a given poverty line. Even when adult equivalents is used as the divisor for aggregate household income, the unit that is considered to be below a poverty line (or not) when determining poverty rates is not an adult equivalent but rather the household itself or a person in the household. Each household member is defined to have the same poverty status (or estimated poverty likelihood) as does the household as a whole.

Suppose a program serves two households. The first household is known to be poor (its per-adult-equivalent or per-capita income as measured by a battery of items in a best-practices survey is less than a given poverty line), and it has three members, one of whom is a program participant. The second household is known to be non-poor, and it has four members, two of whom are program participants.

Poverty rates are at the level of either households or people. If the program defines its participants as households, then the household level is relevant. The estimated household-level poverty rate is the equal-weighted average of poverty statuses (or estimated poverty likelihoods) across participants' households. In the example here, this is

$\frac{1 \cdot 1 + 1 \cdot 0}{1 + 1} = \frac{1}{2} = 0.5 = 50 \text{ percent}.$ 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

$\frac{3 \cdot 1 + 4 \cdot 0}{3 + 4} = \frac{3}{7} = 0.43 = 43 \text{ percent}.$ In the "$3 \cdot 1$" term in the numerator, the "3" is the first household's weight because it has three members, and the "1" is its poverty status (poor). In the "$4 \cdot 0$" term in the numerator, the "4" is the second household's weight because it has four members, and the zero is its poverty status (non-poor). The "$3 + 4$" in the denominator is the sum of the weights of the two households. A household's weight is its number of members because the unit of analysis is the household member.

As a final example—one that pertains to what is likely the most common situation in practice—a program counts as participants only those household members with whom it deals with directly. For the example here, this means that some—but not all—household members are counted. The person-level rate is now the participant-weighted average of the poverty statuses of households with participants, or $\frac{1 \cdot 1 + 2 \cdot 0}{1 + 2} = \frac{1}{3} = 0.33 = 33 \text{ percent}.$ 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 of households' estimated poverty likelihoods), where the weights are the number of relevant units in the household. When reporting, programs should explain who is counted as a participant and why.

Figure 1 reports poverty rates for seven poverty lines at the levels of households and people for Fiji as a whole in 2008/9, for urban and rural areas, and for the construction/calibration and validation samples. Person-level poverty rates are included in Figure 1 because these are the rates reported by governments and used in most policy discussions. Household-level poverty rates are also reported because—as shown above—household-level poverty likelihoods can be straightforwardly converted into poverty rates for other units of analysis. This is also why the poverty scorecard is constructed, calibrated, and validated with household weights.

2.3 Poverty lines

Fiji’s national poverty line (sometimes referred to here as “100% of the national poverty line”) is defined as the cost of a basic-needs food component and a basic-needs non-food component (Narsey, 2012). The derivation—done separately for urban and rural areas—starts with the food basket observed in the 2002/3 HIES for households whose food consumption was in the middle quintile (Narsey, 2008). Using items that make up at least 0.5 percent of this basket, the Fiji Food and Nutrition Center drew up a weekly meal plan for a household of four adult equivalents that provided adequate nutrition and that respected the make-up of the basket. The per-adult-equivalent cost of this meal plan was then updated for changes in food prices between 2002/3 and 2008/9.

The non-food component of Fiji’s national poverty line was likewise derived for 2002/3 and then updated to 2008/9 for changes in non-food prices. It is the average per-adult-equivalent non-food expenditure observed for households in the third decile of non-food expenditure in the 2002/3 HIES, assuming the economies of scale in non-food expenditure associated with households of four adult equivalents.

The resulting national (food-plus-non-food) poverty line for Fiji in 2008/9 is FJD6.59 per adult equivalent per day in urban areas and FJD5.83 in rural areas (Figure 1). These lines imply household-level poverty rates of 15.3 percent (urban) and 36.8 percent (rural), as well as person-level rates of 18.5 percent (urban) and 42.5 percent (rural). These person-level rates match those in Table 3.1 of Narsey (2012).

The derivation of Fiji’s national poverty line is consistent between 2002/3 and 2008/9, facilitating estimates of changes in poverty. It differs, however, from Ravallion’s (1998) cost-of-basic-needs approach that is used in most other countries and is used by World Bank (2011) for

Fiji. In particular, the food line is not the cost of a food basket with a given number of Calories, and the non-food line is not the observed non-food expenditure for households whose observed food expenditure is close to the food line. Nevertheless, the derivation of Fiji's national line is well-documented, and Narsey (2008) makes a case that it reflects actual nutritional requirements and consumption habits as well as typical economies of scale in household size. The approach also seems to be a reasonable compromise within a consensus-building process in which the definition of the national poverty line affects minimum-wage laws and ethnic-based social spending.

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

- 100% of national
- 150% of national
- 200% of national
- Median
- $1.25/day 2005 PPP
- $2.00/day 2005 PPP
- $2.50/day 2005 PPP

The median line is defined (for urban and rural areas separately) as the median per-capita income of people (not households and not adult equivalents) who are live in households whose per-adult-equivalent income is below 100% of the national line (United States Congress, 2004).

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

- 2005 PPP exchange rate of FJD1.548 per $1.00 (World Bank, 2008)
- Consumer Price Index for Fiji:[4]

[4] The monthly indexes for June 2008 to May 2009 are from www.spc.int/prism/fjtest/Key%20Stats/Prices/8.2%20CPI_national.pdf, retrieved 12 December 2013. The monthly indexes for 2005 are from Olivia Vakaloloma of the Fiji Islands Bureau of Statistics.

  - Average in 2005: 100.0333
  - Average from June 2008 to May 2009: 106.9375
- Average all-Fiji national line (Figure 1): FJD6.20
- The value of the national line in urban (FJD6.59) and rural (FJD5.83) areas

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

$$(2005\ \text{PPP exchange rate}) \cdot \$1.25 \cdot \left(\frac{\text{CPI}_{\text{June 2008 to May 2009}}}{\text{CPI}_{2005}}\right) =$$

$$\left(\frac{\text{FJD}1.548}{\$1.00}\right) \cdot \$1.25 \cdot \left(\frac{106.9375}{100.0333}\right) = \text{FJD}2.07.$$

This line applies to Fiji as a whole. In a given poverty-line region, the \$1.25/day line is the all-Fiji \$1.25/day line, multiplied by the value of the national line in that poverty-line region, and then divided by Fiji's average national line. For the example of urban areas, the \$1.25/day line is the all-Fiji \$1.25/day line (FJD2.07, Figure 1), multiplied by the value of the national line in urban areas (FJD6.59), divided by the average national line (FJD6.20). This gives a \$1.25/day line in urban areas of FJD2.20.

For Fiji overall, the person-level poverty rate for the \$1.25/day 2005 PPP poverty line is 3.9 percent (Figure 1). This is lower than the 5.9 percent reported for the 2008/9 HIES by the World Bank's PovCalNet.[5] While part of the difference is likely due to PovcalNet's use of expenditure rather than income, PovCalNet does not report its \$1.25/day line in local currency, nor how it adjusts for prices over time and across regions.

[5] iresearch.worldbank.org/PovcalNet/index.htm, retrieved 25 June 2014

USAID microenterprise partners in Fiji who use the poverty scorecard to report poverty rates to USAID should use the median line. This is because USAID defines the very poor as those people in households whose per-adult-equivalent or per-capita income is below the highest of two lines (Figure 1):

- $1.25/day 2005 PPP (FJD2.07)
- Median line (FJD3.44).

3. Scorecard construction

For Fiji, about 70 candidate indicators are initially prepared in the areas of:

- Household composition (such as the number of members)
- Education (such as the highest level attained by the male head/spouse)
- Housing (such as the type of outer walls)
- Ownership of durable assets (such as televisions or washing machines)
- Employment (such as the number of household members who work for money)

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

One aim of the scorecard is to measure changes in poverty through time. This means that, when selecting indicators and holding other considerations constant, preference is given to more sensitive indicators. For example, the ownership of a television or a washing machine is probably more likely to change in response to changes in poverty than is the age of the male head/spouse.

The scorecard itself is built using 100% of the national poverty line and Logit regression on the construction sub-sample. Indicator selection uses both judgment and statistics. The first step is to use Logit to build one scorecard for each candidate indicator. Each scorecard’s power to rank households by poverty status is measured as “c” (SAS Institute Inc., 2004).

One of these one-indicator scorecards is then selected based on several factors (Schreiner et al., 2004; Zeller, 2004). These include improvement in accuracy, likelihood of acceptance by users (determined by simplicity, cost of collection, and “face validity” in terms of experience, theory, and common sense), sensitivity to changes in poverty, variety among indicators, applicability across regions, relevance for distinguishing among households at the poorer end of the distribution of income, likelihood of having a slow-changing relationship with poverty over time, 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[6] and non-statistical criteria. The non-statistical criteria can improve robustness through time and help ensure that indicators are simple, sensible, and acceptable to users.

The single poverty scorecard here applies to all of Fiji. 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 (Tarozzi and Deaton, 2007) at the risk of overfitting (Haslett, 2012).

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

4. Practical guidelines for scorecard use

The main challenge of scorecard design is not to maximize statistical accuracy but rather to improve the chances that the scorecard is actually used (Schreiner, 2005b). When scoring projects fail, the reason is not usually statistical inaccuracy but rather the failure of 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, Fiji's scorecard fits on one page. The construction process, indicators, and points are simple and transparent. Additional work is minimized; non-specialists can compute scores by hand in the field because the scorecard has:

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

The scorecard (and its back-page worksheet) is ready to be photocopied. It can be used with a simple spreadsheet database (Microfinance Risk Management, L.L.C., 2014) that records identifying information, dates, and indicator values and then computes (and stores) scores and poverty likelihoods.

A field worker using Fiji'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 first name, age, and whether the person works for money
- Record household size in the scorecard header, and record the responses to first four scorecard indicators based on the back-page worksheet, drawing a circle around the relevant responses and their points, and writing each point value in the far right-hand column
- Read each of the remaining six 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).[7] IRIS Center (2007a) and Toohig (2008) are useful nuts-and-bolts guides for

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

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 Indicators" found at the end of this paper, as they are an integral part of the poverty scorecard.[8]

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

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are hidden, field workers and respondents can apply common sense to guess which response options are linked with greater poverty.

[8] 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 the Fiji Islands Bureau of Statistics did when it fielded the 2008/9 HIES.

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 poverty scoring will inform an issue that matters to the organization.

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

- Employees of the organization
- Third parties

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

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

5. Estimates of household poverty likelihoods

The sum of scorecard points for a household is called the score. For Fiji, 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 100% of the national line, scores of 35–39 have a poverty likelihood of 40.6 percent, and scores of 30–34 have a poverty likelihood of 52.1 percent (Figure 3).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 35–39 are associated with a poverty likelihood of 40.6 percent for 100% of the national line but of 1.7 percent for the $1.25/day 2005 PPP line.[9]

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-adult-equivalent or per-capita income below a given poverty line.

For the example of 100% of the national line (Figure 4), there are 11,980 (normalized) households in the calibration sub-sample with a score of 35–39. Of these, 4,859 (normalized) are

[9] Starting with Figure 3, many figures have seven versions, one for each of the seven poverty lines. To keep them straight, they are grouped by poverty line. Single tables pertaining to all seven lines are placed with the tables for 100% of the national line.

below the poverty line. The estimated poverty likelihood associated with a score of 35–39 is then 40.6 percent, because 4,859 ÷ 11,980 = 40.6 percent.

To illustrate with 100% of the national line and a score of 40–44, there are 13,982 (normalized) households in the calibration sample, of whom 3,368 (normalized) are below the line (Figure 4). The poverty likelihood for this score range is then 3,368 ÷ 13,982 = 24.1 percent.

The same method is used to calibrate scores with estimated poverty likelihoods for the other six poverty lines.[10]

Figure 5 shows, for all scores, the likelihood that a given household's per-adult-equivalent or per-capita income falls in a range demarcated by two adjacent poverty lines.

[10] 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 that include few households would otherwise lead to higher scores being linked with higher poverty likelihoods.

For the example of adult-equivalent poverty lines, the probability that a household with a score of 35–39 falls between two adjacent poverty lines is:

- 40.6 percent below 100% of the national line
- 34.7 percent between 100% and 150% of the national line
- 14.1 percent between 150% and 200% of the national line
- 10.7 percent above 200% of the national line

For the example of per-capita poverty lines, the probability that a household with a score of 35–39 falls between two adjacent poverty lines is:

- 1.7 percent below $1.25/day
- 16.4 percent between $1.25/day and $2.00/day
- 12.5 percent between $2.00/day and $2.50/day
- 69.5 percent above $2.50/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 income. 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 Fiji poverty scorecard are transformed coefficients from a Logit regression, (untransformed) scores are not converted to poverty likelihoods via the Logit formula of $2.718281828^{score} \times (1 + 2.718281828^{score})^{-1}$. 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.[11]

[11] 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 Fiji's population. Thus, the scorecard will generally be biased when applied after May 2009 (the last month of fieldwork for the 2008/9 HIES) 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 Fiji 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 income below a poverty line
- For each score, record the difference between the estimated poverty likelihood (Figure 3) and the true poverty likelihood in the bootstrap sample
- Repeat the previous three steps 1,000 times
- For each score, report the average difference between estimated and true poverty likelihoods across the 1,000 bootstrap samples
- For each score, report the two-sided intervals containing the central 900, 950, and 990 differences between estimated and true poverty likelihoods

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

For 100% of the national line, the average poverty likelihood across bootstrap samples for scores of 35–39 in the validation sample is too high by 2.7 percentage points. For scores of 40–44, the average estimate is too low by 6.0 percentage points.[12]

[12] 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.

The 90-percent confidence interval for the differences for scores of 35–39 is ±1.9 percentage points (100% of the national line, Figure 6). This means that in 900 of 1,000 bootstraps, the difference between the estimate and the true value is between +0.8 and +4.6 percentage points (because +2.7 – 1.9 = +0.8, and +2.7 + 1.9 = +4.6). In 950 of 1,000 bootstraps (95 percent), the difference is +2.7 ± 2.4 percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is +2.7 ± 3.1 percentage points.

Most differences between estimated poverty likelihoods and true values in Figure 6 are small, but a few are large. There are differences because the validation sample is a single sample that—thanks to sampling variation—differs in distribution from the construction/calibration sub-samples and from Fiji'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.

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 HIES fieldwork in May 2009. That is, it may fit the data from the 2008/9 HIES 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 2008/9 HIES but not in the overall population of Fiji. 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 2014 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 76.3, 52.1, and 24.1 percent (national line, Figure 3). The group's estimated poverty rate is the households' average poverty likelihood of (76.3 + 52.1 + 24.1) ÷ 3 = 50.8 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 52.1 percent. This differs from the 50.8 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 Fiji 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 1.2 percentage points (Figure 8, summarizing Figure 7 across all seven poverty lines). The average absolute difference across poverty lines is about 0.5 percentage points. At least part of these differences is due to sampling variation in the division of the 2008/9 HIES into two sub-samples.

When estimating poverty rates at a point in time, the bias reported in Figure 8 should be subtracted from the average poverty likelihood to make the estimate unbiased. For the Fiji scorecard and 100% of the national line, bias happens to be 0.0 percentage points, so the unbiased estimate in the three-household example above is 50.8 – (0.0) = 50.8 percent. In general, bias will not be zero, so this adjustment for known bias will matter.

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

For example, suppose that the average poverty likelihood in a sample of n = 16,384 with the Fiji scorecard and the national line is 50.8 percent. Then estimates in 90 percent of such samples would be expected to fall in the range of 50.8 – (0.0) – 0.5 = 50.3 percent to 50.8 – (0.0) + 0.5 = 51.3 percent, with the most likely true value being the unbiased estimate in the middle of this range (50.8 – (0.0) = 50.8 percent). This is because the original (biased) estimate is 50.8 percent, bias is 0.0 percentage points, and the 90-percent confidence interval for 100% of the national line and this sample size is ±0.5 percentage points (Figure 8).

6.2 Formula for standard errors for estimates of poverty rates

How precise are the point-in-time estimates? Because 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 standard error of the average difference.

To derive a formula for the standard errors of estimated poverty rates at a point in time from indirect measurement via poverty scorecards (Schreiner, 2008a), 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, Fiji's 2008/9 HIES gives a direct-measurement estimate of the household-level poverty rate for 100% of the national line of $\hat{p}$ = 25.9 percent (Figure 1). If this estimate came from a sample of n = 16,384 households from a population N of 175,246 (the number of households in Fiji in 2008/9), then the finite population correction ϕ is $\sqrt{\frac{175{,}246 - 16{,}384}{175{,}246 - 1}}$ = 0.9521, which might be taken as $\phi = 1$. If the desired confidence level is 90-percent (z = 1.64), then the confidence interval ±c is

$$\pm z \cdot \sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}} = \pm 1.64 \cdot \sqrt{\frac{0.259 \cdot (1 - 0.259)}{16{,}384}} \cdot \sqrt{\frac{175{,}246 - 16{,}384}{175{,}246 - 1}} = \pm 0.534$$

percentage points. (If ϕ were taken as 1, then the interval is ±0.561 percentage points.)

Poverty scorecards, however, do not measure poverty directly, so this formula is not applicable. To derive a formula for the Fiji scorecard, consider Figure 7, which reports empirical confidence intervals ±c for the differences for the scorecard applied to 1,000 bootstraps of various sizes from the validation sample. For example, with n = 16,384 and 100% of the national line, the 90-percent confidence interval is ±0.497 percentage points.[13]

That is, the 90-percent confidence interval with n = 16,384 is ±0.497 percentage points for the Fiji poverty scorecard and ±0.534 percentage points for direct measurement. The ratio of the two intervals is 0.497 ÷ 0.534 = 0.93.

[13] Due to rounding, Figure 7 displays 0.5, not 0.497.

Now consider the same exercise, but with n = 8,192. The confidence interval under direct measurement with 100% of the national line is

$\pm 1.64 \cdot \sqrt{\frac{0.259 \cdot (1 - 0.259)}{8{,}192}} \cdot \sqrt{\frac{175{,}246 - 16{,}384}{175{,}246 - 1}} = \pm 0.756$ percentage points. The empirical confidence interval with the Fiji poverty scorecard (Figure 7) is ±0.706 percentage points. Thus for n = 8,192, the ratio of the two intervals is 0.706 ÷ 0.756 = 0.93.

This ratio of 0.93 for n = 8,192 is the same as the ratio of 0.93 for n = 16,384. Across all sample sizes of 256 or more in Figure 7, the average ratio turns out to be 0.88 (Figure 8), implying that confidence intervals for indirect estimates of poverty rates via the Fiji scorecard and the national poverty line are—for a given sample size—about 12-percent narrower than confidence intervals for direct estimates via the 2008/9 HIES. This 0.88 appears in Figure 8 as the "α factor" because if α = 0.88, then the formula for confidence intervals c for the Fiji poverty 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 six of the seven poverty lines in Figure 8.

The formula relating confidence intervals with standard errors for poverty scoring can be rearranged to give a formula for determining sample size before measurement. If $\tilde{p}$ is the expected poverty rate before measurement, then the formula for sample size n from a population of size N that is based on the desired confidence level that corresponds to z and the desired confidence interval ±c is $n = N \cdot \left(\frac{z^2 \cdot \alpha^2 \cdot \tilde{p} \cdot (1 - \tilde{p})}{z^2 \cdot \alpha^2 \cdot \tilde{p} \cdot (1 - \tilde{p}) + c^2 \cdot (N - 1)} \right)$. If the population N is “large” relative to the sample size n, then the finite population correction factor ϕ can be taken as one (1), and the formula becomes $n = \left(\frac{\alpha \cdot z}{c}\right)^2 \cdot \tilde{p} \cdot (1 - \tilde{p})$.

To illustrate how to use this, suppose the population N is 175,246 (the number of households in Fiji in 2008/9), suppose c = 0.03840, z = 1.64 (90-percent confidence), and the relevant poverty line is 100% of the national line so that the most sensible expected poverty rate $\tilde{p}$ is Fiji’s overall poverty rate for that line in 2008/9 (25.9 percent at the household level, Figure 1). The α factor is 0.88 (Figure 8). Then the sample-size formula gives

$$n = 175{,}246 \cdot \left(\frac{1.64^2 \cdot 0.88^2 \cdot 0.259 \cdot (1 - 0.259)}{1.64^2 \cdot 0.88^2 \cdot 0.259 \cdot (1 - 0.259) + 0.03840^2 \cdot (175{,}246 - 1)}\right) = 271,$$ which is

not terribly far from the sample size of 256 observed for these parameters in Figure 7 for 100% of the national line. Taking the finite population correction factor ϕ as one gives almost the same result, as $n = \left(\frac{0.88 \cdot 1.64}{0.03840}\right)^2 \cdot 0.259 \cdot (1 - 0.259) = 272$.[14]

Of course, the α factors in Figure 8 are specific to Fiji, 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 scorecard following the approach in this paper.

[14] 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 Fiji should report using the median line. Given the α factor of 0.89 for this line (Figure 8), an expected before-measurement household-level poverty rate of 11.2 percent (the all-Fiji rate for 2008/9, Figure 1), and a confidence level of 90 percent, then n = 300 implies a confidence interval of $\pm 1.64 \cdot 0.89 \cdot \sqrt{\frac{0.112 \cdot (1 - 0.112)}{300}}$ = ±2.7 percentage points.

In practice after the end of fieldwork for the HIES in May 2009, a program would select a poverty line (say, 100% of the national line), note its participants' population size (for example, N = 10,000 participants), select a desired confidence level (say, 90 percent, or z = 1.64), select a desired confidence interval (say, ±2.0 percentage points, or c = ±0.02), make an assumption about $\tilde{p}$ (perhaps based on a previous measurement such as the household-level poverty rate for 100% of the national line for Fiji of 25.9 percent in the 2008/9 HIES in Figure 1), look up α (here, 0.88 in Figure 8), assume that the scorecard will still work in the future and for non-nationally representative sub-groups,[15] and then compute the required sample size. In this illustration, $n = 10{,}000 \cdot \left(\frac{1.64^2 \cdot 0.88^2 \cdot 0.259 \cdot (1 - 0.259)}{1.64^2 \cdot 0.88^2 \cdot 0.259 \cdot (1 - 0.259) + 0.02^2 \cdot (10{,}000 - 1)} \right)$ = 909.

[15] 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 May 2009 will resemble that in the 2008/9 HIES 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 2008/9 HIES, this paper cannot test estimates of change over time for Fiji, and it can only suggest approximate formulas for standard errors. Nonetheless, the relevant concepts are presented here because, in practice, local pro-poor organizations can apply the scorecard to collect their own data and measure change through time.

7.1 Warning: Change is not impact

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

7.2 Estimating changes in poverty rates over time

Consider the illustration begun in the previous section. On 1 January 2014, an organization samples three households who score 20, 30, and 40 and so have poverty likelihoods of 76.3, 52.1, and 24.1 percent (100% of the national line, Figure 3). Adjusting for the known bias of 0.0 percentage points (Figure 8), the group's baseline estimated poverty rate is the households' average poverty likelihood of [(76.3 + 52.1 + 24.1) ÷ 3] – (0.0) = 50.8 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 2016, 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 59.1, 40.6, and 17.3 percent, 100% of the national line, Figure 3). Adjusting for known bias, the average poverty likelihood at follow-up is [(59.1 + 40.6 + 17.3) ÷ 3] – (0.0) = 39.0 percent, an improvement of 50.8 – 39.0 = 11.8 percentage points.[16]

Thus, about one in eight or nine participants in this hypothetical example cross the poverty line in 2014/6.[17] Among those who start below the line, about one in four or five (11.8 ÷ 50.8 = 23.2 percent) on net end up above the line.[18]

7.3 Accuracy for estimated change in two independent samples

With only the 2008/9 HIES, it is not possible to measure the accuracy of scorecard estimates of changes in groups' poverty rates over time. In practice, of course, local pro-poor organizations in Fiji can still use the poverty scorecard to estimate change. The rest of this

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

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 ±c with the standard error σ of a poverty 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,[19] and α is the average (across a range of bootstrapped sample sizes) of the ratio of the observed confidence interval from a poverty 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 poverty scorecard, where $\tilde{p}$ is based on previous measurements and is assumed equal at both baseline and follow-up:

$n = 2 \cdot N \cdot \left(\frac{z^2 \cdot \alpha^2 \cdot \tilde{p} \cdot (1 - \tilde{p})}{z^2 \cdot \alpha^2 \cdot \tilde{p} \cdot (1 - \tilde{p}) + c^2 \cdot (N - 1)} \right)$. If ϕ can be taken as one, then the formula becomes $n = 2 \cdot \left(\frac{\alpha \cdot z}{c} \right)^2 \cdot \tilde{p} \cdot (1 - \tilde{p})$.

[19] 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.

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

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 (±c = ±0.02), the poverty line is 100% of the national line, α = 1.15, $\hat{p}$ = 0.259 (the household-level poverty rate in 2008/9 for the national line in Figure 1), and the population N is large enough relative to the expected sample size n that the finite population correction ϕ can be taken as one. Then the baseline sample size is $n = 2 \cdot \left(\frac{1.15 \cdot 1.64}{0.02}\right)^2 \cdot 0.259 \cdot (1 - 0.259) \cdot 1$ = 3,414, and the follow-up sample size is also 3,414.

7.5 Precision for estimated change for one sample, scored twice

Analogous to previous derivations, the general formula relating the confidence interval ±c to the standard error σ when using a poverty scorecard to estimate change for a single group of households, all of whom are scored at two points in time, is:[20]

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

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

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

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

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

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

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

Given this, a sample-size formula for a group of households to whom the Fiji scorecard is applied twice (once after May 2009 and then again later) is

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

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 (±c = ±0.02), the poverty line is 100% of the national line, the sample will first be scored in 2014 and then again in 2017 (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 $p_{2008/9}$ is taken as 25.9 percent (Figure 1), and α is assumed to be 1.30. Then the baseline sample size is $n = 2 \cdot \left(\frac{1.30 \cdot 1.64}{0.02}\right)^2 \cdot \{-0.02 + 0.016 \cdot 3 + 0.47 \cdot [0.259 \cdot (1 - 0.259)]\} \cdot 1$ = 2,687. The same group of 2,687 households is scored at follow-up as well.

8. Targeting

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

There is a distinction between targeting status (scoring at or below a targeting cut-off) and poverty status (having income below a poverty line). Poverty status is a fact that is defined by whether income 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 targeting tool is perfect, and targeting is unsuccessful when households truly below a poverty line are not targeted (undercoverage) or when households truly above a poverty line are targeted (leakage).

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

Programs should weigh these trade-offs when setting a cut-off. A formal way to do this is to assign net benefits—based on a program's values and mission—to each of the four possible targeting outcomes and then to choose the cut-off that maximizes total net benefits (Adams and Hand, 2000; Hoadley and Oliver, 1998).

Figure 10 shows the distribution of households by targeting outcome for Fiji. For an example cut-off of 39 or less, outcomes for 100% of the national line in the validation sample are:

- Inclusion: 17.9 percent are below the line and correctly targeted
- Undercoverage: 8.0 percent are below the line and mistakenly not targeted
- Leakage: 16.9 percent are above the line and mistakenly targeted
- Exclusion: 57.2 percent are above the line and correctly not targeted

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

- Inclusion: 22.0 percent are below the line and correctly targeted
- Undercoverage: 3.9 percent are below the line and mistakenly not targeted
- Leakage: 26.8 percent are above the line and mistakenly targeted
- Exclusion: 47.3 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 10 for a given poverty line
- Select the cut-off with the highest total net benefit

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

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

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

Figure 10 shows “Total Accuracy” for all cut-offs for the Fiji scorecard. For 100% of the national line in the validation sample, total net benefit is greatest (78.3) for a cut-off of 29 or less, with about four in five households in Fiji correctly classified.

“Total Accuracy” weighs successful inclusion of households below the line the same as successful exclusion of households above the line. If a program values inclusion more (say, twice as much) than exclusion, 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).[21]

[21] Figure 10 also reports BPAC, the Balanced Poverty Accuracy Criteria adopted by USAID for certifying poverty scorecards. IRIS Center (2005) made BPAC to consider accuracy in terms of the bias of estimated poverty rates and in terms of targeting inclusion. BPAC = (Inclusion – |Undercoverage – Leakage|) x [100 ÷ (Inclusion + Undercoverage)]. Schreiner (2014) explains why BPAC is not a useful measure of accuracy for poverty scorecards.

As an alternative to assigning benefits and costs to targeting outcomes and then choosing a cut-off to maximize total net benefits, a program could set a cut-off to achieve a desired poverty rate among targeted households. The third column of Figure 11 (“% targeted HHs who are poor”) shows, for the Fiji scorecard applied to the validation sample, the expected poverty rate among households who score at or below a given cut-off. For the example of 100% of the national line, targeting households who score 39 or less would target 34.8 percent of all households (second column) and be associated with a poverty rate among those targeted of 51.5 percent (third column).

Figure 11 also reports two other measures of targeting accuracy. The first is a version of coverage (“% poor HHs who are targeted”). For the example of 100% of the national line with the validation sample and a cut-off of 39 or less, 69.0 percent of all poor households are covered.

The final targeting measure in Figure 11 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For 100% of the national line with the validation sample and a cut-off of 39 or less, covering 1.1 poor households means leaking to 1 non-poor household.

9. The context of poverty scorecards in Fiji

This section discusses an existing scorecard for Fiji (World Bank, 2011) in terms of its goals, method, definition of poverty, data, bias, and precision. In general, the advantages of the poverty scorecard here are its:

- Reporting of both 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

World Bank (2011) uses the "poverty mapping" approach of Elbers, Lanjouw, and Lanjouw (2003) to estimate poverty rates for Fiji's four divisions, 15 provinces, and 85 tikina. The goal is to "provide a powerful visual depiction of poverty pockets that can help ensure that anti-poverty programs reach the poor. . . . [Poverty mapping can also] inform the planning process at the sub-national level . . . [and] facilitate both targeting and evaluating social-protection programs" (p. 1). A central finding is that "more than 30 percent of all the poor are concentrated in just three out of 85 tikinas, namely, Naitasiri, Vuda, and Labasa" (p. ix).

In its poverty mapping, World Bank uses a different national poverty line for Fiji, one that more closely follows Ravallion (1998). Narsey (2012, Annex B) compares the World Bank's line with Fiji's official one:

- Fiji's line is derived from expenditure and applied to income, while the World Bank's line is derived from expenditure and applied to expenditure
- Fiji's country-wide food and non-food price deflators differ from the World Bank's
- Fiji applies one country-wide price deflator in both urban and rural areas, while the World Bank uses urban-specific and rural-specific deflators
- Fiji's food basket is based on 2002/3 data, while the World Bank uses 2008/9 data
- Fiji defines distinct urban and rural food baskets, but the World Bank does not
- Fiji's food component differs from that of World Bank in terms of the:
  - Size of the reference household (four adult equivalents rather than three)
  - Reference group for the food basket (middle quintile rather than second through fifth deciles)
  - Nutritional standard (meal plan that reflects the make-up of food basket rather than the food basket scaled to provide 2,793 Calories)

On net, the World Bank's line is 14 cents lower than Fiji's in urban areas and 80 cents lower in rural areas (Narsey, 2012, p. 105). When these lines are applied to expenditure rather than income, World Bank's estimates of person-level poverty rates are higher that the official Fiji ones both in urban areas (26.2 versus 18.5 percent) and in rural areas (44.0 versus 42.5 percent).

It is assumed, based on poverty-mapping exercises for other countries, that World Bank constructs its poverty scorecard using generalized least-squares regression with data from the 2008/9 HIES to estimate the logarithm of per-capita expenditure, considering only indicators that match items in Fiji's 2007 census.[22] The resulting scorecard is then applied to the census data to estimate poverty rates for the World Bank's national poverty line. Such estimates would not be

[22] World Bank does not report indicators or points, nor whether it uses one all-Fiji scorecard, or four divisional scorecards, or eight scorecards (urban/rural for each division). It does not report whether the indicators are limited to those in the 2008/9 HIES or whether they also include community-level averages derived from the census.

possible with only the 2008/9 HIES due to its smaller sample size. Finally, World Bank makes "poverty maps" that quickly show how estimated poverty rates vary across areas in a way that makes sense to non-specialists.

Poverty mapping in World Bank has much in common with the poverty scoring here in that they both:

- Build a scorecard with nationally representative survey data and then apply it to other data on groups that are not nationally representative
- Estimate poverty rates for groups
- Provide unbiased estimates when their assumptions hold
- Report standard errors
- Seek to be useful in practice

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
- Requires data on fewer households for construction and calibration

Strengths of poverty scoring include that it:

- Uses simple, verifiable indicators that are quick and inexpensive to collect
- Is simpler in terms of both construction and application
- Tests accuracy empirically
- Surfaces estimates of poverty likelihoods for individual households
- Reports bias
- Reduces overfitting by selecting indicators with statistical and non-statistical criteria
- Reports 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 poverty scoring seeks to help local pro-poor organizations to manage their social performance.[23] On a technical level, World Bank estimates expenditure, whereas the poverty scorecard estimates poverty likelihoods.[24]

Because Fiji's 2007 census does not measure income, World Bank cannot test accuracy out-of-sample with the 2007 census; they can only test accuracy in-sample with the 2008/9 HIES, that is, using the same data that was already used to construct the scorecard. In general, in-sample tests over-estimate accuracy.

[23] 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 poverty scoring. In Elbers et al. (2007), the developers of poverty mapping seem to take a small step away from their original position.

[24] According to Haslett and Jones (2006, p. 61), "the benefits of [poverty-mapping] accrue when interest is in several non-linear functions of the same target variable [such as the squared 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 exactly what the poverty scorecard does.

Table 17 in World Bank supplies the data needed to measure bias at the level of Fiji's four divisions. In terms of percentage points, bias is –0.6 (Central), +2.9 (Eastern), +1.2 (Northern), and +0.2 (Western), giving an average absolute bias of 1.2 percentage points. World Bank says that the poverty-map estimates have "excellent consistency", although it is not clear whether consistency means bias nor by what standard it can be judged as excellent.

When the poverty scorecard here is applied out-of-sample to the validation sample, bias at the division level is +4.5 (Central), +34.9 (Eastern), –0.5 (Northern), and –1.2 percentage points (Western). In-sample—and more comparable to World Bank—scoring's bias is +2.4 (Central), +2.7 (Eastern), 0.0 (Northern), and –2.4 (Western). Scoring's average absolute bias of 1.9 percentage points is not much higher than World Bank's 1.2.

10. Conclusion

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

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

The scorecard is constructed with half of the data from Fiji's 2008/9 HIES, calibrated to seven poverty lines, and tested on data from the other half of the 2008/9 HIES. 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. Targeting accuracy is also reported.

When the scorecard is applied to the validation sample, the maximum absolute difference between estimates versus true poverty rates for groups of households at a point in time is 1.2 percentage points. The average absolute bias across the seven poverty lines is about 0.5 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 ±0.5 percentage points or better.

If an organization wants to use the scorecard for targeting, then the results here provide useful information for selecting a cut-off that fits its 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 poverty 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 simple poverty scorecard is a practical, objective way for pro-poor programs in Fiji to estimate income-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 :

Fiji Islands Bureau of Statistics. (2008) “2008/9 Household Income and Expenditure Survey: Field Staff Manual”, Suva. [the Manual]

and

Fiji Islands Bureau of Statistics. (2008) “2008/9 Household Income and Expenditure Survey: Questionnaire”, Suva. [the Questionnaire]

General Guidelines:

Making contact

According to p. 24 of the Manual, “Try to avoid times—such as meal times—when the household will be busy. For example, farmers are usually unwilling to stand around and talk on beautiful, sunny days. . . .

“You must identify yourself by producing the identification card provided by [your organization]. . . .

“You will need to tailor your approach to suit individual cases, but in all circumstances you will need to be friendly, knowledgeable on survey matters, and tactfully persistent.

“Your introduction to the household needs to include the following: ‘Good evening. My name is [your name] from [your organization]. Here is my ID Card. Your household, together with a few other households in the area, have been selected to take part in our survey. [Our organization is interested in learning more about our participants].”

Overcoming objections

According to p. 25 of the Manual, “There is generally a certain amount of suspicion towards a strange caller, and although the above introduction will be sufficient to be invited into many homes, it is likely that you will meet with responses such as ‘we are not interested’, ‘we are a bit tied up’, etc. It is very important for the accuracy of the survey that interviewers take some time to try to convince such households to participate.”

Confidentiality

According to p. 27 of the Manual, “All information given in the survey is . . . confidential. . . . The final results of the survey are published only in summarised form. No figures relating to any individual persons or households can be gleaned from the survey results.”

Establishing and maintaining rapport

According to pp. 27–28 of the Manual, “The following suggestions may help you to establish rapport and to maintain it throughout the survey:

- Be sympathetic towards potential refusals. . . .
- Be yourself when approaching a household. Be relaxed and friendly, with an air of confidence (but not over-confidence). . . .
- Be flexible. . . .
- When approaching a household for the first time, go away if there is a row going on. . . . Chances are, you will not be welcome
- If you are met by a barking dog, do not go in, or leave. Wait for someone to appear from the house. If no one appears, then chances are that no one is home. . . .
- Be a listener, especially to those who want to express strong views about the government or whatever. Often, after they have released their frustrations, they will be in a mood to co-operate
- Always try to meet the husband and wife together before saying much about what you have come for. . . .
- Do not accept one spouse's word that the other spouse will not participate in the survey. . . .
- It helps to find a genuine common interest to establish rapport. Pets, particular garden plants, hobbies, etc., can be good talking points, especially if the person obviously takes pride in the particular interest
- Do not be quick to conclude that a household will not participate. Be persistent, and keep discussing the situation. That can exhaust all their excuses for not being able to take part
- During the interview, do not pretend to know something that you do not know. Say that you will check it out if you are not sure. Sometimes, it can help to ask the person's opinion on a possible solution
- At the initial contact, talk to people at about the same physical level, not, for example, from several steps below their doorway (which puts you in an inferior/superior position). . . .
- Establishing rapport can be aided by your dressing up or down to suit the area. . . ."

<u>Interviewer safety</u>
According to pp. 28–29 of the Manual, "As an interviewer, you are not expected to take unnecessary risks.

- When working in isolated areas, make sure someone knows when you are expected home
- Let your supervisor know if the road or weather conditions make it impossible to complete work as planned
- If you think your personal safety is at risk in a particular household, then withdraw quickly. . . .
- Conduct interviews on the doorstep if you feel safer there
- Notify your supervisor immediately you experience any physical or verbal abuse. . . .
- Always assume that there could be a dog on the property
- Never take a dog unawares. Make every attempt (for example, rattling gates) to attract its attention before entering
- If a dog is on a lead, make sure you know how far the lead stretches
- Step back from a closed door after knocking
- Use your clipboard as protection
- Back away quickly, never turn and run

- Use the vehicle, rather than walk up long driveways. Remain in the vehicle and toot if an uncontrolled dog appears
- Avoid visiting areas where roaming dogs are common on rubbish-collection day”

Guidelines relating to specific indicators in the scorecard

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

According to p. 11 of the Manual, a household refers is either:

- "A single individual living in a dwelling who makes his or her own housekeeping arrangements, or
- A group of persons living in or sharing a dwelling who participate in some measure at least in the consumption of food purchased for joint use by members, or who, if not dependent upon a household member, contribute some portion of income towards the provision of essentials of living for the household as a whole"

According to pp. 12–13 of the Manual, household members are:

- "All persons who normally spend four or more nights a week in the household
- Any person who, because of the nature of his/her occupation, cannot spend as many as four nights a week in the household but who:
    - Makes a financial contribution to the running of the household
    - Is not currently a member of another private household
- Any person at boarding school or other non-private institution who usually spends holidays or other continuous periods at home, and whose living costs are at least 50-percent subsidised by the household . . .
- Any child whose custody is shared between two households but who spends more than half his/her time in the interviewed household. Where custody/care is shared equally between two households, the child should be included in the interviewed household only if the child is there on the night of the interview
- Any person who has been in the household for at least 6 weeks prior to the interview, [even if he/she] will be permanently leaving the household at some time after the interview
- Any person who is at present staying with the household and who, by the time he or she leaves, will have been with the household for at least six weeks."

2. In the last 30 days, how many household members 10-years-old or older worked for money?
    A. None
    B. One
    C. Two
    D. Three or more

According to p. 31 of the Manual, “Money work here means:

- A wage or salary job
- Business, shop, taxi/carrier business, repair shop
- Growing things for sale
- Raising animals for sale
- Catching fish, collecting shells for sale
- Providing services for money

“Include also persons who had a job but were either sick, on leave, or did not attend work for some other reason.”

According to p. 37 of the Manual, “Household members engaged solely in non-economic activities such as cooking and making food, washing and ironing clothes, etc. for the household for its own consumption” are not to be considered as working.

3. In the last 30 days, did the male head/spouse work for money?
    A. No
    B. Yes
    C. No male head/spouse

According to p. 31 of the Manual, "Money work here means:

- A wage or salary job
- Business, shop, taxi/carrier business, repair shop
- Growing things for sale
- Raising animals for sale
- Catching fish, collecting shells for sale
- Providing services for money

"Include also persons who had a job but were either sick, on leave, or did not attend work for some other reason."

According to p. 37 of the Manual, "Household members engaged solely in non-economic activities such as cooking and making food, washing and ironing clothes, etc. for the household for its own consumption" are not to be considered as working.

For the purposes of the simple poverty scorecard, the male head/spouse is defined as:

- The household head, if the head is male
- The spouse/partner/companion of the household head, if the head is female
- Non-existent, if the head is female and if she does not have a spouse/partner/companion who is also a member of the household

4. In the last 30 days, did the female head/spouse work for money?
    A. No
    B. No female head/spouse
    C. Yes

According to p. 31 of the Manual, “Money work here means:

- A wage or salary job
- Business, shop, taxi/carrier business, repair shop
- Growing things for sale
- Raising animals for sale
- Catching fish, collecting shells for sale
- Providing services for money

“Include also persons who had a job but were either sick, on leave, or did not attend work for some other reason.”

According to p. 37 of the Manual, “Household members engaged solely in non-economic activities such as cooking and making food, washing and ironing clothes, etc. for the household for its own consumption” are not to be considered as working.

For the purposes of the simple poverty scorecard, the female head/spouse is defined as:

- The household head, if the head is female
- The spouse/partner/companion of the household head, if the head is male
- Non-existent, if the head is male and if he does not have a spouse/partner/companion who is also a member of the household

5. What is the highest level of education attained by the male head/spouse?
    A. None, kindergarten, primary Class 1 to 3, special education, or not recognized
    B. No male head/spouse
    C. Primary class 4 to 6, or secondary form 1 to 3
    D. Secondary form 4
    E. Secondary form 5 or 6
    F. Form 7, certificate, diploma, degree, post-graduate certificate or diploma, master's, or Ph.D

The Manual has no additional information about this indicator.

For the purposes of the simple poverty scorecard, the male head/spouse is defined as:

- The household head, if the head is male
- The spouse/partner/companion of the household head, if the head is female
- Non-existent, if the head is female and if she does not have a spouse/partner/companion who is also a member of the household

6. Are the outer walls of the dwelling constructed with . . .?
    A. Permanent walls of tin or corrugated iron, traditional bure materials, makeshift or improvised materials, or other
    B. Wood
    C. Concrete, brick, or cement

The Manual has no additional information about this indicator.

7. Are any gas/electric stoves available for use by any members of the household?
    A. No
    B. Yes

The Manual has no additional information about this indicator.

According to FIBoS' Government Statistician, available for use by any members of the household means that a gas/electric stove is physically present in the residence of the household and can be used by the household. For example, if two households occupy a single residence (say, a father and mother who form one separate household, and a second separate household formed by the family of one of their children) and if a gas/electric stove belongs to the child's household but is also used by the child's parents' household, then the gas/electric stove is counted for the purposes of this indicator, regardless of which of the two households is being interviewed.

Available for use by any members of the household does not include borrowing the use of a gas/electric stove belonging to a household that lives in a separate residence, such as when household from time to time cooks with the neighbor's gas/electric stove that is normally kept at the neighbor's residence.

8. What does the household mainly use for cooking?
    A. Kerosene
    B. Wood
    C. LPG, or electricity

The Manual has no additional information about this indicator.

9. Are any washing machines available for use by any members of the household?
    A. No
    B. Yes

The Manual has no additional information about this indicator.

According to FIBoS' Government Statistician, available for use by any members of the household means that a washing machine is physically present in the residence of the household and can be used by the household. For example, if two households occupy a single residence (say, a father and mother who form one separate household, and a second separate household formed by the family of one of their children) and if a washing machine belongs to the child's household but is also used by the child's parents' household, then the washing machine is counted for the purposes of this indicator, regardless of which of the two households is being interviewed.

Available for use by any members of the household does not include borrowing the use of a washing machine belonging to a household that lives in a separate residence, such as when household from time to time uses a neighbor's washing machine that is normally kept at the neighbor's residence.

10. Are any videos/TVs available for use by any members of the household?

A. No
B. Yes

The Manual has no additional information about this indicator.

According to FIBoS' Government Statistician, available for use by any members of the household means that a video/TV is physically present in the residence of the household and can be used by the household. For example, if two households occupy a single residence (say, a father and mother who form one separate household, and a second separate household formed by the family of one of their children) and if a video/TV belongs to the child's household but is also used by the child's parents' household, then the video/TV is counted for the purposes of this indicator, regardless of which of the two households is being interviewed.

Available for use by any members of the household does not include borrowing the use of a video/TV belonging to a household that lives in a separate residence, such as when household from time to time goes to watch television at a neighbor's residence with a television that is normally kept at the neighbor's residence.

Figure 1: Poverty lines and poverty rates for Fiji overall, by urban/rural, by construction/validation samples, by poverty line, and by households and people

Sample	Line or rate	Level	n	Poverty rates (% with income less than a poverty line) and poverty lines (FJD per day per adult equivalent or per person)						
				National				Intl. 2005 PPP		
				100%	150%	200%	Median	$1.25	$2.00	$2.50
All Fiji	Line	People		6.20	9.31	12.41	3.44	2.07	3.31	4.14
	Rate	Households	3,573	25.9	49.9	65.6	11.2	2.5	12.6	21.9
		People		30.6	56.0	71.7	15.3	3.9	17.1	28.0
Urban	Line	People		6.59	9.88	13.17	3.81	2.20	3.51	4.39
	Rate	Households	1,662	15.3	35.3	51.9	6.7	9.4	6.7	12.9
		People		18.5	41.0	58.6	9.2	1.2	9.4	16.9
Rural	Line	People		5.83	8.75	11.66	3.07	1.94	3.11	3.89
	Rate	Households	1,911	36.8	64.9	79.5	15.8	4.1	18.6	31.1
		People		42.5	70.6	84.6	21.3	6.6	24.6	38.9
Construction and calibration										
Selecting indicators and points, and associating scores with likelihoods	Rate	Households	1,801	25.9	49.9	65.4	11.3	2.3	12.5	21.9
	Rate	People		31.0	55.9	71.3	15.6	3.7	17.0	27.9
Validation										
Measuring accuracy	Rate	Households	1,772	25.9	49.9	65.7	11.1	2.7	12.7	21.9
	Rate	People		30.3	56.0	72.2	15.1	4.2	17.2	28.1

Source: 2008/9 HIES. Poverty lines in average prices for all of Fiji from June 2008 to May 2009.
The three national lines are per-adult-equivalent. The median line and the three international 2005 PPP lines are per-capita.

Figure 2: Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
994	What does the household mainly use for cooking? (Kerosene; Wood; LPG, or electricity)
853	What is the highest level of education attained by the male head/spouse? (None, kindergarten, primary Class 1 to 3, special education, or not recognized; Primary class 4 to 6, or secondary form 1 to 3; No male head/spouse; Secondary form 4; Secondary form 5 or 6; Form 7, certificate, diploma, degree, post-graduate certificate or diploma, master's, or Ph.D)
809	In the past 12 months, did any member of the household have any earnings from wage or salary work? (No; Yes)
773	In the last 30 days in their principle occupation, were any household members political leaders, civil servants, directors, managers, administrators, scientists, professionals, engineers, teachers, writers, artists, clergy, technicians/associate professionals, clerks, secretaries, cashiers, or semi-skilled assistants? (No; Yes)
758	Are any gas/electric stoves available for use by any members of the household? (No; Yes)
726	In the last 30 days, what was the type of business/industry/sector in which the male head/spouse had his principle occupation? (Agriculture, forestry, fishing, mining, quarrying, or private households with employed persons; Does not work; No male head/spouse; Construction; Other community, social and personal services; Manufacturing; Wholesale and retail; Financial intermediation, real estate, renting, and business activities; Electricity, gas, and water, hotels and restaurants, transport, storage, and communication, public administration, defense, education, or health and social work, or extra-territorial organisations)
720	In the last 30 days in the business/industry/sector of their principle occupation, how many household members did not work in agriculture, forestry, fishing, mining, quarrying, or private households with employed persons? (None; One; Two; Three or more)
692	What is the highest level of education attained by the female head/spouse? (None, kindergarten, primary class 1 to 6, special education, not recognized, or secondary form 1; Secondary form 2; Secondary form 3 or 4; Secondary form 5; No female head/spouse; Secondary form 6; Form 7, certificate, diploma, degree, post-graduate certificate or diploma, master's, or Ph.D)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
665	In the last 30 days, what was the principle occupation of the male head/spouse? (Farmer/grower (cash or subsistence), rancher, forestry worker, fisherperson, or hunter; Does not work; Salesperson, domestic servant, cleaner, or unskilled labourer; No male head/spouse; Construction worker/supervisor, mechanic, metalworker, carpenter, repair worker, handicrafts, food processor, or textile worker; Machine operator/supervisor, assembler, miner, or driver; Transport operator, hospitality worker, personal-care worker, security, or sales assistant; Scientist, professional, engineer, teacher, writer, artist, or clergy; Political leader, civil servant, director, manager, or administrator; Technician, associate professional, clerk, secretary, cashier, or semi-skilled assistant)
640	Are any refrigerators available for use by any members of the household? (No; Yes)
636	Are any videos/TVs available for use by any members of the household? (No; Yes)
621	Are any washing machines available for use by any members of the household? (No; Yes)
618	Are the outer walls of the dwelling constructed with . . .? (Permanent walls of tin or corrugated iron, traditional bure materials, makeshift or improvised materials, or other; Wood; Concrete, brick, or cement)
602	In the last 30 days, what was the principle occupation of the female head/spouse? (Farmer/grower (cash or subsistence), rancher, forestry worker, fisherperson, hunter, construction worker/supervisor, mechanic, metalworker, carpenter, repair worker, handicrafts, food processing, or textile worker; Does not work; Salesperson, domestic servant, cleaner, or unskilled labourer; No female head/spouse; Transport operator, hospitality worker, personal-care worker, security, sales assistant, machine operator/supervisor, assembler, miner, or driver; Political leader, civil servant, director, manager, administrator, scientist, professional, engineer, teacher, writer, artist, clergy, technician/associate professional, clerk, secretary, cashier, or semi-skilled assistant)
555	In the last 30 days in the business/industry/sector of their main job, did any household members work in agriculture, forestry, fishing, mining, quarrying, or as employed persons in private households? (Yes; No)
538	Are any computers available for use by any members of the household? (No; Yes)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
511	In the last 30 days in their principle occupation, how many household members were farmers/growers (cash or subsistence), ranchers, forestry workers, fisherpeople, hunters, salespeople, domestic servants, cleaners, or unskilled labourers? (Three or more; Two; One; None)
503	Does the household have electricity? If yes, by what supply? (No; Yes (FEA, or other); Yes (FSC, Vatukoula, or village power plant; Yes (PWD, or own plant))
503	In the last 30 days, what was the type of business/industry/sector in which the female head/spouse had her principle occupation? (Agriculture, forestry, fishing, mining, or quarrying; Does not work; No female head/spouse; Manufacturing, wholesale and retail, other community, social and personal services, or private households with employed persons; Electricity, gas, and water, construction, hotels and restaurants, transport, storage, and communication, financial intermediation, real estate, renting, and business activities, public administration, defense, education, or health and social work, or extra-territorial organisations)
488	How many members does the household have? (Eight or more; Seven; Six; Five; Four; Three; One or two)
450	In the last 30 days, how many household members planted or collected shells/fish, or provided for their own use? (Four or more; Three; Two; One; None)
440	Does your household have a flush toilet for use only by the household? (No; Yes)
428	In their main job in the past 30 days, how many household members were wage/salary earners or employers? (None; One; Two or more)
426	How many household members are 18-years-old or younger? (Four or more; Three; Two; One; None)
395	How many household members are 17-years-old or younger? (Four or more; Three; Two; One; None)
365	How many household members are 16-years-old or younger? (Four or more; Three; Two; One; None)
352	In the last 30 days in their principle occupation, how many household members were farmers/growers (cash or subsistence), ranchers, forestry workers, fisherpeople, or hunters? (Two or more; One; None)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
343	Does this household . . .? (Occupy living quarters in some other way; Rent them from a private landlord or from the Housing Authority; Own these living quarters; Occupy housing by leave of employer, or is a squatter; Occupy government or institutional housing)
341	How many household members have a cell phone? (None; One; Two; Three; Four or more)
335	How many household members are 15-years-old or younger? (Four or more; Three; Two; One; None)
306	Does your household have Sky TV/Sky Pacific/PBS? (No; Yes)
305	Do all household members ages 6 to 17 attend school? (No; Yes; No members ages 6 to 17)
301	Is the household's water . . .? (Other; Roof tank, or well; Borehole, or river or creek; Communal standpipe; Metered)
294	Do all household members ages 6 to 16 attend school? (No; Yes; No members ages 6 to 16)
292	In the last 30 days, did the female head/spouse work for money? (No; No female head/spouse; Yes)
286	Do all household members ages 6 to 18 attend school? (No; Yes; No members ages 6 to 18)
280	Was any member of the household involved in any of the following economic activities (other than wage and salary earning) in the last 12 months? (Sugar cane, dalo, ginger, yaqona, other crops, vegetables [via, maize, sorghum, groundnuts, pigeon, cowpeas, moong, urdi, cocoa, tobacco, broomcorn, pawpaws, citrus fruits, mangoes, passion fruit, lettuce, onions, potatoes, garlic, carrots, or other fresh vegetables], livestock or livestock products, forestry, handicrafts, or fishing)? (Yes; No)
268	How many household members are 14-years-old or younger? (Three or more; Two; One; None)
263	What is the employment status of the male head/spouse? How is he paid? (Does not work; Self-employed, or unpaid family/community worker; No male head/spouse; Wage/salary earner; Employer)
262	How many household members are 13-years-old or younger? (Three or more; Two; One; None)
259	Do all household members ages 6 to 15 attend school? (No; Yes; No members ages 6 to 15)
252	How many household members are 12-years-old or younger? (Three or more; Two; One; None)
247	Are any telephones available for use by any members of the household? (No; Yes)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
232	How many household members are 11-years-old or younger? (Three or more; Two; One; None)
224	How many household members are self-employed or are unpaid family/community workers? (Two or more; One; None)
221	Are any cars carriers/trucks, or outboard motors available for use by any members of the household? (No; Yes)
218	How many rooms are there for this household? (One; Two; Three; Four; Five; Six or more)
211	How many household members are self-employed? (Two or more; One; None)
203	Do all household members ages 6 to 14 attend school? (No; Yes; No members ages 6 to 14)
168	How many household members are 6-years-old or younger? (Two or more; One; None)
157	In the last 30 days in their principle occupation, were any household members not farmers/growers (cash or subsistence), ranchers, forestry workers, fisherpeople, hunters, salespeople, domestic servants, cleaners, nor unskilled labourers? (No; Yes)
148	Do all household members ages 6 to 13 attend school? (No; Yes; No members ages 6 to 13)
147	Does this household live in a . . .? (Independent dwelling; Building housing two or more households, hotel or lodging house, or other)
143	In the last 30 days, did the male head/spouse plant or collect shells/fish, or provide for his own use? (Yes; No male head/spouse; No)
142	What is the employment status of the female head/spouse? How is she paid? (Does not work; No female head/spouse; Self-employed, unpaid family/community worker, wage/salary earner, or employer)
134	Are any radios available for use by any members of the household? (No; Yes)
129	Do all household members ages 6 to 12 attend school? (No; Yes; No members ages 6 to 12)
113	Do all household members ages 6 to 11 attend school? (No; Yes; No members ages 6 to 11)
104	In the last 30 days, how many household members 10-years-old or older worked for money? (None; One; Two; Three or more)
100	In the last 30 days, did the male head/spouse work for money? (No; No male head/spouse; Yes)

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

Uncertainty coefficient	Indicator (Responses ordered starting with those linked with higher poverty likelihoods)
89	In the last 30 days, did the female head/spouse plant or collect shells/fish or provide for her own use? (Yes; No female head/spouse; No)
78	Did your household pay any money for garbage collection within the past year? (No; Yes)
54	Are any household members unpaid family/community workers? (Yes; No)
51	What is the marital status of the male head/spouse? (Widowed, separated, or divorced; Married; No male head/spouse; Never-married)
44	Are any brush cutters available for use by any members of the household? (No; Yes)
35	Does your household use Telecard/Quick dial? (No; Yes)
33	In the past 12 months, did any member of the household have any earnings (whether cash or payments in kind by free or partly free food, housing, or other goods and services) from casual wage work? (Yes; No)
20	Did any member of the household receive income in the last 12 months from partnership in any business enterprise, or from own-account activity (in any sector other than agriculture and handicraft) such as, for example, wholesaling/retailed, hawkers, manufacturing, building, and construction (for example, bures, churches, etc.)? (No; Yes)
11	What is the marital status of the female head/spouse? (Widowed, separated, or divorced; Married; No female head/spouse; Never-married)

Source: 2008/9 HIES and 100% of the national poverty line

Tables for
100% of the National Poverty Line

(and Tables Pertaining to All Seven Poverty Lines)

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	84.6
10–14	84.6
15–19	84.3
20–24	76.3
25–29	59.1
30–34	52.1
35–39	40.6
40–44	24.1
45–49	17.3
50–54	11.9
55–59	5.9
60–64	1.8
65–69	0.4
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 4 (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	0	÷	0	=	100.0
5–9	81	÷	96	=	84.6
10–14	684	÷	809	=	84.6
15–19	1,166	÷	1,384	=	84.3
20–24	2,780	÷	3,645	=	76.3
25–29	4,190	÷	7,091	=	59.1
30–34	5,087	÷	9,760	=	52.1
35–39	4,859	÷	11,980	=	40.6
40–44	3,368	÷	13,982	=	24.1
45–49	1,931	÷	11,176	=	17.3
50–54	1,308	÷	10,965	=	11.9
55–59	450	÷	7,608	=	5.9
60–64	112	÷	6,253	=	1.8
65–69	20	÷	5,695	=	0.4
70–74	0	÷	4,196	=	0.0
75–79	0	÷	2,585	=	0.0
80–84	0	÷	2,225	=	0.0
85–89	0	÷	224	=	0.0
90–94	0	÷	325	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 5 (Per-adult-equivalent poverty lines): Probability that a given household's per-adult-equivalent income falls in a range demarcated by two adjacent per-adult-equivalent poverty lines

Score	Likelihood (%) of having daily per-adult-equivalent income in a range demarcated by adjacent per-adult-equivalent poverty lines			
	< 100% Natl.	≥100% Natl. and < 150% Natl.	≥150% Natl. and < 200% Natl.	≥$200% Natl.
	< FJD6.20	≥FJD6.20 and < FJD9.31	≥FJD9.31 and < FJD12.41	≥FJD12.41
0–4	100.0	0.0	0.0	0.0
5–9	84.6	15.4	0.0	0.0
10–14	84.6	15.4	0.0	0.0
15–19	84.3	13.9	0.9	0.9
20–24	76.3	15.6	5.7	2.4
25–29	59.1	28.3	8.2	4.4
30–34	52.1	32.7	9.3	5.9
35–39	40.6	34.7	14.1	10.7
40–44	24.1	36.1	20.9	18.9
45–49	17.3	28.6	22.8	31.4
50–54	11.9	25.1	22.4	40.5
55–59	5.9	18.0	24.9	51.2
60–64	1.8	10.8	16.9	70.6
65–69	0.4	6.7	7.5	85.5
70–74	0.0	1.6	6.7	91.7
75–79	0.0	0.0	3.7	96.3
80–84	0.0	0.0	2.7	97.3
85–89	0.0	0.0	0.0	100.0
90–94	0.0	0.0	0.0	100.0
95–100	0.0	0.0	0.0	100.0

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

	Likelihood (%) of having daily per-capita income in a range demarcated by per-capita poverty lines			
	< $1.25/day	≥$1.25/day and < $2.00/day	≥$2.00/day and < $2.50/day	≥$2.50/day
Score	< FJD2.07	≥FJD2.07 and < FJD3.31	≥FJD3.31 and < FJD4.14	≥FJD4.14
0–4	100.0	0.0	0.0	0.0
5–9	71.4	11.5	10.9	6.3
10–14	44.5	35.9	13.2	6.3
15–19	21.5	40.6	16.5	21.4
20–24	18.0	35.9	16.0	30.2
25–29	5.9	28.2	22.9	42.9
30–34	4.6	23.5	21.1	50.7
35–39	1.7	16.4	12.5	69.5
40–44	0.0	9.2	10.2	80.6
45–49	0.0	2.5	8.5	89.0
50–54	0.0	1.6	4.0	94.4
55–59	0.0	0.6	3.3	96.1
60–64	0.0	0.2	2.0	97.8
65–69	0.0	0.0	0.6	99.4
70–74	0.0	0.0	0.0	100.0
75–79	0.0	0.0	0.0	100.0
80–84	0.0	0.0	0.0	100.0
85–89	0.0	0.0	0.0	100.0
90–94	0.0	0.0	0.0	100.0
95–100	0.0	0.0	0.0	100.0

The median line (FJD3.44) is close to $2.00/day (FJD3.31) and so is omitted.

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

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	–15.4	7.7	7.7	7.7
10–14	–4.4	4.4	5.1	6.6
15–19	+18.0	5.2	6.3	8.1
20–24	+4.2	2.9	3.6	4.6
25–29	+0.5	2.4	3.0	4.2
30–34	+1.5	2.1	2.6	3.2
35–39	+2.7	1.9	2.4	3.1
40–44	–6.0	3.9	4.0	4.3
45–49	+0.2	1.4	1.6	2.0
50–54	+2.2	1.2	1.4	2.0
55–59	–1.3	1.3	1.5	2.0
60–64	–1.1	1.0	1.1	1.3
65–69	–0.5	0.5	0.6	0.7
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	–2.7	2.0	2.1	2.5
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

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

Sample Size n	Difference between estimate and true value			
		Confidence interval (± percentage points)		
	Diff.	90-percent	95-percent	99-percent
1	–0.6	64.0	70.9	86.2
4	–0.4	31.9	37.6	49.8
8	–0.3	21.4	26.4	35.1
16	+0.1	15.6	17.7	24.4
32	+0.2	11.1	13.0	16.2
64	+0.1	7.8	9.1	12.3
128	+0.1	5.3	6.4	8.8
256	–0.0	3.8	4.6	6.0
512	–0.0	2.6	3.1	4.2
1,024	–0.0	1.9	2.3	2.9
2,048	–0.0	1.4	1.6	2.0
4,096	–0.0	1.0	1.2	1.6
8,192	–0.0	0.7	0.9	1.1
16,384	–0.0	0.5	0.6	0.8

Figure 8 (All poverty lines): Average differences between estimates and true values for poverty rates of a group of households at a point in time from 1,000 bootstrap samples of n = 16,384, with precision and the α factor for precision, scorecard applied to the validation sample

	Poverty line						
	National				Intl. 2005 PPP		
	100%	150%	200%	Median	$1.25	$2.00	$2.50
Estimate minus true value	0.0	–0.6	–1.2	–0.2	–0.5	–0.6	–0.2
Precision of difference	0.5	0.5	0.5	0.4	0.2	0.4	0.5
α factor for precision	0.88	0.82	0.78	0.89	1.09	0.92	0.86

Differences between estimates and true values are displayed in units of percentage points.
Precision is measured as 90-percent confidence intervals in units of ± percentage points.
Differences and precision estimated from 1,000 bootstraps with n = 16,384.
α is estimated from 1,000 bootstrap samples of *n* = 256, 512, 1,024, 2,048, 4,096, 8,192, and 16,384.

Figure 9 (All poverty lines): Possible targeting outcomes

<table>
<tr><td rowspan="3" colspan="2"></td><td colspan="2">Targeting segment</td></tr>
<tr><td>Targeted</td><td>Non-targeted</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="2">True poverty status</td><td>Below poverty line</td><td>Inclusion
Below poverty line
Correctly
Targeted</td><td>Undercoverage
Below poverty line
Mistakenly
Non-targeted</td></tr>
<tr><td>Above poverty line</td><td>Leakage
Above poverty line
Mistakenly
Targeted</td><td>Exclusion
Above poverty line
Correctly
Non-targeted</td></tr>
</table>

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

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	25.9	0.0	74.1	74.1	–100.0
≤9	0.1	25.8	0.0	74.1	74.2	–99.3
≤14	0.8	25.1	0.1	74.0	74.8	–93.4
≤19	1.7	24.2	0.6	73.5	75.2	–84.5
≤24	4.3	21.6	1.6	72.5	76.8	–60.5
≤29	8.6	17.3	4.4	69.7	78.3	–16.6
≤34	13.4	12.5	9.4	64.7	78.2	+39.8
≤39	17.9	8.0	16.9	57.2	75.1	+34.9
≤44	22.0	3.9	26.8	47.3	69.3	–3.2
≤49	24.0	2.0	36.0	38.1	62.1	–38.8
≤54	25.1	0.9	45.8	28.3	53.3	–76.9
≤59	25.6	0.3	52.9	21.2	46.8	–104.1
≤64	25.8	0.1	59.0	15.1	40.9	–127.6
≤69	25.8	0.1	64.6	9.5	35.3	–149.3
≤74	25.8	0.1	68.8	5.3	31.1	–165.5
≤79	25.8	0.1	71.4	2.7	28.6	–175.5
≤84	25.9	0.0	73.5	0.5	26.5	–183.8
≤89	25.9	0.0	73.8	0.3	26.2	–184.7
≤94	25.9	0.0	74.1	0.0	25.9	–185.9
≤100	25.9	0.0	74.1	0.0	25.9	–185.9

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

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

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.4	Only poor targeted
≤14	0.9	89.4	3.1	8.4:1
≤19	2.3	75.0	6.6	3.0:1
≤24	5.9	72.5	16.6	2.6:1
≤29	13.0	66.0	33.2	1.9:1
≤34	22.8	58.9	51.8	1.4:1
≤39	34.8	51.5	69.0	1.1:1
≤44	48.7	45.1	84.9	0.8:1
≤49	59.9	40.0	92.4	0.7:1
≤54	70.9	35.3	96.7	0.5:1
≤59	78.5	32.6	98.8	0.5:1
≤64	84.7	30.4	99.5	0.4:1
≤69	90.4	28.6	99.7	0.4:1
≤74	94.6	27.3	99.7	0.4:1
≤79	97.2	26.6	99.7	0.4:1
≤84	99.5	26.1	100.0	0.4:1
≤89	99.7	26.0	100.0	0.4:1
≤94	100.0	25.9	100.0	0.3:1
≤100	100.0	25.9	100.0	0.3:1

Tables for

150% of the National Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	98.2
20–24	91.9
25–29	87.4
30–34	84.8
35–39	75.2
40–44	60.2
45–49	45.8
50–54	37.1
55–59	23.9
60–64	12.6
65–69	7.0
70–74	1.6
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (150% of the national line): Average differences between estimated and true poverty likelihoods for households by score range from 1,000 bootstraps of n = 16,384, with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+0.0	0.0	0.0	0.0
15–19	+7.7	3.4	4.0	5.5
20–24	–1.4	1.7	2.1	2.7
25–29	+2.1	1.7	2.1	2.8
30–34	+4.4	1.7	1.9	2.5
35–39	–2.4	2.0	2.2	2.5
40–44	–6.6	4.1	4.3	4.6
45–49	–5.9	4.0	4.2	4.6
50–54	+6.5	1.9	2.2	3.0
55–59	–4.0	3.1	3.3	3.8
60–64	+2.4	1.6	1.9	2.6
65–69	+3.1	1.0	1.1	1.4
70–74	+1.6	0.0	0.0	0.0
75–79	–2.4	1.8	2.0	2.2
80–84	–4.9	3.3	3.5	3.8
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

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

Sample Size n	Difference between estimate and true value			
		Confidence interval (± percentage points)		
	Diff.	90-percent	95-percent	99-percent
1	+0.2	69.1	73.9	84.6
4	–0.6	32.9	39.5	54.7
8	–0.6	22.7	27.2	35.2
16	–0.6	16.0	19.1	25.3
32	–0.6	11.9	14.0	17.8
64	–0.7	8.6	10.6	13.6
128	–0.6	5.8	6.9	9.0
256	–0.6	4.0	4.7	6.7
512	–0.6	2.9	3.6	4.6
1,024	–0.6	2.1	2.5	3.1
2,048	–0.6	1.5	1.7	2.2
4,096	–0.6	1.0	1.2	1.8
8,192	–0.6	0.8	0.9	1.2
16,384	–0.6	0.5	0.6	0.8

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

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	49.9	0.0	50.1	50.1	–100.0
≤9	0.1	49.8	0.0	50.1	50.2	–99.6
≤14	0.9	49.0	0.0	50.1	51.0	–96.4
≤19	2.2	47.7	0.1	50.0	52.2	–91.1
≤24	5.6	44.3	0.4	49.7	55.3	–77.0
≤29	11.7	38.2	1.4	48.7	60.4	–50.5
≤34	19.4	30.5	3.4	46.7	66.1	–15.4
≤39	28.6	21.3	6.2	43.9	72.6	+27.0
≤44	37.8	12.1	11.0	39.1	76.9	+73.4
≤49	43.5	6.4	16.4	33.7	77.2	+67.1
≤54	46.8	3.1	24.0	26.0	72.9	+51.8
≤59	48.8	1.1	29.7	20.4	69.2	+40.5
≤64	49.4	0.5	35.3	14.8	64.2	+29.2
≤69	49.7	0.2	40.7	9.4	59.1	+18.4
≤74	49.7	0.2	44.9	5.2	54.9	+10.0
≤79	49.8	0.1	47.5	2.6	52.4	+4.9
≤84	49.9	0.0	49.5	0.5	50.5	+0.7
≤89	49.9	0.0	49.8	0.3	50.2	+0.3
≤94	49.9	0.0	50.1	0.0	49.9	–0.4
≤100	49.9	0.0	50.1	0.0	49.9	–0.4

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

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

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.2	Only poor targeted
≤14	0.9	100.0	1.8	Only poor targeted
≤19	2.3	94.8	4.3	18.4:1
≤24	5.9	93.8	11.2	15.1:1
≤29	13.0	89.5	23.4	8.6:1
≤34	22.8	85.2	38.9	5.8:1
≤39	34.8	82.3	57.3	4.7:1
≤44	48.7	77.5	75.7	3.4:1
≤49	59.9	72.6	87.2	2.7:1
≤54	70.9	66.1	93.9	1.9:1
≤59	78.5	62.2	97.8	1.6:1
≤64	84.7	58.3	99.0	1.4:1
≤69	90.4	55.0	99.6	1.2:1
≤74	94.6	52.5	99.6	1.1:1
≤79	97.2	51.2	99.7	1.0:1
≤84	99.5	50.2	100.0	1.0:1
≤89	99.7	50.1	100.0	1.0:1
≤94	100.0	49.9	100.0	1.0:1
≤100	100.0	49.9	100.0	1.0:1

Tables for

200% of the National Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	99.1
20–24	97.6
25–29	95.6
30–34	94.1
35–39	89.3
40–44	81.1
45–49	68.6
50–54	59.5
55–59	48.8
60–64	29.4
65–69	14.5
70–74	8.3
75–79	3.7
80–84	2.7
85–89	0.0
90–94	0.0
95–100	0.0

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

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+0.0	0.0	0.0	0.0
15–19	–0.9	0.5	0.5	0.5
20–24	–0.6	0.8	1.0	1.4
25–29	+0.7	1.1	1.3	1.7
30–34	+0.1	0.9	1.1	1.5
35–39	+1.3	1.3	1.5	1.9
40–44	–4.1	2.6	2.7	3.0
45–49	–2.9	2.3	2.4	2.8
50–54	–0.7	2.0	2.3	3.1
55–59	–3.1	2.8	3.0	3.6
60–64	–3.1	2.7	3.0	3.7
65–69	–1.0	2.0	2.4	3.2
70–74	+4.0	1.3	1.5	2.0
75–79	+1.3	1.2	1.4	1.8
80–84	–4.3	3.2	3.4	3.9
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

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

Sample Size	Difference between estimate and true value			
		Confidence interval (± percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.5	59.9	75.8	89.8
4	–1.2	30.4	36.4	48.8
8	–1.2	21.2	25.3	34.5
16	–1.2	14.8	17.9	24.9
32	–1.1	10.9	13.0	17.7
64	–1.2	7.7	9.1	12.5
128	–1.2	5.4	6.5	8.3
256	–1.2	3.7	4.4	5.9
512	–1.2	2.7	3.2	4.2
1,024	–1.2	1.8	2.1	3.0
2,048	–1.2	1.3	1.6	2.0
4,096	–1.2	0.9	1.1	1.5
8,192	–1.2	0.7	0.8	1.1
16,384	–1.2	0.5	0.6	0.7

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

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	65.7	0.0	34.3	34.3	–100.0
≤9	0.1	65.6	0.0	34.3	34.4	–99.7
≤14	0.9	64.8	0.0	34.3	35.2	–97.2
≤19	2.3	63.4	0.0	34.3	36.6	–93.0
≤24	5.9	59.8	0.1	34.2	40.1	–82.1
≤29	12.6	53.1	0.4	33.9	46.5	–61.0
≤34	21.7	44.0	1.1	33.2	54.9	–32.3
≤39	32.2	33.4	2.5	31.8	64.0	+2.0
≤44	44.0	21.6	4.7	29.6	73.7	+41.3
≤49	52.0	13.7	8.0	26.4	78.3	+70.3
≤54	58.5	7.1	12.3	22.0	80.5	+81.2
≤59	62.3	3.4	16.2	18.1	80.5	+75.4
≤64	64.3	1.4	20.4	13.9	78.2	+68.9
≤69	65.2	0.5	25.2	9.1	74.3	+61.6
≤74	65.4	0.3	29.2	5.1	70.5	+55.5
≤79	65.5	0.2	31.7	2.6	68.1	+51.7
≤84	65.7	0.0	33.8	0.5	66.2	+48.6
≤89	65.7	0.0	34.0	0.3	66.0	+48.3
≤94	65.7	0.0	34.3	0.0	65.7	+47.8
≤100	65.7	0.0	34.3	0.0	65.7	+47.8

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

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

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.1	Only poor targeted
≤14	0.9	100.0	1.4	Only poor targeted
≤19	2.3	100.0	3.5	Only poor targeted
≤24	5.9	98.6	8.9	71.8:1
≤29	13.0	96.6	19.2	28.6:1
≤34	22.8	95.2	33.0	19.9:1
≤39	34.8	92.8	49.1	12.8:1
≤44	48.7	90.4	67.0	9.4:1
≤49	59.9	86.7	79.1	6.5:1
≤54	70.9	82.6	89.1	4.7:1
≤59	78.5	79.4	94.9	3.9:1
≤64	84.7	75.9	97.9	3.1:1
≤69	90.4	72.1	99.3	2.6:1
≤74	94.6	69.1	99.6	2.2:1
≤79	97.2	67.4	99.7	2.1:1
≤84	99.5	66.1	100.0	1.9:1
≤89	99.7	65.9	100.0	1.9:1
≤94	100.0	65.7	100.0	1.9:1
≤100	100.0	65.7	100.0	1.9:1

Tables for

the Median Poverty Line

Figure 3 (Median 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	71.4
10–14	67.6
15–19	58.3
20–24	51.1
25–29	31.6
30–34	24.6
35–39	16.3
40–44	7.2
45–49	3.4
50–54	1.1
55–59	0.8
60–64	0.3
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

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

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	–28.6	14.3	14.3	14.3
10–14	+7.9	7.2	8.7	11.2
15–19	+8.7	5.5	6.4	9.2
20–24	–0.7	3.3	3.9	4.9
25–29	–6.7	4.5	4.8	5.2
30–34	–0.1	2.0	2.5	3.1
35–39	+2.5	1.3	1.6	2.2
40–44	–1.0	1.0	1.2	1.5
45–49	–0.6	0.8	1.0	1.1
50–54	+0.1	0.4	0.5	0.6
55–59	+0.5	0.2	0.2	0.3
60–64	+0.3	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

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

Sample Size n	Difference between estimate and true value			
		Confidence interval (± percentage points)		
	Diff.	90-percent	95-percent	99-percent
1	–0.8	53.5	67.4	75.5
4	–0.1	21.9	26.8	39.5
8	–0.4	15.7	18.9	24.7
16	–0.2	11.5	13.3	17.5
32	+0.0	7.8	9.4	12.3
64	+0.0	5.4	6.6	8.9
128	–0.0	4.1	4.9	6.4
256	–0.2	2.8	3.4	4.5
512	–0.2	2.1	2.5	3.2
1,024	–0.2	1.4	1.7	2.1
2,048	–0.2	1.0	1.2	1.5
4,096	–0.2	0.7	0.8	1.1
8,192	–0.2	0.5	0.6	0.8
16,384	–0.2	0.4	0.4	0.6

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

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	11.1	0.0	88.8	88.8	–100.0
≤9	0.1	11.0	0.0	88.8	88.9	–98.3
≤14	0.6	10.5	0.3	88.5	89.1	–86.6
≤19	1.3	9.8	1.0	87.8	89.1	–67.8
≤24	3.0	8.1	2.9	85.9	88.9	–19.6
≤29	5.8	5.3	7.3	81.6	87.3	+34.5
≤34	7.9	3.2	14.9	74.0	81.9	–34.1
≤39	9.4	1.7	25.3	63.5	72.9	–128.1
≤44	10.5	0.6	38.2	50.7	61.2	–244.0
≤49	10.9	0.2	48.9	39.9	50.9	–340.8
≤54	11.1	0.0	59.8	29.1	40.1	–438.5
≤59	11.1	0.0	67.3	21.5	32.6	–506.7
≤64	11.1	0.0	73.6	15.3	26.4	–563.1
≤69	11.1	0.0	79.3	9.6	20.7	–614.4
≤74	11.1	0.0	83.5	5.4	16.5	–652.2
≤79	11.1	0.0	86.1	2.8	13.9	–675.5
≤84	11.1	0.0	88.3	0.5	11.6	–695.5
≤89	11.1	0.0	88.5	0.3	11.4	–697.6
≤94	11.1	0.0	88.8	0.0	11.1	–700.5
≤100	11.1	0.0	88.8	0.0	11.1	–700.5

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

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

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.9	Only poor targeted
≤14	0.9	64.5	5.3	1.8:1
≤19	2.3	56.0	11.6	1.3:1
≤24	5.9	50.4	26.9	1.0:1
≤29	13.0	44.2	51.9	0.8:1
≤34	22.8	34.7	71.2	0.5:1
≤39	34.8	27.0	84.6	0.4:1
≤44	48.7	21.6	94.7	0.3:1
≤49	59.9	18.3	98.6	0.2:1
≤54	70.9	15.6	99.7	0.2:1
≤59	78.5	14.1	100.0	0.2:1
≤64	84.7	13.1	100.0	0.2:1
≤69	90.4	12.3	100.0	0.1:1
≤74	94.6	11.7	100.0	0.1:1
≤79	97.2	11.4	100.0	0.1:1
≤84	99.5	11.2	100.0	0.1:1
≤89	99.7	11.1	100.0	0.1:1
≤94	100.0	11.1	100.0	0.1:1
≤100	100.0	11.1	100.0	0.1:1

Tables for

the $1.25/day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	71.4
10–14	44.5
15–19	21.5
20–24	18.0
25–29	5.9
30–34	4.6
35–39	1.7
40–44	0.0
45–49	0.0
50–54	0.0
55–59	0.0
60–64	0.0
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

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

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+18.8	20.5	24.8	31.6
10–14	+10.5	7.4	8.8	11.1
15–19	–9.7	7.5	7.9	8.8
20–24	–1.6	2.8	3.3	4.2
25–29	–2.6	2.0	2.1	2.3
30–34	+1.4	1.0	1.2	1.5
35–39	–0.1	0.5	0.6	0.8
40–44	–1.6	1.0	1.1	1.2
45–49	–0.4	0.3	0.3	0.4
50–54	–0.6	0.5	0.5	0.6
55–59	+0.0	0.0	0.0	0.0
60–64	+0.0	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

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

Sample Size n	Difference between estimate and true value			
		Confidence interval (± percentage points)		
	Diff.	90-percent	95-percent	99-percent
1	–0.1	3.0	9.0	69.3
4	–0.5	13.3	15.5	25.9
8	–0.7	8.5	11.7	17.5
16	–0.5	6.2	7.4	10.9
32	–0.4	4.4	5.3	6.9
64	–0.3	3.1	3.6	4.6
128	–0.4	2.2	2.8	3.4
256	–0.4	1.6	1.8	2.4
512	–0.5	1.2	1.4	1.7
1,024	–0.5	0.8	1.0	1.2
2,048	–0.5	0.6	0.7	1.0
4,096	–0.5	0.4	0.5	0.7
8,192	–0.5	0.3	0.3	0.5
16,384	–0.5	0.2	0.2	0.3

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

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	2.7	0.0	97.3	97.3	–100.0
≤9	0.0	2.7	0.0	97.2	97.3	–94.7
≤14	0.3	2.4	0.6	96.7	97.0	–54.6
≤19	0.7	2.0	1.5	95.7	96.5	+ 11.6
≤24	1.4	1.3	4.5	92.7	94.1	–66.6
≤29	2.0	0.7	11.0	86.3	88.3	–304.6
≤34	2.2	0.5	20.6	76.7	78.9	–655.2
≤39	2.4	0.3	32.4	64.9	67.3	–1,088.0
≤44	2.6	0.1	46.1	51.1	53.7	–1,594.2
≤49	2.7	0.1	57.3	40.0	42.7	–2,002.6
≤54	2.7	0.0	68.2	29.1	31.8	–2,402.8
≤59	2.7	0.0	75.8	21.5	24.2	–2,682.2
≤64	2.7	0.0	82.0	15.3	18.0	–2,911.8
≤69	2.7	0.0	87.7	9.6	12.3	–3,120.9
≤74	2.7	0.0	91.9	5.4	8.1	–3,274.9
≤79	2.7	0.0	94.5	2.8	5.5	–3,369.9
≤84	2.7	0.0	96.7	0.5	3.3	–3,451.6
≤89	2.7	0.0	97.0	0.3	3.0	–3,459.8
≤94	2.7	0.0	97.3	0.0	2.7	–3,471.7
≤100	2.7	0.0	97.3	0.0	2.7	–3,471.7

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

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

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	51.2	1.8	1.0:1
≤14	0.9	36.7	12.2	0.6:1
≤19	2.3	32.7	27.5	0.5:1
≤24	5.9	23.5	51.3	0.3:1
≤29	13.0	15.4	73.6	0.2:1
≤34	22.8	9.7	81.4	0.1:1
≤39	34.8	6.9	88.5	0.1:1
≤44	48.7	5.3	95.6	0.1:1
≤49	59.9	4.4	97.6	0.0:1
≤54	70.9	3.8	100.0	0.0:1
≤59	78.5	3.5	100.0	0.0:1
≤64	84.7	3.2	100.0	0.0:1
≤69	90.4	3.0	100.0	0.0:1
≤74	94.6	2.9	100.0	0.0:1
≤79	97.2	2.8	100.0	0.0:1
≤84	99.5	2.7	100.0	0.0:1
≤89	99.7	2.7	100.0	0.0:1
≤94	100.0	2.7	100.0	0.0:1
≤100	100.0	2.7	100.0	0.0:1

Tables for

the $2.00/day 2005 PPP Poverty Line

Figure 3 ($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	82.8
10–14	80.4
15–19	62.1
20–24	53.8
25–29	34.2
30–34	28.1
35–39	18.0
40–44	9.2
45–49	2.5
50–54	1.6
55–59	0.6
60–64	0.2
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($2.00/day line): Average differences between estimated and true poverty likelihoods for households by score range from 1,000 bootstraps of n = 16,384, with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	–17.2	8.6	8.6	8.6
10–14	+20.7	7.2	8.7	11.2
15–19	+7.6	5.5	6.5	8.9
20–24	–1.7	3.2	3.9	5.0
25–29	–3.7	3.0	3.3	3.9
30–34	+1.1	2.0	2.4	3.2
35–39	+1.0	1.4	1.7	2.3
40–44	–2.9	2.0	2.1	2.3
45–49	–2.5	1.6	1.7	2.0
50–54	+0.5	0.4	0.5	0.6
55–59	–1.3	1.0	1.1	1.3
60–64	+0.2	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 7 ($2.00/day line): Average differences between estimated poverty rates and true values for a group at a point in time for 1,000 bootstraps of various sample sizes, with confidence intervals, scorecard applied to the validation sample

Sample Size n	Difference between estimate and true value			
		Confidence interval (± percentage points)		
	Diff.	90-percent	95-percent	99-percent
1	–1.0	53.0	63.0	76.4
4	–0.5	24.5	29.6	42.2
8	–0.6	17.0	21.2	28.4
16	–0.5	12.4	14.6	20.4
32	–0.4	8.4	9.9	13.1
64	–0.3	5.9	7.1	9.7
128	–0.4	4.3	5.1	6.5
256	–0.5	3.0	3.5	4.9
512	–0.5	2.2	2.7	3.4
1,024	–0.6	1.5	1.8	2.4
2,048	–0.6	1.0	1.2	1.6
4,096	–0.5	0.8	0.9	1.2
8,192	–0.6	0.6	0.7	0.8
16,384	–0.6	0.4	0.5	0.6

Figure 10 ($2.00/day line): Shares of households by cut-off score and targeting classification, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	12.7	0.0	87.3	87.3	–100.0
≤9	0.1	12.6	0.0	87.3	87.4	–98.5
≤14	0.6	12.1	0.3	87.0	87.6	–88.3
≤19	1.4	11.3	0.9	86.4	87.8	–71.2
≤24	3.2	9.5	2.7	84.6	87.8	–27.8
≤29	5.9	6.7	7.1	80.2	86.2	+44.1
≤34	8.3	4.4	14.5	72.9	81.2	–14.0
≤39	10.3	2.4	24.5	62.8	73.1	–93.3
≤44	11.9	0.8	36.9	50.5	62.4	–190.7
≤49	12.4	0.2	47.5	39.8	52.3	–274.6
≤54	12.6	0.1	58.3	29.0	41.5	–360.1
≤59	12.7	0.0	65.8	21.5	34.2	–419.1
≤64	12.7	0.0	72.1	15.3	27.9	–468.4
≤69	12.7	0.0	77.8	9.6	22.2	–513.3
≤74	12.7	0.0	82.0	5.4	18.0	–546.4
≤79	12.7	0.0	84.5	2.8	15.5	–566.8
≤84	12.7	0.0	86.8	0.5	13.2	–584.4
≤89	12.7	0.0	87.0	0.3	13.0	–586.1
≤94	12.7	0.0	87.3	0.0	12.7	–588.7
≤100	12.7	0.0	87.3	0.0	12.7	–588.7

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

Figure 11 ($2.00/day line): Share of all households who are targeted (that is, score at or below the cut-off), the share of targeted households who are poor (that is, have income below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.8	Only poor targeted
≤14	0.9	64.5	4.6	1.8:1
≤19	2.3	59.7	10.8	1.5:1
≤24	5.9	54.2	25.4	1.2:1
≤29	13.0	45.6	46.9	0.8:1
≤34	22.8	36.5	65.7	0.6:1
≤39	34.8	29.5	80.9	0.4:1
≤44	48.7	24.4	93.8	0.3:1
≤49	59.9	20.7	98.1	0.3:1
≤54	70.9	17.7	99.0	0.2:1
≤59	78.5	16.2	100.0	0.2:1
≤64	84.7	15.0	100.0	0.2:1
≤69	90.4	14.0	100.0	0.2:1
≤74	94.6	13.4	100.0	0.2:1
≤79	97.2	13.0	100.0	0.1:1
≤84	99.5	12.7	100.0	0.1:1
≤89	99.7	12.7	100.0	0.1:1
≤94	100.0	12.7	100.0	0.1:1
≤100	100.0	12.7	100.0	0.1:1

Tables for

the $2.50/day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	93.7
10–14	93.7
15–19	78.6
20–24	69.8
25–29	57.1
30–34	49.3
35–39	30.5
40–44	19.4
45–49	11.0
50–54	5.6
55–59	3.9
60–64	2.2
65–69	0.6
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($2.50/day line): Average differences between estimated and true poverty likelihoods for households by score range from 1,000 bootstraps of n = 16,384, with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (± percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	–6.3	3.2	3.2	3.2
10–14	+21.0	6.6	7.8	11.0
15–19	+17.1	5.5	6.5	8.9
20–24	–6.7	4.8	5.1	5.4
25–29	–4.2	3.4	3.6	3.9
30–34	+9.3	2.2	2.5	3.3
35–39	–2.3	2.0	2.2	3.1
40–44	–3.9	2.7	2.8	3.0
45–49	–2.7	2.0	2.2	2.4
50–54	+2.0	0.7	0.9	1.1
55–59	–2.7	2.0	2.1	2.5
60–64	+2.2	0.0	0.0	0.0
65–69	+0.6	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

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

Sample Size n	Difference between estimate and true value			
		Confidence interval (± percentage points)		
	Diff.	90-percent	95-percent	99-percent
1	+0.2	59.4	68.8	83.8
4	–0.3	28.3	34.5	46.4
8	–0.2	21.0	24.9	31.7
16	+0.1	15.1	17.9	24.9
32	+0.1	9.9	11.8	16.0
64	+0.1	7.5	9.1	11.4
128	+0.0	4.9	6.0	7.7
256	–0.1	3.6	4.3	5.4
512	–0.1	2.6	3.2	3.9
1,024	–0.2	1.7	2.1	2.8
2,048	–0.2	1.3	1.5	1.8
4,096	–0.2	0.9	1.1	1.4
8,192	–0.2	0.6	0.7	1.0
16,384	–0.2	0.5	0.6	0.8

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

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: ≥ poverty line mistakenly targeted	Exclusion: ≥ poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
≤4	0.0	21.9	0.0	78.1	78.1	–100.0
≤9	0.1	21.8	0.0	78.1	78.2	–99.1
≤14	0.7	21.2	0.2	77.9	78.6	–92.7
≤19	1.6	20.3	0.7	77.4	79.0	–82.2
≤24	4.3	17.6	1.7	76.5	80.7	–53.4
≤29	8.7	13.1	4.3	73.8	82.5	–0.6
≤34	12.4	9.4	10.4	67.8	80.2	+52.6
≤39	16.3	5.6	18.5	59.6	75.9	+15.4
≤44	19.4	2.4	29.3	48.8	68.3	–34.1
≤49	21.0	0.9	38.9	39.2	60.2	–78.1
≤54	21.4	0.5	49.5	28.7	50.1	–126.4
≤59	21.9	0.0	56.6	21.5	43.4	–159.1
≤64	21.9	0.0	62.9	15.3	37.1	–187.7
≤69	21.9	0.0	68.6	9.6	31.4	–213.8
≤74	21.9	0.0	72.8	5.4	27.2	–233.0
≤79	21.9	0.0	75.4	2.8	24.6	–244.8
≤84	21.9	0.0	77.6	0.5	22.4	–255.0
≤89	21.9	0.0	77.8	0.3	22.2	–256.0
≤94	21.9	0.0	78.1	0.0	21.9	–257.5
≤100	21.9	0.0	78.1	0.0	21.9	–257.5

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

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

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.0	100.0	0.0	Only poor targeted
≤9	0.1	100.0	0.4	Only poor targeted
≤14	0.9	76.3	3.2	3.2:1
≤19	2.3	69.6	7.3	2.3:1
≤24	5.9	71.7	19.5	2.5:1
≤29	13.0	66.9	39.9	2.0:1
≤34	22.8	54.5	56.8	1.2:1
≤39	34.8	46.8	74.4	0.9:1
≤44	48.7	39.9	88.9	0.7:1
≤49	59.9	35.0	96.0	0.5:1
≤54	70.9	30.2	97.9	0.4:1
≤59	78.5	27.8	100.0	0.4:1
≤64	84.7	25.8	100.0	0.3:1
≤69	90.4	24.2	100.0	0.3:1
≤74	94.6	23.1	100.0	0.3:1
≤79	97.2	22.5	100.0	0.3:1
≤84	99.5	22.0	100.0	0.3:1
≤89	99.7	21.9	100.0	0.3:1
≤94	100.0	21.9	100.0	0.3:1
≤100	100.0	21.9	100.0	0.3:1