Simple Poverty Scorecard® Poverty-Assessment Tool Dominican Republic

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Abstract

The Simple Poverty Scorecard-brand poverty-assessment tool uses ten low-cost indicators from the Dominican Republic's 2007 National Household Income and Expenditure Survey to estimate the likelihood that a household has expenditure below a given poverty line. Field workers can collect responses in about ten minutes. The scorecard's accuracy is reported for a range of poverty lines. The scorecard is a practical way for pro-poor programs in the Dominican Republic to measure poverty rates, to track changes in poverty rates over time, and to segment clients for targeted services.

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Simple Poverty Scorecard® Poverty-Assessment Tool

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

Indicator	Value	Points	Score
1. How many household members are 16-years-old or younger?	A. Four or more	0	
	B. Three	3	
	C. Two	7	
	D. One	11	
	E. None	12	
2. What is highest level and grade that the female head/spouse has passed?	A. None, or up to first grade	0	
	B. Second to fifth grade	2	
	C. Sixth or seventh grade	3	
	D. Eight to twelfth grade	5	
	E. There is no female head/spouse	5	
	F. One to three years of post-secondary school or college	7	
	G. Four or more years of post-secondary school or college	10	
3. Does any household member attend a private or semi-private school?	A. No	0	
	B. Yes	4	
4. How many household members work in a business whose main activity is agriculture, animal husbandry, hunting, fishing, mining, or quarrying?	A. Five or more	0	
	B. Four	6	
	C. Three	7	
	D. Two	11	
	E. One	19	
	F. None	22	
5. What is the main material of the roof?	A. Tin, asbestos, *yagua* leaves, cane, or other	0	
	B. Reinforced concrete	3	
6. What type of toilet arrangement does the household have?	A. Not private flush toilet	0	
	B. Private flush toilet	4	
7. Does the residence have a water meter?	A. No	0	
	B. Yes	8	
8. What the the principal cooking fuel used by the household?	A. Firewood, charcoal, kerosene, or other	0	
	B. Electricity or propane	8	
	C. Does not cook	13	
9. Does the household have a motorcycle, car, SUV, or pick-up?	A. No	0	
	B. Motorcycle only	5	
	C. Car, SUV, or pick-up (regardless of motorcycle)	17	
10. Does the household have a VCR or DVD?	A. No	0	
	B. Yes	7	

Score:

Simple Poverty Scorecard® Poverty-Assessment Tool Dominican Republic

1. Introduction

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

The direct approach to poverty measurement via surveys is difficult and costly. As a case in point, the Dominican Republic's 2007 National Household Income and Expenditure Survey (*Encuesta Nacional de Ingresos y Gastos de los Hogares*, ENIGH) runs more than 110 pages.

In contrast, the indirect approach via the scorecard is simple, quick, and inexpensive. It uses ten verifiable indicators (such as "What is the main material of the roof?" and "Does the household have a VCR or DVD?") to get a score that is highly correlated with poverty status as measured by expenditure from the exhaustive survey.

The scorecard differs from "proxy means tests" (Coady, Grosh, and Hoddinott, 2002) in that it is tailored to the capabilities and purposes not of national governments but rather of local, pro-poor organizations. The feasible poverty-measurement options for local organizations are typically subjective and relative (such as participatory

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

The scorecard here can be used by organizations that want to know what share of their participants are below a poverty line such as the Millennium Development Goals' $1.25/day at 2005 purchase-power parity (PPP). It can also be used by USAID microenterprise partners who must report how many of their participants are among the poorest half of people below the national poverty line. It can be used to measure movement across a poverty line (Daley-Harris, 2009). The scorecard is an expenditure-based, objective tool with known accuracy that can serve for monitoring, management, and/or targeting. While expenditure surveys are difficult and costly even for governments, a simple, inexpensive scorecard may be feasible for a local, pro-poor organization.

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

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

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

The scorecard is based on data from the 2007 ENIGH from the Dominican Republic's *Oficina Nacional de Estadística*. 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

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

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

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

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

The scorecard can also be used for targeting services to poorer households. To help managers choose an appropriate targeting cut-off, this paper reports several measures of targeting accuracy for a range of possible cut-offs.

This paper presents a single scorecard whose indicators and points are derived from the World Bank's (2006) poverty line for the Dominican Republic (the "national poverty line" and data on household expenditure. Scores from this scorecard are calibrated to poverty likelihoods for ten poverty lines.

The scorecard is constructed and calibrated using a sub-sample from the 2007 ENIGH. Its accuracy is then validated on a different sub-sample from the 2007 ENIGH. While all three scoring estimators are *unbiased* (that is, they match the true value on average in repeated samples when applied to the same population from which the scorecard is built), they are—like all predictive models—biased to some extent when applied to a different population.[1]

Thus, while the indirect scoring approach is less costly than the direct survey approach, it is also biased. (The direct survey approach is unbiased by definition.)

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

There is bias because scoring must assume that the relationships between indicators and poverty will be the same in the future as they are in the data used to build the scorecard. Scoring must also assume that these relationships will be the same in all subgroups as in the population as a whole. Of course, these assumptions—ubiquitous and inevitable in predictive modeling—hold only partly.

When applied to the validation sample for the Dominican Republic with the national poverty line and $n = 16{,}384$, the average difference between scorecard estimates of groups' poverty rates and true rates at a point in time is –0.3 percentage points. Across all ten lines, the average absolute difference is 0.9 percentage points, and the maximum absolute difference is 1.6 percentage points.

Because the validation sample is representative of the same population as the data that is used to construct the scorecard and because all the data come from the same time frame, the scorecard estimators are unbiased and these observed differences are due to sampling variation; the average difference would be zero if the 2007 ENIGH were to be repeatedly redrawn and then divided into sub-samples before repeating the entire scorecard-building and accuracy-testing process.

For $n = 16{,}384$, the 90-percent confidence intervals for these estimates are +/– 0.5 percentage points or less. For $n = 1{,}024$, these intervals are +/–2.1 percentage points or less.

Section 2 below documents data, poverty rates, and poverty lines for the Dominican Republic. Sections 3 and 4 describe scorecard construction and offer

practical guidelines for use. Sections 5 and 6 detail the estimation of households' poverty likelihoods and of groups' poverty rates at a point in time. Section 7 discusses estimating changes in poverty rates, and Section 8 covers targeting. Section 9 places the new scorecard here in the context of similar existing exercises for the Dominican Republic. The final section is a summary.

2. Data and poverty lines

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

2.1 Data

The scorecard is based on data from the 8,363 households in the 2007 ENIGH. This is the most recent national expenditure survey available for the Dominican Republic. Households are randomly divided into three sub-samples (Figure 2):

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

2.2 Poverty rates and poverty lines

2.2.1 Rates

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

Beyond this general definition, there two special cases, *household-level poverty rates* and *person-level poverty rates*. With household-level rates, each household is counted as if it had only one person, regardless of true household size, so all households

are counted equally. With person-level rates (the "head-count index"), each household is weighted by the number of people in it, so larger households have greater weight.

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

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

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

The scorecard here is constructed using the Dominican Republic's 2007 ENIGH and household-level lines. Scores are calibrated to household-level poverty likelihoods, and accuracy is measured for household-level rates.

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

2.2.2 Poverty lines

Figure 2 reports poverty lines and household- and person-level poverty rates for the Dominican Republic, based on the 2007 ENIGH.

The Dominican Republic has no official poverty lines (Morillo Pérez, 2009), so this paper uses those in World Bank (2006). The "general" or "moderate" poverty line (hereafter called the "national line" or "100% of the national line") is the total expenditure implied when per-capita food expenditure equals the cost of 2,161 calories, given that food expenditure averaged 48.7 percent of total expenditure in the 2004 *Encuesta de Condiciones de Vida*. This World Bank (2006) line as of April 2006 is adjusted to average prices during 8 January 2007 to 17 January 2008 (the period ENIGH was in the field) using the consumer price index.[2] This gives DOP99.88 per person per day, rounded here to DOP100. The household-level poverty rate for the national line is then 30.6 percent, and the person-level rate is 39.3 percent (Figure 2).

The "extreme" or "food" poverty line is the expenditure required for the caloric minimum. This is 48.7 percent of the national line, rounded here to DOP50/person/day

[2] `http://www.bancentral.gov.do/estadisticas_economicas/precios/ipc.xls`, retrieved 7 April 2010. The April 2006 index is 267.76, and the average index for the period of the fieldwork of the 2007 ENIGH is 288.452.

and called "50% of the national line". The corresponding household-level rate is 6.2 percent, and the person-level rate is 9.0 percent (Figure 2).

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

- 50% of national
- 75% of national
- 100% of national
- 150% of national
- 200% of national
- USAID "extreme"
- $1.25/day 2005 PPP
- $2.50/day 2005 PPP
- $3.75/day 2005 PPP
- $5.00/day 2005 PPP

The lines based on multiples of the national line are self-explanatory.

The USAID "extreme" line is defined as the median aggregate household per-capita expenditure of people (not households) below the national line (U.S. Congress, 2002).

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

- Estimated 2005 PPP exchange rate for "individual consumption expenditure by households" (World Bank, 2008): DOP20.396 per $1.00
- Consumer price indices for the Dominican Republic: 251.470 for 2005 on average, and 288.453 during the 2007 ENIGH fieldwork

Using the formula in Sillers (2006), the \$1.25/day 2005 PPP line for the Dominican Republic as a whole in 2007 is:

$$(\text{2005 PPP exchange rate}) \cdot \$1.25 \cdot \frac{\text{CPI}_{\text{Ave. 2007}}}{\text{CPI}_{\text{Ave. 2005}}} = \left(\frac{\text{DOP}20.396}{\$1.00}\right) \cdot \$1.25 \cdot \frac{288.453}{251.470} = \text{DOP}29.24.$$

The \$2.50/day, \$3.75/day, and \$5.00/day 2005 PPP lines are multiples of the \$1.25/day 2005 PPP line.

The values of all poverty lines are in Figure 3, as well as poverty rates—at both the household-level and the person-level—by province and for the Dominican Republic as a whole.

3. Scorecard construction

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

- Family composition (such as household size)
- Education (such as type of school attended)
- Employment (such as the number of household members working in agriculture)
- Housing (such as the main material of the roof)
- Ownership of durable goods (such as VCRs or DVDs)

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

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

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

One of these one-indicator scorecards is then selected based on several factors (Schreiner *et al.*, 2004; Zeller, 2004), including improvement in accuracy, likelihood of

acceptance by users (determined by simplicity, cost of collection, and "face validity" in terms of experience, theory, and common sense), sensitivity to changes in poverty status, variety among indicators, and verifiability.

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

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

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

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

4. Practical guidelines for scorecard use

The main challenge of scorecard design is not to squeeze out the last drops of accuracy but rather to improve the chances that scoring is actually used (Schreiner, 2005). When scoring projects fail, the reason is not usually technical inaccuracy but rather the failure of an organization to decide to do what is needed to integrate scoring in its processes and to learn to use it properly (Schreiner, 2002). After all, most reasonable scorecards predict tolerably well, thanks to the empirical phenomenon known as the "flat maximum" (Falkenstein, 2008; Hand, 2006; Baesens *et al.*, 2003; Lovie and Lovie, 1986; Kolesar and Showers, 1985; Stillwell, Barron, and Edwards, 1983; Dawes, 1979; Wainer, 1976; Myers and Forgy, 1963). The bottleneck is less technical and more human, not statistics but organizational-change management. Accuracy is easier to achieve than adoption.

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

To this end, the scorecard fits on a single 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 ten indicators
- Only categorical indicators
- Simple weights (non-negative integers, and no arithmetic beyond addition)

A field worker using the paper scorecard would:

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

4.1 Quality control

Of course, field workers must be trained. High-quality outputs require high-quality inputs. If organizations or field workers gather their own data and if they believe that they have an incentive to exaggerate poverty rates (for example, if funders reward them for higher poverty rates), then it is wise to do on-going quality control via data review and random audits (Matul and Kline, 2003).[3] IRIS Center (2007a) and Toohig (2008) are useful nuts-and-bolts guides for planning, budgeting, training field

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

workers and supervisors, logistics, sampling, interviewing, piloting, recording data, and controlling quality.

In particular, while collecting indicators for the scorecard is relatively easier than most alternatives, it is still absolutely difficult. Training and explicit definitions of the terms and concepts in the scorecard is essential.[4] For example, one study in Nigeria finds distressingly low inter-rater and test-retest correlations for indicators as seemingly simple and obvious as whether the household owns an automobile (Onwujekwe, Hanson, and Fox-Rushby, 2006).

For the example of a Mexican social program that uses self-reported indicators in the first stage of scorecard-based targeting, Martinelli and Parker (2007) find that "underreporting [of asset ownership] is widespread but not overwhelming, except for a few goods . . . [and] overreporting is common for a few goods, which implies that self-reporting may lead to the exclusion of deserving households" (pp. 24–25). Still, as done in the second stage of the Mexican program, field agents using the scorecard can verify responses with a home visit and correct any false reports.

[4] Appendix A is a guide for interpreting indicators in the scorecard.

4.2 Implementation and sampling

In terms of implementation and sample design, an organization must make choices about:

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

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

- Employees of the organization
- Third-party contractors

Responses, scores, and poverty likelihoods can be recorded:

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

The subjects to be scored can be:

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

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

Frequency of application can be:

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

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

- Different sets of participants, with each set representative of a given group
- A single set of participants

An example bundle of implementation and design choices is provided by BRAC and ASA, two microlenders in Bangladesh (each with more than 7 million participants) who are applying the Simple Poverty Scorecard tool for Bangladesh (Chen and Schreiner, 2009a). Their design is that loan officers in a random sample of branches score all their clients each time they visit a homestead (about once a year) as part of their standard due diligence prior to loan disbursement. Responses in the field are recorded on paper before being sent to a central office to be entered into a spreadsheet database. The sampling plans of ASA and BRAC cover 50,000–100,000 participants each, which is far more than would be required to inform most decisions at a typical pro-poor organization.

5. Estimates of household poverty likelihoods

The sum of scorecard points for a household is called the *score*. For the Dominican Republic, 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 poverty line, the scores themselves have only relative units. For example, doubling the score does not double the likelihood of being above a poverty line.

To get absolute units, scores must be converted to *poverty likelihoods*, that is, probabilities of being below a poverty line. This is done via simple look-up tables. For the example of the national line with the 2007 ENIGH, scores of 30–34 correspond to a poverty likelihood of 43.5 percent, and scores of 35–39 correspond to a poverty likelihood of 27.9 percent (Figure 5).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 30–34 are associated with a poverty likelihood of 43.5 percent for the national line but 4.8 percent for 50% of the national line.[5]

5.1 Calibrating scores with poverty likelihoods

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

[5] Starting with Figure 5, many figures have ten versions, one for each of the ten poverty lines. Single tables pertaining to all lines are with the tables for the national line.

For the example of the national line (Figure 6), there are 9,923 (normalized) households in the calibration sub-sample with a score of 30–34, of whom 4,314 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 30–34 is then 43.5 percent, because 4,314 ÷ 9,923 = 0.435.

As another illustration, consider the national line and a score of 35–39. Now there are 12,349 (normalized) households in the calibration sample, of whom 3,445 (normalized) are below the line (Figure 6). Thus, the poverty likelihood for this score is 3,445 ÷ 12,349 = 0.279, or 27.9 percent.

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

Figure 7 shows, for all scores, the likelihood that expenditure falls in a range demarcated by two adjacent poverty lines. For example, the daily expenditure of someone with a score of 30–34 falls in the following ranges with probability:

- 1.4 percent — less than $1.25/day 2005 PPP
- 3.5 percent — between $1.25/day 2005 PPP and 50% of national
- 4.3 percent — between 50% of national and $2.50/day 2005 PPP
- 8.1 percent — between $2.50/day 2005 PPP and USAID “extreme”
- 4.9 percent — between USAID “extreme” and 75% of national
- 11.4 percent — between 75% of national and $3.75/day 2005 PPP
- 9.9 percent — between $3.75/day 2005 PPP and 100% of national
- 14.7 percent — between 100% of national and $5.00/day 2005 PPP
- 18.9 percent — between $5.00/day 2005 PPP and 150% of national
- 13.6 percent — between 150% of national and 200% of national
- 9.2 percent — more than 200% of national

Even though the scorecard is constructed partly based on judgment, this calibration process produces poverty likelihoods that are objective, that is, derived from

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

Although the points in the Dominican scorecard are transformed coefficients from a Logit regression, scores are not converted to poverty likelihoods via the Logit formula of 2.718281828^{score} x $(1+ 2.718281828^{score})^{-1}$. This is because the Logit formula is esoteric and difficult to compute by hand. It is 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. Converting scores to poverty likelihoods requires no arithmetic at all, just a look-up table. This non-parametric calibration can also improve accuracy, especially with large calibration samples.

5.2 Accuracy of estimates of households' poverty likelihoods

As long as the relationships between indicators and poverty do not change and as long as the scorecard is applied to households who are representative of the same

population from which the scorecard is constructed, this calibration process produces unbiased estimates of poverty likelihoods. *Unbiased* means that in repeated samples from the same population, the average estimate matches the true poverty likelihood. The scorecard also produces unbiased estimates of poverty rates at a point in time, as well as unbiased estimates of changes in poverty rates between two points in time.[6]

But the relationships between indicators and poverty do change with time, and they also change across sub-groups in the Dominican population. Thus, the scorecard will generally be biased when applied after the 17 January 2008 end date of fieldwork for the 2007 ENIGH (as it must be applied in practice) or when applied with non-nationally representative groups (as it probably will be applied by local, pro-poor organizations).

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

How accurate are these estimates of households' poverty likelihoods, given the assumption of representativeness? To check, the scorecard is applied to 1,000 bootstrap samples of size n = 16,384 from the validation sub-sample. Bootstrapping entails (Efron and Tibshirani, 1993):

- Score each household in the validation sample
- Draw a new bootstrap sample *with replacement* from the validation sample
- For each score, compute the true poverty likelihood in the bootstrap sample, that is, the share of households with the score who have expenditure below a poverty line
- For each score, record the difference between the estimated poverty likelihood (Figure 5) and the true poverty likelihood in the bootstrap sample
- Repeat the previous three steps 1,000 times
- For each score, report the average difference between estimated and true poverty likelihoods across the 1,000 bootstrap samples
- For each score, report the two-sided interval containing the central 900, 950, or 990 differences between estimated and true poverty likelihoods

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

For the national line in the validation sample, the average poverty likelihood across bootstrap samples for scores of 30–34 is too low by 7.5 percentage points. For scores of 35–39, the estimate is too low by 9.0 percentage points.[7]

The 90-percent confidence interval for the differences for scores of 30–34 is +/– 4.9 percentage points (Figure 8). This means that in 900 of 1,000 bootstraps, the

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

difference between the estimate and the true value is between –12.4 and –2.6 percentage points (because –7.5 – 4.9 = –12.4, and –7.5 + 4.9 = –2.6). In 950 of 1,000 bootstraps (95 percent), the difference is –7.5 +/–5.1 percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is
–7.5 +/–5.5 percentage points.

For almost all scores, Figure 8 shows differences—some of them large—between estimated poverty likelihoods and true values. The differences are not all zero because the validation sub-sample is a single, finite sample that—thanks to sampling variation—differs in distribution from the construction/calibration sub-samples and from the Dominican population. Also, some score ranges have few households in them, increasing the importance of sampling variation.

For targeting, what matters is less the differences across all score ranges and more the differences in score ranges just above and just 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.

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

Another possible source of bias is overfitting. By construction, the scorecard here is unbiased, but it may still be *overfit* when applied after the end of field work for the 2007 ENIGH. That is, the scorecard may fit the 2007 data so closely that it captures

not only some real patterns but also some false patterns that, due to sampling variation, show up only in the 2007 data. Or the scorecard may be overfit in the sense that it is not robust to changes in the relationships between indicators and poverty over time. Finally, the scorecard could also be overfit when it is applied to samples from non-nationally representative sub-groups.

Overfitting can be mitigated by simplifying the scorecard and by not relying only on data but rather also considering experience, judgment, and theory. Of course, the scorecard here does this. Bootstrapping scorecard construction—which is not done here—can also mitigate overfitting by reducing (but not eliminating) dependence on a single sampling instance. Combining scorecards can also help, at the cost of complexity. Simplifying the scorecard can also reduce overfitting (at the cost of decreased precision), although the scorecard here is already parsimonious with limited scope for simplification. Often the best option is simply to update the scorecard once new data is available from a national expenditure survey.

In any case, errors in individual households' likelihoods largely balance out in the estimates of groups' poverty rates (see the next section). Furthermore, much of the differences between scorecard estimates and true values may come from non-scorecard sources. These factors can be addressed only by improving data quantity and quality, which is beyond the scope of the scorecard.

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

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

To illustrate, suppose a program samples three households on Jan. 1, 2010 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 65.8, 43.5, and 25.4 percent (national line, Figure 5). The group's estimated poverty rate is the households' average poverty likelihood of $(65.8 + 43.5 + 25.4) \div 3 = 44.9$ percent.[8]

6.1 Accuracy of estimated poverty rates at a point in time

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

Summarizing Figure 10 across poverty lines and years for $n = 16{,}384$, Figure 9 shows that the absolute differences between estimated poverty rates and true rates for the scorecard applied to the validation sample are 1.6 percentage points or less. The average absolute difference across the ten poverty lines for the validation sample is 0.9 percentage points.

[8] The group's poverty rate is *not* the poverty likelihood associated with the average score. Here, the average score is $(20 + 30 + 40) \div 3 = 30$, and the poverty likelihood associated with the average score is 43.5 percent. This is not the 44.9 percent found as the average of the three poverty likelihoods associated with each of the three scores.

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

In the specific case of the national line and the validation sample, 90 percent of all samples of $n = 16{,}384$ produce estimates that differ from the true value in the range of –0.3 – 0.5 = –0.8 to –0.3 + 0.3 = 0.0 percentage points. This is because –0.3 is the average difference and +/–0.5 is its 90-percent confidence interval. The average difference is –0.3 because the average scorecard estimate is too low by 0.3 percentage points; the scorecard tends to estimate a poverty rate of 31.3 percent for the validation sample, but the true value is 31.6 percent (Figure 2).

Part of these differences is due to sampling variation in the division of the 2007 ENIGH into three sub-samples. Of course, estimates of poverty rates at a point in time from now on will be most accurate for periods that resemble 2007.

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

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

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

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

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

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

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

n is the sample size.

For example, with a sample $n = 16{,}384$, 90-percent confidence ($z = 1.64$), and a poverty rate p of 31.6 percent (the true rate in the validation sample for the national line in Figure 2), the confidence interval c is

$$+/- z \cdot \sqrt{\frac{p \cdot (1-p)}{n}} = +/- 1.64 \cdot \sqrt{\frac{0.316 \cdot (1-0.316)}{16{,}384}} = +/–0.596 \text{ percentage points.}$$

The scorecard, however, does not measure poverty directly, so this formula is not applicable. To derive a formula for the Dominican scorecard, consider Figure 10, which reports empirical confidence intervals c for the differences for the scorecard applied to 1,000 bootstrap samples of various sample sizes from the validation sample. For $n =$ 16,384, the national line, and the validation sub-sample, the 90-percent confidence

interval is +/–0.485 percentage points.[9] Thus, the ratio of confidence intervals for scoring versus direct measurement is 0.485 ÷ 0.596 = 0.81.

Now consider the same case, but with n = 8,192. The confidence interval under direct measurement is $+/-1.64 \cdot \sqrt{\frac{0.316 \cdot (1-0.316)}{8{,}192}} = +/-0.842$ percentage points. The empirical confidence interval with the Dominican scorecard for the national line (Figure 10) is +/–0.640 percentage points. Thus for n = 8,192, the ratio for the scorecard to direct measurement is 0.640 ÷ 0.842 = 0.76.

This ratio of 0.76 for n = 8,192 is not far from the ratio of 0.81 for n = 16,384. Indeed, across all sample sizes of 256 or more in Figure 10, the average ratio turns out to be 0.78, implying that confidence intervals for indirect estimates of poverty rates via the Dominican scorecard and this poverty line are about 22 percent narrower than those for direct estimates. This 0.78 appears in Figure 9 as the "α factor" because if $\alpha = 0.78$, then the formula relating confidence intervals c and standard errors σ for the Dominican scorecard is $c = +/- z \cdot \alpha \cdot \sigma$. The standard error for point-in-time estimates of poverty rates via scoring is $\alpha \cdot \sqrt{\frac{p \cdot (1-p)}{n}}$.

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

[9] Due to rounding, Figure 10 displays 0.5, not 0.485.

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

To illustrate how to use this, suppose $c = 0.03680$ and $z = 1.64$ (90-percent confidence), and $\hat{p} = 0.3015$ (the average poverty rate for the national line in the construction and calibration sub-samples, Figure 2). Then the formula gives $n = \left(\frac{0.78 \cdot 1.64}{0.03680}\right)^2 \cdot 0.3015 \cdot (1 - 0.3015) = 255$, which is almost the same as the sample size of 256 observed for these parameters in Figure 10.

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

In practice after the end of the 2007 ENIGH field work in January 2008, an organization would select a poverty line (say, the national line), select a desired

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

confidence level (say, 90 percent, or $z = 1.64$), select a desired confidence interval (say, +/–2.0 percentage points, or $c = 0.02$), make an assumption about $\hat{p}$ (perhaps based on a previous measurement such as the 30.6-percent average for the national line in Figure 2), look up α (here, 0.78), assume that the scorecard will work the same in the future and for non-nationally representative sub-groups,[11] and then compute the required sample size. In this illustration, $n = \left(\frac{0.78 \cdot 1.64}{0.02}\right)^2 \cdot 0.306 \cdot (1 - 0.306) = 869$.

[11] This paper reports accuracy for the scorecard applied to the validation sample, but it cannot test accuracy for later years or for other groups. Performance will deteriorate with time to the extent that the relationships between indicators and poverty change. The formula apply under simple random sampling. Under cluster sampling, sample sizes will be larger for a given confidence level and confidence interval.

7. Estimates of changes in group poverty rates over time

The change in a group's poverty rate between two points in time is estimated as the change in the average poverty likelihood of the households in the group. With data for 2007 only, this paper cannot estimate changes over time, nor can it present sample-size formula. Nevertheless, the relevant concepts are presented here because, in practice, pro-poor organizations can apply the scorecard to measure change over time.

7.1 Warning: Change is not impact

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

7.2 Calculating estimated changes in poverty rates over time

Consider the illustration begun in the previous section. On Jan. 1, 2010, a program samples three households who score 20, 30, and 40 and so have poverty likelihoods of 65.8, 43.5, and 25.4 percent (national line, Figure 5). The group's baseline estimated poverty rate is the households' average poverty likelihood of (65.8 + 43.5 + 25.4) ÷ 3 = 44.9 percent.

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

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

By way of illustration, suppose that a year later on Jan. 1, 2011, the program samples three additional households who are in the same cohort as the three households originally sampled (or suppose that the program scores the same three original households a second time) and finds that their scores are now 25, 35, and 45 (poverty likelihoods of 53.6, 27.9, and 14.1 percent, national line, Figure 5). Their average poverty likelihood at follow-up is (53.6 + 27.9 + 14.1) ÷ 3 = 31.9 percent, an improvement of 44.9 – 31.9 = 13.0 percentage points.[12]

This suggests that more than one in seven participants moved above the poverty line in 2010. (This is a net figure; some people start above the line and end below it, and vice versa.) Among those who started below the line, almost one in three (13.0 ÷

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

44.9 = 29.0 percent) ended up above the line. Of course, the scorecard does not reveal the reasons for this change.

7.3 Accuracy for estimated change in two independent samples

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

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

z, c, and p are defined as before, n is the sample size at both baseline and follow-up,[13] and α is the average (across a range of bootstrapped sample sizes) of the ratio of the observed confidence intervals from a scorecard and the theoretical confidence intervals from the textbook formula for direct measurement for two equal-sized independent samples.

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

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

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

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

To illustrate the use of the formula above to determine sample size for estimating changes in poverty rates across two independent samples, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is 2 percentage points ($c = 0.02$), the poverty line is the national line, $\alpha = 1.19$, and $\hat{p} = 0.306$ (from Figure 2). Then the baseline sample size is $n = 2 \cdot \left(\frac{1.19 \cdot 1.64}{0.02} \right)^2 \cdot 0.306 \cdot (1 - 0.306) =$ 4,045, and the follow-up sample size is also 4,045.

7.4 Accuracy for estimated change for one sample, scored twice

The general formula relating the confidence interval c to the standard error σ when using scoring to estimate change for a single group of households, all of whom are scored at two points in time, is:[14]

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

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

As usual, the formula for σ can be rearranged to give a formula for sample size n before measurement. This requires an estimate (based on information available before measurement) of the expected shares of all households who cross the poverty line $\hat{p}_{12}$ and $\hat{p}_{21}$. Before measurement, it is reasonable to assume that the overall change in the poverty rate will be zero, which implies $\hat{p}_{12} = \hat{p}_{21} = \hat{p}_*$, giving:

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

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

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

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

Given this, a sample-size formula for a group of households to whom the Dominican scorecard is applied twice (once after the end of field work for the 2007 ENIGH and then again later) is:

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

In Peru (the only other country for which there is a data-based estimate, Schreiner 2009a), the average α across years and poverty lines is about 1.30.

To illustrate the use of this formula, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is 2.0 percentage points ($c = 0.02$), the poverty line is the national line, and the sample will be scored first in 2010 and then again in 2013 ($y = 3$). The before-baseline poverty rate is 30.6 percent ($p_{2007} = 0.306$, Figure 2), and suppose $\alpha = 1.30$. Then the baseline sample size is $n = 2 \cdot \left(\frac{1.3 \cdot 1.64}{0.02} \right)^2 \cdot \{-0.02 + 0.016 \cdot 3 + 0.47 \cdot [0.306 \cdot (1 - 0.306)]\} = 2{,}905$. The same group of 2,905 households is scored at follow-up as well.

8. Targeting

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

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

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

Figure 11 depicts these four possible targeting outcomes. Targeting accuracy varies by cut-off; a higher cut-off has better inclusion (but greater leakage), while a lower cut-off has better exclusion (but higher undercoverage).

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

Figure 12 shows the distribution of households by targeting outcome. For an example cut-off of 34 or less and the scorecard applied to the validation sample, outcomes for the national line are:

- Inclusion: 22.3 percent are below the line and correctly targeted
- Undercoverage: 9.3 percent are below the line and mistakenly not targeted
- Leakage: 12.4 percent are above the line and mistakenly targeted
- Exclusion: 56.0 percent are above the line and correctly not targeted

Increasing the cut-off to 39 or less improves inclusion and undercoverage but worsens leakage and exclusion:

- Inclusion: 26.8 percent are below the line and correctly targeted
- Undercoverage: 4.9 percent are below the line and mistakenly not targeted
- Leakage: 20.3 percent are above the line and mistakenly targeted
- Exclusion: 48.1 percent are above the line and correctly not targeted

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

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

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

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

The most difficult step is assigning benefits and costs to targeting outcomes. Any program that uses targeting—with or without scoring—should thoughtfully consider how it values successful inclusion or exclusion versus errors of undercoverage or 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 successfully included or successfully excluded:

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

Figure 12 shows "Total Accuracy" for all cut-offs for the Dominican scorecard. For the national line in the validation sample, total net benefit is greatest (78.6) for a cut-off of 29 or less, with about four in five Dominican households 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 could reflect this by setting the benefit for inclusion to 2 and the benefit for exclusion to 1. Then the chosen cut-off would maximize (2 x Households correctly included) + (1 x Households correctly excluded).[15]

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

[15] Figure 12 also reports "BPAC", the Balanced Poverty Accuracy Criteria adopted by USAID as its criterion for certifying poverty-assessment tools. IRIS Center (2005) says BPAC considers accuracy both in terms of the estimated poverty rate and targeting inclusion.
BPAC = (Inclusion – |Undercoverage – Leakage|) x [100 ÷ (Inclusion+Undercoverage)].

achieve a desired poverty rate among targeted households. The third column of Figure 13 ("% targeted who are poor") shows the expected poverty rate among Dominican households who score at or below a given cut-off. For the example of the national line and the validation sample, targeting households who score 34 or less would target 34.7 percent of all households (second column) and produce a poverty rate among those targeted of 64.4 percent (third column).

Figure 13 also reports two other measures of targeting accuracy. The first is a version of inclusion ("% of poor who are targeted"). For the example of the national line and the validation sample with a cut-off of 34 or less, 70.6 percent of all poor households are covered.

The final targeting measure in Figure 13 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For the national line, the validation sample, and a cut-off of 34 or less, covering 1.8 poor households means leaking to one non-poor household.

9. The context of Dominican poverty-assessment tools

This section discusses two existing poverty-assessment tools for the Dominican Republic in terms of their goals, methods, poverty lines, poverty definitions, indicators, cost, accuracy, and precision. The advantages of the new scorecard here are its use of the latest nationally representative data, its focus on feasibility for local, pro-poor organizations, its testing of accuracy and precision out-of-sample, and its reporting of formulas for standard errors.

9.1 Gwatkin *et al.*

Gwatkin *et al.* (2007) apply to the Dominican Republic an approach used in 56 countries with Demographic and Health Surveys (Rutstein and Johnson, 2004). They use Principal Components Analysis to make an asset index from simple, low-cost indicators available for the 27,135 households in the Dominican 2002 DHS. The PCA index is like the scorecard except that, because the DHS does not collect data on income or expenditure, it is based on a different conception of poverty, its accuracy vis-à-vis expenditure-based poverty is unknown, and it can only be assumed to be a proxy for long-term wealth/economic status.[16] Well-known examples of the PCA asset-index

[16] Still, because the indicators are similar and because the "flat maximum" is important, carefully built PCA indices and expenditure-based scorecards may pick up the same underlying construct (perhaps "permanent income", see Bollen, Glanville, and Stecklov, 2007), and they rank households much the same. Tests of how well rankings by PCA

approach include Ferguson *et al.* (2003), Sahn and Stifel (2000 and 2003), and Filmer and Pritchett (2001).

The 18 indicators in Gwatkin *et al.* are similar to those in the new scorecard here in terms of their simplicity, low cost, and verifiability:

- Characteristics of the residence:
  - Type of floor
  - Type of wall
  - Type of roof
  - Type of cooking fuel
  - Source of drinking water
  - Type of toilet arrangement
  - Presence of electricity
  - Type of lighting
- Ownership of consumer durables:
  - Radios
  - Televisions
  - Telephones
  - Refrigerators
  - Bicycles
  - Motorcycles or scooters
  - Cars or trucks
- Presence of a domestic worker not related to the head
- Whether any household members work their own or family's agricultural land
- Number of people per sleeping room

Gwatkin *et al.* discuss three basic uses for their index:

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

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indices correspond with rankings by expenditure-based scorecards include Lindelow (2006), Wagstaff and Watanabe (2003), and Montgomery *et al.* (2000).

The first goal is akin to targeting, and the last two goals resemble the monitoring goals here, so the uses of the index are similar to those of the scorecard here.

Still, the Gwatkin *et al.* index is more difficult and costly: it has 18 indicators, one indicator required computing a ratio, it does not fit on a single page, and it cannot be computed by hand in the field. Finally, it has 115 point values, half of them negative, and all with five decimal places.

Unlike the PCA index, the scorecard here is linked directly to an absolute, expenditure-based poverty line. Thus, while both approaches can rank households, only the scorecard can estimate expenditure-based poverty status.

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

9.2 Regalia and Robles

Regalia and Robles (2005a) test whether a poverty-assessment tool can improve social-assistance targeting in the Dominican Republic relative to the existing system

(SIUBEN, *Sistema Unico de Identificación de Beneficiarios*).[17] They find that a tool could reduce the share of the non-poor among those targeted by 16 percentage points and also reduce the share of the poor who are not targeted by 16 percentage points.

Regalia and Robles construct rural and urban tools with stepwise regression of the logarithm of per-capita household income, using indicators from the 9,825 households in the 2004 Living Standards Survey (ECV, *Encuesta de Condiciones de Vida*). Between the two scorecards, there are 31 indicators, all of them simple and inexpensive. Just as important, all 31 indicators are already collected by SIUBEN:

- Demographics of the household:
  - — Logarithm of number of members
  - — Number of household members ages 45–59
  - — Whether any household member lives abroad
  - — Structure of household headship
  - — Sex of the head
  - — Logarithm of the age of the spouse of the head
- Education:
  - — Square of years of education of the head
  - — Square of years of education of the spouse of the head
  - — Literacy of the head
  - — Number of literate members of the household ages 15 or older
  - — Number of members ages 15 to 18 who attend school
- Employment:
  - — Whether the head is employed
  - — Whether the spouse of the head is employed
  - — Number of household members who are employed
  - — Whether the head is salaried, self-employed, or an employer
- Characteristics of the residence:
  - — Type of structure
  - — Tenancy status
  - — Type of walls
  - — Type of roof

[17] Regalia and Robles (2005b) and World Bank (2006) describe related exercises.

  - — Type of floor
  - — Number of rooms (and its square)
  - — Type of toilet arrangement
  - — Source of drinking water
  - — Type of lighting
  - — Means of garbage collection
- Ownership of consumer durables:
  - — Television
  - — Refrigerator
  - — Computer
  - — Air conditioner
  - — Car
- Region of residence

Even though the indicators are simple, Regalia and Robles' scorecards are too complex to do on paper in the field, as they require taking logarithms and squares. Furthermore, point values have three decimal places and are sometimes negative. For SIUBEN, however, this is not an issue, as scores are calculated centrally by computer.

How does targeting accuracy for Regalia and Robles compare to the new scorecard here? Any such comparison is imperfect and biased against the new scorecard here, for three reasons. First, Regalia and Robles' scorecard is segmented by urban/rural. In contrast, the new scorecard here is country-wide.

Second, Regalia and Robles report results with person-level weights. The new scorecard here is constructed with household-level weights, but, to get comparable figures, it is applied here using person-level weights.

Third, Regalia and Robles use *in-sample* tests, that is, they check accuracy with the same data that is used to construct the scorecard in the first place. But in-sample tests overstate accuracy. In contrast, this paper reports only *out-of-sample* tests with

data that is not used to construct the scorecard. Johanssen (2006, for BPAC) and Copestake *et al.* (2005, for a variety of measures) find that accuracy measures for poverty-assessment tools can deteriorate 8 to 17 percent going from in-sample to out-of-sample. Out-of-sample is also more relevant because, in practice, scorecards are applied out-of-sample to data on households that were not used to construct the scorecard.

Regalia and Robles report that 59.3 percent of people with income in the poorest quintile—according to the 2004 ECV—are also placed in the poorest quintile by their tool. For the bottom two quintiles, the percentage is 73.8. For the new scorecard here, the figures are 56.2 percent and 69.9 percent, or 3–4 percentage points lower than for Regalia and Robles. Given sampling variation, the flat maximum, and the fact that the imperfections in the comparison tend to bias the results against the new scorecard here, it seems fair to say that the two scorecards have about the same targeting power.

10. Conclusion

Pro-poor programs in the Dominican Republic can use the scorecard to segment clients for targeted services as well as to estimate:

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

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

The scorecard is built with a sub-sample of data from the 2007 ENIGH, calibrated to ten poverty lines, and tested on a different sub-sample from the 2007 ENIGH.

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

When the scorecard is applied to the validation sample with n = 16,384, the absolute difference between estimates and true poverty rates at a point in time is 1.6 percentage points or less and averages (across the ten poverty lines) 0.9 percentage points. With 90-percent confidence, the precision of these differences for all lines is +/– 0.5 percentage points or less.

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

Although the statistical technique is innovative, and although technical accuracy is important, the design of the scorecard focuses on transparency and ease-of-use. After all, a perfectly accurate scorecard is worthless if programs feel so daunted by its complexity or its cost that they do not even try to use it. For this reason, the scorecard is kept simple, using ten indicators that are inexpensive to collect and that are straightforward to verify. Points are all zeros or positive integers, and scores range from 0 to 100. Scores are related to poverty likelihoods via simple look-up tables, and targeting cut-offs are likewise simple to apply. The design attempts to facilitate adoption by helping managers understand and trust scoring and by allowing non-specialists to generate scores quickly in the field.

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

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Figure 2: Poverty rates and sample sizes, by sub-sample, weight level, and poverty line

		% with expenditure below a poverty line (Poverty rates weighted by households)									
		National					USAID	International 2005 PPP			
Sub-sample	**Households**	**50%**	**75%**	**100%**	**150%**	**200%**	**'Extreme'**	**$1.25/day**	**$2.50/day**	**$3.75/day**	**$5.00/day**
All Dominican Republic											
Household-level poverty rate	8,363	6.2	17.3	30.6	53.4	67.7	14.2	1.0	9.5	24.1	39.8
Person-level poverty rate	8,363	9.0	23.5	39.3	62.8	75.7	19.7	1.4	13.4	32.0	49.4
Poverty line (DOP/person/day)	8,363	50.00	75.00	100.00	150.00	200.00	68.65	29.24	58.48	87.72	116.96
Construction											
Selecting indicators and points	2,774	5.8	16.6	30.1	53.2	67.5	13.5	1.0	9.0	23.0	39.1
Calibration											
Associating scores with likelihoods	2,808	5.8	16.6	30.2	52.8	67.4	13.5	0.8	8.9	23.5	39.2
Validation											
Measuring accuracy	2,781	7.0	18.7	31.6	54.4	68.3	15.7	1.2	10.7	26.0	41.1
Change in poverty rate (percentage points)											
From construction/calibration to validation		–1.3	–2.1	–1.5	–1.4	–0.8	–2.2	–0.3	–1.7	–2.7	–1.9

Source: 2007 *Encuesta Nacional de Ingresos y Gastos de Hogares*.

Figure 3: Poverty rates, by province and poverty line (household-level weights)

	Poverty line (DOP/person/day) and poverty rate (%)									
			National			USAID	International 2005 PPP			
	50%	75%	100%	150%	200%	'Extreme'	$1.25/day	$2.50/day	$3.75/day	$5.00/day
Poverty line	50.00	75.00	100.00	150.00	200.00	68.65	29.24	58.48	87.72	116.96
Poverty rate										
Distrito Nacional	2.0	6.8	13.8	31.2	46.6	5.4	0.3	4.2	9.8	20.8
Azua	7.7	22.5	37.3	70.4	81.5	18.2	1.1	11.0	30.4	50.3
Baoruco	14.1	36.2	52.8	77.7	87.4	35.0	3.2	27.9	44.4	62.8
Barahona	7.4	23.6	46.6	72.1	83.2	19.8	0.8	10.7	35.9	53.5
Dajabón	18.0	46.1	70.3	85.2	91.2	46.1	12.1	24.2	61.4	76.2
Duarte	2.4	14.7	27.8	55.6	69.3	10.2	0.0	6.0	19.7	37.2
Elías Piña	20.6	57.0	71.8	88.0	92.3	49.8	2.7	32.5	68.4	80.2
El Seibo	14.9	34.7	51.4	74.4	84.8	29.4	2.5	21.1	42.4	61.1
Espaillat	3.7	9.4	21.6	48.5	65.0	7.1	0.6	4.2	17.1	30.8
Independencia	9.9	17.2	36.0	64.9	83.4	13.2	3.8	12.0	30.9	45.9
La Altagracia	2.4	8.0	15.5	34.8	49.9	5.9	0.4	3.9	11.8	21.1
La Romana	6.9	16.5	31.7	51.2	65.9	14.2	1.0	10.1	23.4	38.6
La Vega	9.6	22.3	34.4	59.1	74.0	17.9	3.0	11.6	28.6	44.1
María Trinidad Sánchez	6.8	19.3	34.7	64.3	81.0	16.7	0.8	11.1	25.9	47.1
Monte Cristi	8.1	27.3	37.4	63.4	75.7	24.9	1.0	12.2	31.7	47.5
Pedernales	13.0	44.4	53.7	83.7	90.7	39.0	0.0	26.0	51.4	63.7
Peravia	4.4	20.7	37.9	61.5	75.9	15.0	0.7	11.2	26.2	49.3
Puerto Plata	5.8	13.6	25.7	46.4	61.8	12.3	0.9	6.1	20.2	36.7
Salcedo	13.2	20.8	36.3	63.5	75.4	19.0	1.3	17.7	33.4	49.5
Samaná	2.3	9.6	21.4	46.0	59.0	8.4	0.0	6.1	13.5	34.8
San Cristóbal	7.4	22.1	39.2	65.6	78.5	18.3	1.3	11.6	30.9	50.4
San Juan	18.2	39.1	57.9	75.4	84.6	32.4	3.6	25.0	51.8	66.0
San Pedro de Macorís	7.3	17.8	32.0	56.1	71.5	14.2	0.6	9.5	25.3	43.0
Sánchez Ramírez	8.8	27.3	42.3	67.5	83.2	21.8	0.6	15.6	32.9	50.2
Santiago	3.3	11.7	24.1	43.3	59.4	9.4	0.1	5.8	18.6	32.6
Santiago Rodríguez	21.6	40.5	49.4	70.4	77.3	35.6	2.4	26.2	42.7	59.0
Valverde	8.1	18.9	30.3	64.5	70.7	16.1	0.9	11.5	23.8	42.6
Monseñor Nouel	5.1	16.6	32.0	52.0	72.9	13.8	0.6	7.8	24.2	40.6
Monte Plata	16.7	34.3	52.5	73.7	84.4	28.5	5.9	21.9	44.0	60.8
Hato Mayor	9.6	23.6	36.3	59.3	73.4	18.9	0.0	14.5	29.7	44.5
San José de Ocoa	8.0	26.8	55.9	72.8	77.3	22.5	0.0	14.0	46.6	58.3
Santo Domingo	4.3	13.5	26.9	50.6	66.1	10.8	0.3	7.3	20.5	36.1
All Dominican Republic	6.2	17.3	30.6	53.4	67.7	14.2	1.0	9.5	24.1	39.8

Source: 2007 *Encuesta Nacional de Ingresos y Gastos de Hogares*.

Figure 3 (cont.): Poverty rates, by province and poverty line (person-level weights)

	Poverty line (DOP/person/day) and poverty rate (%)									
			National			USAID	International 2005 PPP			
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Poverty line	50.00	75.00	100.00	150.00	200.00	68.65	29.24	58.48	87.72	116.96
Poverty rate										
Distrito Nacional	3.5	9.9	19.3	39.5	55.7	8.4	0.5	6.4	14.7	28.1
Azua	10.5	28.9	47.4	79.5	88.4	23.5	1.7	15.2	39.3	61.4
Baoruco	20.0	45.6	62.8	83.4	91.6	44.4	5.2	34.6	53.5	69.5
Barahona	9.6	29.5	54.1	79.3	87.9	24.7	0.9	13.8	43.7	61.4
Dajabón	21.9	50.3	79.7	91.4	96.2	50.3	14.2	28.3	69.5	84.2
Duarte	3.6	18.9	33.0	62.1	73.8	14.4	0.0	7.6	23.9	43.8
Elías Piña	31.7	70.0	81.3	93.7	96.8	63.6	5.4	43.3	79.4	87.8
El Seibo	22.4	46.9	65.8	85.0	91.8	41.0	2.3	30.9	55.2	73.4
Espaillat	5.4	11.9	27.5	58.5	73.6	10.1	0.4	6.2	22.2	37.2
Independencia	16.3	24.3	40.5	72.4	87.4	20.9	7.9	19.5	37.8	52.1
La Altagracia	4.5	11.7	21.8	42.9	58.0	8.2	0.5	6.0	17.0	28.1
La Romana	10.0	24.2	41.9	61.7	75.3	20.7	1.6	14.7	31.7	49.8
La Vega	14.2	29.7	44.4	67.5	79.9	24.2	3.8	16.4	37.0	53.7
María Trinidad Sánchez	10.0	26.1	43.1	72.1	87.2	21.5	1.4	15.0	34.9	56.2
Monte Cristi	11.8	37.9	49.2	75.1	84.3	35.5	1.6	19.4	44.5	60.4
Pedernales	12.1	49.7	63.5	91.4	94.8	41.8	0.0	27.6	61.2	76.2
Peravia	8.2	31.2	49.7	72.8	84.8	22.4	1.1	18.0	37.5	60.6
Puerto Plata	7.8	15.7	30.2	54.1	68.9	14.3	1.4	8.0	22.1	44.3
Salcedo	14.5	26.2	44.5	71.3	84.5	23.5	2.0	22.1	41.2	58.2
Samaná	3.4	10.6	24.7	53.3	66.4	9.3	0.0	5.5	16.4	38.5
San Cristóbal	10.2	29.1	49.2	74.4	85.6	24.4	1.8	15.7	39.1	60.4
San Juan	22.7	46.0	65.7	80.6	88.2	38.5	5.0	29.7	59.4	72.3
San Pedro de Macorís	11.6	25.0	42.3	65.5	79.1	20.4	1.0	14.7	34.7	53.5
Sánchez Ramírez	11.9	33.3	50.5	75.7	88.0	27.2	0.7	20.7	39.3	59.2
Santiago	4.6	17.1	34.4	56.2	70.5	14.3	0.1	8.2	27.1	45.2
Santiago Rodríguez	28.2	51.3	57.1	74.2	78.4	44.9	2.5	34.9	53.0	66.4
Valverde	11.4	25.6	36.7	69.5	73.9	23.6	1.5	15.7	30.6	52.2
Monseñor Nouel	7.2	22.3	39.2	58.6	79.4	18.6	0.9	10.1	32.0	48.3
Monte Plata	24.7	45.8	65.8	82.3	90.2	39.6	8.1	31.7	57.3	73.0
Hato Mayor	10.8	29.4	45.1	72.3	83.7	24.0	0.0	18.1	39.3	54.8
San José de Ocoa	11.2	32.5	64.6	78.3	83.6	27.2	0.0	17.5	57.1	67.6
Santo Domingo	6.3	19.4	34.7	59.4	74.1	15.6	0.4	10.6	27.7	44.8
All Dominican Republic	9.0	23.5	39.3	62.8	75.7	19.7	1.4	13.4	32.0	49.4

Source: 2007 *Encuesta Nacional de Ingresos y Gastos de Hogares*.

Figure 4: Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (responses are ordered starting with those associated with higher poverty likelihoods)
1523	How many household members work in a business whose main activity is agriculture, animal husbandry, hunting, fishing, mining, or quarrying? (Five or more; Four; Three; Two; One; None)
1159	How many household members are 17-years-old or younger? (Four or more; Three; Two; One; None)
1149	How many household members are 18-years-old or younger? (Four or more; Three; Two; One; None)
1141	How many household members are 16-years-old or younger? (Four or more; Three; Two; One; None)
1047	How many household members are 15-years-old or younger? (Three or more; Two; One; None)
1046	How many household members are there? (Six or more; Five; Four; Three; Two; One; None)
1033	How many household members are 14-years-old or younger? (Three or more; Two; One; None)
1004	How many household members are 13-years-old or younger? (Three or more; Two; One; None)
900	How many household members are 12-years-old or younger? (Three or more; Two; One; None)
849	How many household members are 11-years-old or younger? (Three or more; Two; One; None)
781	What is highest level and grade that the female head/spouse has passed? (None, or up to first grade; Second to fifth grade; Sixth or seventh grade; Eight to twelfth grade; There is no female head/spouse; One to three years of post-secondary school or college; Four or more years of post-secondary school or college)
732	How many household members ages 6 to 18 are going to a public, private, or semi-private school? (Some or all children in this age range are not going to school; All children in this age range are going to public school; All children in this age range are going to school, and at least some of them go to a private or semi-private school; There are no household members in this age range)

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

Uncertainty coefficient	Indicator (responses are ordered starting with those associated with higher poverty likelihoods)
722	How many household members ages 6 to 13 are going to a public, private, or semi-private school? (Some or all children in this age range are not going to school; All children in this age range are going to public school; All children in this age range are going to school, and at least some of them go to a private or semi-private school; There are no household members in this age range)
715	How many household members ages 6 to 15 are going to a public, private, or semi-private school? (Some or all children in this age range are not going to school; All children in this age range are going to public school; All children in this age range are going to school, and at least some of them go to a private or semi-private school; There are no household members in this age range)
704	How many household members ages 6 to 17 are going to a public, private, or semi-private school? (Some or all children in this age range are not going to school; All children in this age range are going to public school; All children in this age range are going to school, and at least some of them go to a private or semi-private school; There are no household members in this age range)
701	How many household members ages 6 to 12 are going to a public, private, or semi-private school? (Some or all children in this age range are not going to school; All children in this age range are going to public school; All children in this age range are going to school, and at least some of them go to a private or semi-private school; There are no household members in this age range)
693	How many household members ages 6 to 16 are going to a public, private, or semi-private school? (Some or all children in this age range are not going to school; All children in this age range are going to public school; All children in this age range are going to school, and at least some of them go to a private or semi-private school; There are no household members in this age range)
692	How many household members ages 6 to 14 are going to a public, private, or semi-private school? (Some or all children in this age range are not going to school; All children in this age range are going to public school; All children in this age range are going to school, and at least some of them go to a private or semi-private school; There are no household members in this age range)

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

Uncertainty coefficient	Indicator (responses are ordered starting with those associated with higher poverty likelihoods)
681	Does the household have a motorcycle, car, SUV, or pick-up? (No; Motorcycle only; Car, SUV, or pick-up (regardless of motorcycle))
678	What the the principal cooking fuel used by the household? (Firewood, charcoal, kerosene, or other; Electricity or propane; Does not cook)
678	Does the household have a car, SUV, or pick-up? (No; Yes)
669	What type of toilet arrangement does the household have? (Not private flush toilet; Private flush toilet)
662	How many household members ages 6 to 11 are going to a public, private, or semi-private school? (Some or all children in this age range are not going to school; All children in this age range are going to public school; All children in this age range are going to school, and at least some of them go to a private or semi-private school; There are no household members in this age range)
583	What is highest level and grade that the male head/spouse has passed? (First grade or less; Second to sixth grade; Seventh to ninth grade; There is no male head/spouse; Tenth to twelfth grade; First year or higher of post-secondary school or college)
573	What is the main material of the roof? (Tin, asbestos, yagua leaves, cane, or other; Reinforced concrete)
536	What is the main material of the floor? (Cement, earth, wood, bricks, parquet, or other; Granite, marble, ceramic tile, or mosaic tile)
518	What was the highest level and grade that a member of the household has passed? (Seventh grade or lower; Eighth or ninth grade; Tenth to twelfth grade; First or second year of post-secondary school or college; Third year or higher of post-secondary school or college)

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

Uncertainty coefficient	Indicator (responses are ordered starting with those associated with higher poverty likelihoods)
492	What is the job or task that the female head/spouse performs in her main job? (Farmer and skilled worker in agricultural and fishing, or does not work; Unskilled worker; Skilled worker and operator of machinery and other skilled work, factory worker, or armed forces; Mid-level technician and professional, service worker, salesperson, and shopkeeper; There is no female head/spouse; Leader, director, manager, and administrator in government or business, professional, scientist, and intellectual, or office workers)
492	What is the main material of the exterior walls? (Palm planks, wooden shingles, *yagua*, asbestos, cardboard, plywood, scavenged materials, or other; Concrete; Wood; Concrete block and wood together, or tin; Concrete block, or bricks)
478	What is the source of water for washing and bathing? (Spring, river, stream, canal, rain, or other; Public network outside the residence, or public network via a public faucet; Well; Truck or tank; Public network inside the residence)
467	Do all household members ages 6 to 13 go to school? (No; Yes; No household members in this age range)
452	Do all household members ages 6 to 14 go to school? (No; Yes; No household members in this age range)
449	What is the main material of the interior walls? (Palm planks, wooden shingles, *yagua*, asbestos, cardboard, plywood, or scavenged materials; Tin, concrete, bricks, wood, concrete block and wood together, none, or other; Concrete block)
449	Do all household members ages 6 to 15 go to school? (No; Yes; No household members in this age range)
446	Do all household members ages 6 to 18 go to school? (No; Yes; No household members in this age range)
442	Does the household have a voltage converter? (No; Yes)

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

Uncertainty coefficient	Indicator (responses are ordered starting with those associated with higher poverty likelihoods)
439	In her principal occupation, what is the status of the female head/spouse? (Domestic servant; Does not work; Self-employed non-professional; Wage or salaried worker for the government, or unpaid worker in a family or non-family business; There is no female head/spouse; Wage or salaried worker in state businesses or institutions, private firms, or tax-free zones, self-employed professional, or owner of incorporated or non-incorporated firms)
437	What is the main sector of business in which the female head/spouse performs her main line of work? (Private households with domestic servants; Does not work, or agriculture, animal husbandry, hunting, and related activities, fishing, or mining and quarrying; Wholesale and retail trade, repair of vehicles, personal effects, and household appliances; There is no female head/spouse; Others)
437	Do all household members ages 6 to 12 go to school? (No; Yes; No household members in this age range)
436	How many household members are 6-years-old or younger? (Two or more; One; None)
434	Do all household members ages 6 to 16 go to school? (No; Yes; No household members in this age range)
433	Does the household have an electrical generator or a voltage converter? (No; Yes)
433	Do all household members ages 6 to 17 go to school? (No; Yes; No household members in this age range)
431	Do all household members ages 6 to 11 go to school? (No; Yes; No household members in this age range)
408	Does the residence have an electric meter? (No; Yes)
371	If the residence has a kitchen, where is it? (Outside the residence; There is no kitchen; Inside the residence)
364	Does the household have a VCR or DVD? (No; Yes)

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

Uncertainty coefficient	Indicator (responses are ordered starting with those associated with higher poverty likelihoods)
355	What is the job or task that the male head/spouse performs in his main job? (Farmed and skilled workers in agricultural and fishing; Unskilled workers; Skilled workers and operators of machinery and other skilled work, or armed forces; There is no male head/spouse; Office workers, or service workers, salespeople, and shopkeepers; Factory workers; Mid-level technicians and professionals; Leaders, directors, managers, and administrators in government or business, or professionals, scientists, and intellectuals)
341	What is the current marital status of the female head/spouse? (Cohabiting; Widowed; Separated from a cohabiting partner; Married, separated from a legal married partner, or never-married; Divorced, or there is no female head/spouse)
340	How many household members are unskilled workers or farmers or skilled workers in agriculture and fishing? (Two or more; One; None)
336	Does the household have a personal computer or laptop? (No; Yes)
329	Does the residence have a water meter? (No; Yes)
327	Does the household have a microwave? (No; Yes)
322	How many household members are employed as professionals, scientists, and intellectuals, technicians and para-professionals, clerks and other office workers, or lawmakers, and policymakers, and executives in public and private administration? (None; One; Two o more)
320	Does the household have a DVD? (No; Yes)
320	In what type of residence does the household live? (Detached house; Living quarters for farm workers; Building not intended for human habitation; Residence under construction; Room in a bunkhouse or behind the main house; Residence shared with a business; Other; Apartment)

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

Uncertainty coefficient	Indicator (responses are ordered starting with those associated with higher poverty likelihoods)
318	Can the female head/spouse read and write? (No; Yes; There is no female head/spouse)
300	What is the main way that the household disposes of its garbage? (Burning, thrown in a yard, lot, or ravine, or no data; Collection by the local government, private company, individual with a tricycle or cart, or thrown in a dumpster)
286	What is the current marital status of the male head/spouse? (Cohabiting; There is no male head/spouse; Other)
278	What is the main sector of business in which the male head/spouse performs his main line of work? (Agriculture, animal husbandry, hunting, and related activities, fishing, or mining and quarrying; Does not work, or private households with domestic servants; Electricity, gas, and water; Other community, social, and personal services; There is no male head/spouse; Public administration and defense, obligatory social-security programs; Logistics, storage, and Communications; Manufacturing and industry; Others)
272	What is the tenancy status of the household in its residence? (Owner from a gift or donation, lives rent-free in housing provided by an employer, relative, friend, or other person, or other; Owned free-and-clear; Owner with a mortgage outstanding, or renter)
247	How many household members are unskilled laborers? (One or more; None)
241	Did the female head/spouse work or perform any economic activity for at least an hour in the past week? (No; Yes; There is no female head/spouse)
206	Can the male head/spouse read and write? (No; There is no male head/spouse; Yes)
190	Does the household have an air conditioner? (No; Yes)
177	Does the household have a refrigerator? (No; Yes)
170	Does any household member currently attend a private or semi-private school? (No; Yes)

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

Uncertainty coefficient	Indicator (responses are ordered starting with those associated with higher poverty likelihoods)
162	What is the structure of household headship? (Both male and female heads/spouses; Female head/spouse only; Male head/spouse only)
135	Does the household have a VCR? (No; Yes)
134	Does the household have a clothes washing machine and/or dryer? (No; Yes)
130	Does the household have a VCR or DVD? (No; Yes)
128	How many rooms does the household use, not counting bathrooms, kitchen, nor hallways? (One to four; Five or more)
120	What is the principle source of electricity for the residence? (Electricity from the public grid (CDEE/EDES); Other)
118	How old is the female head/spouse? (56 or more; 26 to 34; 35 to 44; 25 or younger; 45 to 55; There is no female head/spouse)
114	How old is this residence? (Six to ten years; Less than six years; Eleven to twenty years; Fifty-one years or more; Twenty-one to fifty years; Does not know)
97	In his principal occupation, what is the status of the male head/spouse? (Self-employed non-professional, unpaid worker in a family or non-family business, domestic servant, or does not work; Other; There is no male head/spouse)
87	How many household members work in a business whose main activity is in financial intermediation, real estate and rentals, public administration and defense, obligatory social-security programs, education, social work and health care, or other community, social, and personal services? (None; One; Two or more)
78	Does the household have a stereo system? (No; Yes)
76	In their main line of work, how many household members are wage or salary workers? (None; One; Two or more)
75	In their main line of work, does anyone in the household have a written contract? (No; Yes)

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

Uncertainty coefficient	Indicator (responses are ordered starting with those associated with higher poverty likelihoods)
75	In their main line of work, how many household members are self-employed or business owners? (Two or more; One; None)
73	How old is the male head/spouse? (57 or more; 37 to 43; There is no male head/spouse; 27 to 36; 44 to 56; 26 or younger)
69	How many household members are farmers or skilled workers in agriculture and fishing? (One or more; None)
62	How many rooms does the household use for sleeping? (None to two; Three; Four or more)
55	Does the household own any agricultural or ranch land which it works as the head of a family owned business or as a self-employed farmer? (Yes; No)
42	Does the household have a sewing machine? (No; Yes)
21	Does the household have an electrical generator? (No; Yes)
20	Does the household have a gas stove? (No; Yes)
18	Does the household have an electric or gas stove? (No; Yes)
17	How many household members work in a business whose main activity is in wholesale and retail trade, repair of vehicles, personal effects, and household appliances? (None; One; Two or more)
6	Does the household have a fan? (No; Yes)
5	Did the male head/spouse work or perform any economic activity for at least an hour in the past week? (No; Yes; There is no male head/spouse)
5	How many household members are service workers or salespeople in stores and markets? (Uno o más; None)
4	Does the household have an electric stove? (No; Yes)
2	Does the household have a motorcycle? (No; Yes)
1	In their main line of work, how many household members are domestic servants or unpaid workers in a family or non-family business? (One or more; None)
0	Does the household have a color television? (No; Yes)

Source: 2007 ENIGH and the national poverty line.

National Poverty Line

(and tables pertaining to all ten poverty lines)

Figure 5 (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	91.3
5–9	95.5
10–14	85.9
15–19	77.4
20–24	65.8
25–29	53.6
30–34	43.5
35–39	27.9
40–44	25.4
45–49	14.1
50–54	9.6
55–59	3.7
60–64	1.3
65–69	5.4
70–74	4.7
75–79	2.5
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

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

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,403	÷	1,536	=	91.3
5–9	1,418	÷	1,485	=	95.5
10–14	2,670	÷	3,108	=	85.9
15–19	3,686	÷	4,763	=	77.4
20–24	4,109	÷	6,250	=	65.8
25–29	4,095	÷	7,645	=	53.6
30–34	4,314	÷	9,923	=	43.5
35–39	3,445	÷	12,349	=	27.9
40–44	2,695	÷	10,595	=	25.4
45–49	1,550	÷	10,991	=	14.1
50–54	913	÷	9,562	=	9.6
55–59	242	÷	6,484	=	3.7
60–64	60	÷	4,840	=	1.3
65–69	160	÷	2,971	=	5.4
70–74	127	÷	2,698	=	4.7
75–79	53	÷	2,184	=	2.5
80–84	0	÷	1,736	=	0.0
85–89	0	÷	398	=	0.0
90–94	0	÷	483	=	0.0
95–100	0	÷	0	=	0.0

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

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

	Likelihood of having expenditure in range demarcated by poverty lines per day per capita										
	<$1.25/day	**=>$1.25/day and <50% Natl.**	**=>50% Natl. and <$2.50/day**	**=>$2.50/day and <USAID**	**=>USAID and <75% Natl.**	**=>75% Natl. and <$3.75/day**	**=>$3.75/day and <100% Natl.**	**=>100% Natl. and <$5.00/day**	**=>$5.00/day and <150% Natl.**	**=>150% Natl. and <200% Natl.**	**=>200% Natl.**
Score	**<DOP29.24**	**=>DOP29.24 and <DOP50.00**	**=>DOP50.00 and <DOP58.48**	**=>DOP58.48 and <DOP68.65**	**=>DOP68.65 and <DOP75.00**	**=>DOP75.00 and <DOP87.82**	**=>DOP87.82 and <DOP 100.00**	**=>DOP100.00 and <DOP116.96**	**=>DOP116.96 and <DOP150.00**	**=>DOP150.00 and <DOP200.00**	**=>DOP200.00**
0–4	10.2	35.1	4.2	14.8	7.6	5.4	14.0	8.7	0.0	0.0	0.0
5–9	1.9	30.7	29.1	11.1	7.4	9.1	6.3	2.0	2.5	0.0	0.0
10–14	0.0	25.9	9.9	16.4	10.5	15.8	7.5	6.2	3.5	3.6	0.7
15–19	2.8	17.3	12.0	17.6	8.2	14.8	4.6	8.2	6.2	5.9	2.3
20–24	2.0	14.6	7.6	11.0	6.4	13.6	10.6	12.5	14.5	3.9	3.4
25–29	1.6	7.7	6.2	7.8	6.8	12.5	10.9	14.4	14.9	8.3	8.8
30–34	1.4	3.5	4.3	8.1	4.9	11.4	9.9	14.7	18.9	13.6	9.2
35–39	0.4	3.4	0.7	2.2	2.8	9.1	9.3	17.5	20.7	18.1	15.8
40–44	0.2	1.5	1.9	2.4	2.0	8.6	8.9	10.8	18.5	19.8	25.5
45–49	0.0	1.1	1.1	2.4	0.5	2.0	7.0	8.2	17.9	20.7	39.2
50–54	0.4	0.6	0.5	1.2	1.5	2.7	2.7	5.6	12.2	25.6	47.1
55–59	0.0	0.0	0.0	0.0	0.0	1.6	2.1	2.7	11.3	15.9	66.4
60–64	0.0	0.3	0.0	0.0	0.0	0.0	0.9	1.1	7.9	11.8	78.0
65–69	0.0	0.0	0.0	1.9	0.0	1.6	1.9	3.8	6.3	18.9	65.6
70–74	0.0	0.0	0.0	0.0	0.0	0.0	4.7	1.7	7.8	12.8	73.0
75–79	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.6	1.5	4.2	91.3
80–84	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	95.7
85–89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
90–94	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
95–100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Note: All poverty likelihoods in percentage units.

Figure 8 (National line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) from the validation sample, 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	–2.1	2.6	3.2	3.9
5–9	–0.4	2.4	2.8	4.0
10–14	+1.4	2.9	3.5	4.5
15–19	–0.8	2.6	3.0	3.9
20–24	+2.6	2.7	3.2	4.4
25–29	–1.0	2.4	3.0	4.1
30–34	–7.5	4.9	5.1	5.5
35–39	–9.0	5.5	5.6	5.9
40–44	+8.0	1.6	2.0	2.4
45–49	+3.5	1.2	1.5	2.1
50–54	+1.0	1.2	1.4	2.0
55–59	–0.9	1.0	1.2	1.6
60–64	–2.4	1.8	1.9	2.2
65–69	+4.3	0.7	0.9	1.1
70–74	+4.4	0.2	0.3	0.3
75–79	+0.7	1.0	1.2	1.6
80–84	–1.0	0.8	0.9	1.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 9 (All poverty lines): Differences, precision of differences, and the α factor for bootstrapped estimates of poverty rates for groups of households at a point in time for the scorecard applied to the validation sample

	Poverty line								
	National					USAID	International 2005 PPP		
	50%	75%	100%	150%	200%	'Extreme'	$1.25/day	$2.50/day	$3.75/day	$5.00/day
Estimate minus true value										
Scorecard applied to validation sample	–0.8	–1.4	–0.3	–0.5	+0.5	–1.6	–0.2	–1.4	–1.3	–1.0
Precision of difference										
Scorecard applied to validation sample	0.3	0.4	0.5	0.5	0.5	0.4	0.1	0.3	0.5	0.5
α factor for standard errors										
Scorecard applied to validation sample	0.82	0.78	0.78	0.80	0.89	0.80	0.73	0.82	0.77	0.8
Precision is measured as 90-percent confidence intervals in units of +/– percentage points.										
Differences and precision estimated from 1,000 bootstraps of size n = 16,384.										
α is estimated from 1,000 bootstrap samples of n = 256, 512, 1,024, 2,048, 4,096, 8,192, and 16,384.										

Figure 10 (National line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–2.1	62.8	70.2	83.9
4	–0.8	30.0	36.0	48.1
8	–0.8	20.3	25.5	35.7
16	–0.7	14.9	18.5	26.1
32	–0.5	10.9	12.6	17.0
64	–0.4	7.3	8.8	11.1
128	–0.5	5.3	6.3	8.4
256	–0.3	3.7	4.5	6.0
512	–0.3	2.6	3.0	4.0
1,024	–0.3	1.8	2.3	2.9
2,048	–0.3	1.3	1.6	1.9
4,096	–0.3	1.0	1.1	1.5
8,192	–0.3	0.6	0.8	1.0
16,384	–0.3	0.5	0.6	0.8

Figure 11 (All poverty lines): Possible outcomes from targeting by poverty score

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

Figure 12 (National line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.4	30.2	0.1	68.3	69.7	–90.6
5–9	2.9	28.8	0.2	68.2	71.1	–81.4
10–14	5.5	26.1	0.6	67.7	73.3	–63.2
15–19	9.3	22.4	1.6	66.7	76.0	–36.3
20–24	13.3	18.4	3.9	64.5	77.7	–3.9
25–29	17.5	14.1	7.3	61.1	78.6	+33.6
30–34	22.3	9.3	12.4	56.0	78.3	+60.9
35–39	26.8	4.9	20.3	48.1	74.8	+35.8
40–44	28.8	2.8	28.8	39.5	68.3	+8.8
45–49	30.1	1.6	38.6	29.8	59.9	–21.9
50–54	30.9	0.7	47.3	21.1	52.0	–49.5
55–59	31.3	0.4	53.4	14.9	46.2	–68.8
60–64	31.5	0.2	58.1	10.3	41.8	–83.5
65–69	31.5	0.1	61.0	7.4	38.9	–92.8
70–74	31.5	0.1	63.7	4.7	36.2	–101.2
75–79	31.6	0.0	65.8	2.6	34.2	–108.0
80–84	31.6	0.0	67.5	0.9	32.5	–113.3
85–89	31.6	0.0	67.9	0.5	32.1	–114.5
90–94	31.6	0.0	68.4	0.0	31.6	–116.1
95–100	31.6	0.0	68.4	0.0	31.6	–116.1

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

Figure 13 (National line): For a given score cut-off, the percentage of all households who are targeted, the percentage of targeted households who are poor, the percentage of poor households who are targeted, and the number of poor households who are successful targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.5	93.0	4.5	13.3:1
5–9	3.0	95.0	9.1	19.0:1
10–14	6.1	90.0	17.4	9.0:1
15–19	10.9	85.1	29.3	5.7:1
20–24	17.1	77.3	41.9	3.4:1
25–29	24.8	70.6	55.3	2.4:1
30–34	34.7	64.4	70.6	1.8:1
35–39	47.1	56.9	84.6	1.3:1
40–44	57.7	50.0	91.1	1.0:1
45–49	68.6	43.8	95.1	0.8:1
50–54	78.2	39.5	97.7	0.7:1
55–59	84.7	36.9	98.8	0.6:1
60–64	89.5	35.2	99.5	0.5:1
65–69	92.5	34.1	99.6	0.5:1
70–74	95.2	33.1	99.7	0.5:1
75–79	97.4	32.4	99.8	0.5:1
80–84	99.1	31.9	100.0	0.5:1
85–89	99.5	31.8	100.0	0.5:1
90–94	100.0	31.6	100.0	0.5:1
95–100	100.0	31.6	100.0	0.5:1

50% of the National Poverty Line

Figure 5 (50% of national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	45.3
5–9	32.6
10–14	25.9
15–19	20.1
20–24	16.6
25–29	9.3
30–34	4.8
35–39	3.8
40–44	1.7
45–49	1.1
50–54	1.0
55–59	0.0
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 (50% of national line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	696	÷	1,536	=	45.3
5–9	484	÷	1,485	=	32.6
10–14	806	÷	3,108	=	25.9
15–19	956	÷	4,763	=	20.1
20–24	1,036	÷	6,250	=	16.6
25–29	712	÷	7,645	=	9.3
30–34	477	÷	9,923	=	4.8
35–39	474	÷	12,349	=	3.8
40–44	179	÷	10,595	=	1.7
45–49	117	÷	10,991	=	1.1
50–54	95	÷	9,562	=	1.0
55–59	0	÷	6,484	=	0.0
60–64	16	÷	4,840	=	0.3
65–69	0	÷	2,971	=	0.0
70–74	0	÷	2,698	=	0.0
75–79	0	÷	2,184	=	0.0
80–84	0	÷	1,736	=	0.0
85–89	0	÷	398	=	0.0
90–94	0	÷	483	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 8 (50% of national line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) from the validation sample, 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	–5.5	5.6	6.5	8.3
5–9	–24.9	15.2	15.5	16.3
10–14	–1.1	3.6	4.2	5.6
15–19	–5.4	4.1	4.3	4.9
20–24	–1.0	2.1	2.5	3.4
25–29	+1.4	1.3	1.6	2.2
30–34	–6.0	3.7	3.9	4.0
35–39	+0.3	0.7	0.8	1.1
40–44	+1.1	0.2	0.3	0.4
45–49	+0.7	0.2	0.2	0.3
50–54	+0.9	0.1	0.1	0.1
55–59	–0.6	0.5	0.5	0.6
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 10 (50% of national line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–1.8	50.0	58.3	70.7
4	–1.2	16.7	20.5	31.8
8	–0.8	11.7	14.4	19.6
16	–1.0	8.7	10.5	13.5
32	–0.8	5.9	7.3	9.6
64	–0.8	4.4	5.3	6.4
128	–0.8	3.1	3.7	5.0
256	–0.8	2.1	2.5	3.3
512	–0.8	1.5	1.7	2.4
1,024	–0.8	1.0	1.2	1.7
2,048	–0.8	0.8	0.9	1.2
4,096	–0.7	0.6	0.7	0.8
8,192	–0.8	0.4	0.5	0.6
16,384	–0.8	0.3	0.3	0.4

Figure 12 (50% of national line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.9	6.2	0.7	92.3	93.2	–65.8
5–9	1.7	5.3	1.3	91.7	93.4	–32.5
10–14	2.6	4.5	3.5	89.4	92.0	+23.8
15–19	3.8	3.3	7.1	85.8	89.6	–1.3
20–24	4.8	2.2	12.3	80.6	85.5	–74.5
25–29	5.5	1.6	19.3	73.6	79.1	–174.2
30–34	6.4	0.7	28.4	64.6	71.0	–302.2
35–39	6.8	0.2	40.2	52.7	59.5	–470.9
40–44	6.9	0.1	50.7	42.2	49.2	–619.6
45–49	7.0	0.1	61.7	31.3	38.3	–774.7
50–54	7.0	0.0	71.2	21.7	28.8	–910.0
55–59	7.0	0.0	77.6	15.3	22.4	–1,001.4
60–64	7.0	0.0	82.5	10.5	17.5	–1,070.1
65–69	7.0	0.0	85.5	7.5	14.5	–1,112.2
70–74	7.0	0.0	88.1	4.8	11.9	–1,150.5
75–79	7.0	0.0	90.3	2.6	9.7	–1,181.4
80–84	7.0	0.0	92.1	0.9	7.9	–1,206.1
85–89	7.0	0.0	92.5	0.5	7.5	–1,211.7
90–94	7.0	0.0	93.0	0.0	7.0	–1,218.6
95–100	7.0	0.0	93.0	0.0	7.0	–1,218.6

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

Figure 13 (50% of national line): For a given score cut-off, the percentage of all households who are targeted, the percentage of targeted households who are poor, the percentage of poor households who are targeted, and the number of poor households who are successful targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.5	57.0	12.4	1.3:1
5–9	3.0	57.4	24.6	1.3:1
10–14	6.1	42.3	36.8	0.7:1
15–19	10.9	34.4	53.2	0.5:1
20–24	17.1	28.2	68.6	0.4:1
25–29	24.8	22.0	77.5	0.3:1
30–34	34.7	18.3	90.2	0.2:1
35–39	47.1	14.5	96.7	0.2:1
40–44	57.7	12.0	98.3	0.1:1
45–49	68.6	10.2	99.1	0.1:1
50–54	78.2	9.0	99.4	0.1:1
55–59	84.7	8.3	100.0	0.1:1
60–64	89.5	7.9	100.0	0.1:1
65–69	92.5	7.6	100.0	0.1:1
70–74	95.2	7.4	100.0	0.1:1
75–79	97.4	7.2	100.0	0.1:1
80–84	99.1	7.1	100.0	0.1:1
85–89	99.5	7.1	100.0	0.1:1
90–94	100.0	7.0	100.0	0.1:1
95–100	100.0	7.0	100.0	0.1:1

75% of the National Poverty Line

Figure 5 (75% of national line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	71.9
5–9	80.1
10–14	62.7
15–19	57.9
20–24	41.6
25–29	30.2
30–34	22.2
35–39	9.4
40–44	8.0
45–49	5.1
50–54	4.2
55–59	0.0
60–64	0.3
65–69	1.9
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 (75% of national line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,105	÷	1,536	=	71.9
5–9	1,190	÷	1,485	=	80.1
10–14	1,949	÷	3,108	=	62.7
15–19	2,759	÷	4,763	=	57.9
20–24	2,599	÷	6,250	=	41.6
25–29	2,307	÷	7,645	=	30.2
30–34	2,199	÷	9,923	=	22.2
35–39	1,166	÷	12,349	=	9.4
40–44	843	÷	10,595	=	8.0
45–49	562	÷	10,991	=	5.1
50–54	399	÷	9,562	=	4.2
55–59	0	÷	6,484	=	0.0
60–64	16	÷	4,840	=	0.3
65–69	56	÷	2,971	=	1.9
70–74	0	÷	2,698	=	0.0
75–79	0	÷	2,184	=	0.0
80–84	0	÷	1,736	=	0.0
85–89	0	÷	398	=	0.0
90–94	0	÷	483	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 8 (75% of national line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) from the validation sample, 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	–19.3	11.1	11.4	11.9
5–9	+1.9	4.7	5.8	7.7
10–14	–7.1	5.2	5.5	6.2
15–19	+1.5	3.1	3.6	5.0
20–24	+1.8	2.7	3.2	3.9
25–29	–1.5	2.3	2.8	3.4
30–34	–8.4	5.2	5.4	5.8
35–39	–7.4	4.5	4.6	4.8
40–44	+3.8	0.7	0.9	1.1
45–49	+1.0	0.8	1.0	1.2
50–54	+2.1	0.6	0.7	1.0
55–59	–2.6	1.7	1.7	1.9
60–64	+0.3	0.0	0.0	0.0
65–69	+1.9	0.0	0.0	0.0
70–74	–0.3	0.2	0.3	0.3
75–79	–1.7	1.4	1.5	1.8
80–84	–1.0	0.8	0.9	1.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 10 (75% of national line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–2.6	59.7	74.2	85.9
4	–1.3	25.6	31.5	45.3
8	–1.4	17.4	21.0	29.4
16	–1.7	12.5	15.0	17.9
32	–1.4	8.4	10.2	12.8
64	–1.3	6.0	7.2	9.5
128	–1.4	4.3	5.2	6.7
256	–1.4	3.2	3.8	4.8
512	–1.4	2.1	2.5	3.4
1,024	–1.4	1.5	1.8	2.5
2,048	–1.4	1.1	1.3	1.7
4,096	–1.4	0.8	1.0	1.2
8,192	–1.4	0.6	0.6	0.9
16,384	–1.4	0.4	0.5	0.6

Figure 12 (75% of national line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.4	17.3	0.1	81.1	82.5	–84.3
5–9	2.6	16.1	0.4	80.9	83.4	–70.0
10–14	4.7	14.0	1.4	79.9	84.6	–42.0
15–19	7.3	11.4	3.6	77.7	85.1	–2.6
20–24	9.8	8.9	7.3	74.0	83.8	+44.2
25–29	12.3	6.5	12.5	68.8	81.0	+33.0
30–34	15.0	3.7	19.7	61.6	76.6	–5.2
35–39	17.0	1.7	30.0	51.3	68.3	–60.5
40–44	17.7	1.0	40.0	41.3	59.0	–113.7
45–49	18.2	0.6	50.5	30.8	48.9	–169.9
50–54	18.4	0.3	59.8	21.4	39.8	–219.8
55–59	18.6	0.1	66.1	15.2	33.8	–253.3
60–64	18.6	0.1	70.9	10.3	28.9	–279.1
65–69	18.6	0.1	73.9	7.4	26.0	–295.0
70–74	18.6	0.1	76.6	4.7	23.3	–309.3
75–79	18.7	0.0	78.7	2.6	21.2	–320.7
80–84	18.7	0.0	80.4	0.9	19.6	–329.7
85–89	18.7	0.0	80.8	0.5	19.2	–331.9
90–94	18.7	0.0	81.3	0.0	18.7	–334.4
95–100	18.7	0.0	81.3	0.0	18.7	–334.4

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

Figure 13 (75% of national line): For a given score cut-off, the percentage of all households who are targeted, the percentage of targeted households who are poor, the percentage of poor households who are targeted, and the number of poor households who are successful targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.5	90.8	7.5	9.9:1
5–9	3.0	85.8	13.8	6.0:1
10–14	6.1	77.1	25.3	3.4:1
15–19	10.9	67.3	39.2	2.1:1
20–24	17.1	57.4	52.6	1.3:1
25–29	24.8	49.4	65.5	1.0:1
30–34	34.7	43.3	80.3	0.8:1
35–39	47.1	36.2	91.0	0.6:1
40–44	57.7	30.6	94.4	0.4:1
45–49	68.6	26.4	97.0	0.4:1
50–54	78.2	23.5	98.1	0.3:1
55–59	84.7	22.0	99.4	0.3:1
60–64	89.5	20.8	99.4	0.3:1
65–69	92.5	20.1	99.4	0.3:1
70–74	95.2	19.5	99.5	0.2:1
75–79	97.4	19.2	99.7	0.2:1
80–84	99.1	18.9	100.0	0.2:1
85–89	99.5	18.8	100.0	0.2:1
90–94	100.0	18.7	100.0	0.2:1
95–100	100.0	18.7	100.0	0.2:1

150% of the National Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	95.7
15–19	91.8
20–24	92.7
25–29	82.9
30–34	77.2
35–39	66.1
40–44	54.7
45–49	40.1
50–54	27.4
55–59	17.7
60–64	10.2
65–69	15.5
70–74	14.2
75–79	4.6
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

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

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,536	÷	1,536	=	100.0
5–9	1,485	÷	1,485	=	100.0
10–14	2,974	÷	3,108	=	95.7
15–19	4,372	÷	4,763	=	91.8
20–24	5,795	÷	6,250	=	92.7
25–29	6,335	÷	7,645	=	82.9
30–34	7,655	÷	9,923	=	77.2
35–39	8,163	÷	12,349	=	66.1
40–44	5,796	÷	10,595	=	54.7
45–49	4,412	÷	10,991	=	40.1
50–54	2,618	÷	9,562	=	27.4
55–59	1,147	÷	6,484	=	17.7
60–64	495	÷	4,840	=	10.2
65–69	462	÷	2,971	=	15.5
70–74	383	÷	2,698	=	14.2
75–79	99	÷	2,184	=	4.6
80–84	0	÷	1,736	=	0.0
85–89	0	÷	398	=	0.0
90–94	0	÷	483	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 8 (150% of national line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) from the validation sample, 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	+1.0	1.7	2.1	2.7
15–19	–4.1	2.6	2.7	2.9
20–24	+2.4	1.8	2.1	2.9
25–29	–0.8	1.9	2.3	2.9
30–34	–6.2	3.9	4.0	4.2
35–39	–3.6	2.7	2.9	3.2
40–44	+6.7	2.2	2.6	3.3
45–49	–2.2	2.1	2.6	3.3
50–54	–4.1	3.1	3.3	3.8
55–59	–0.4	2.0	2.4	3.3
60–64	+2.0	1.5	1.9	2.6
65–69	+5.6	2.4	2.8	3.8
70–74	+6.4	2.0	2.4	3.2
75–79	+1.9	1.1	1.4	1.9
80–84	–1.0	0.8	0.9	1.0
85–89	–10.4	8.2	8.8	10.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 10 (150% of national line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.8	65.7	74.9	89.3
4	–0.1	34.5	41.0	54.7
8	–0.7	24.1	28.8	36.7
16	–0.9	17.2	20.0	27.0
32	–0.7	11.6	13.8	18.3
64	–0.5	8.3	9.7	12.8
128	–0.5	5.8	6.9	8.9
256	–0.5	4.0	4.9	6.2
512	–0.5	2.8	3.3	4.5
1,024	–0.5	2.0	2.4	3.1
2,048	–0.5	1.4	1.8	2.3
4,096	–0.5	1.1	1.2	1.5
8,192	–0.5	0.7	0.9	1.1
16,384	–0.5	0.5	0.6	0.8

Figure 12 (150% of national line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.5	52.9	0.0	45.6	47.1	–94.4
5–9	3.0	51.4	0.0	45.6	48.6	–88.9
10–14	6.0	48.4	0.2	45.4	51.4	–77.8
15–19	10.5	43.9	0.4	45.2	55.7	–60.7
20–24	16.2	38.2	0.9	44.7	60.9	–38.7
25–29	22.7	31.7	2.1	43.5	66.2	–12.7
30–34	30.8	23.6	3.9	41.7	72.6	+20.5
35–39	39.3	15.1	7.8	37.8	77.1	+58.7
40–44	44.4	10.0	13.3	32.3	76.7	+75.6
45–49	49.0	5.4	19.6	26.0	75.0	+64.0
50–54	52.0	2.4	26.2	19.4	71.3	+51.8
55–59	53.2	1.3	31.5	14.1	67.2	+42.0
60–64	53.6	0.8	35.9	9.7	63.4	+34.0
65–69	53.9	0.5	38.6	7.0	61.0	+29.1
70–74	54.2	0.2	41.0	4.6	58.8	+24.6
75–79	54.3	0.1	43.1	2.5	56.8	+20.8
80–84	54.3	0.1	44.8	0.8	55.2	+17.7
85–89	54.4	0.0	45.1	0.5	54.9	+17.1
90–94	54.4	0.0	45.6	0.0	54.4	+16.2
95–100	54.4	0.0	45.6	0.0	54.4	+16.2

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

Figure 13 (150% of national line): For a given score cut-off, the percentage of all households who are targeted, the percentage of targeted households who are poor, the percentage of poor households who are targeted, and the number of poor households who are successful targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.5	100.0	2.8	Only poor targeted
5–9	3.0	100.0	5.6	Only poor targeted
10–14	6.1	97.4	11.0	37.1:1
15–19	10.9	96.5	19.3	27.9:1
20–24	17.1	94.6	29.8	17.5:1
25–29	24.8	91.5	41.7	10.8:1
30–34	34.7	88.9	56.7	8.0:1
35–39	47.1	83.4	72.2	5.0:1
40–44	57.7	77.0	81.6	3.3:1
45–49	68.6	71.4	90.1	2.5:1
50–54	78.2	66.5	95.5	2.0:1
55–59	84.7	62.8	97.7	1.7:1
60–64	89.5	59.9	98.6	1.5:1
65–69	92.5	58.3	99.1	1.4:1
70–74	95.2	56.9	99.6	1.3:1
75–79	97.4	55.8	99.8	1.3:1
80–84	99.1	54.8	99.9	1.2:1
85–89	99.5	54.7	100.0	1.2:1
90–94	100.0	54.4	100.0	1.2:1
95–100	100.0	54.4	100.0	1.2:1

200% of the National Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	99.3
15–19	97.7
20–24	96.6
25–29	91.2
30–34	90.8
35–39	84.2
40–44	74.5
45–49	60.9
50–54	52.9
55–59	33.6
60–64	22.0
65–69	34.4
70–74	27.0
75–79	8.7
80–84	4.3
85–89	0.0
90–94	0.0
95–100	0.0

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

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,536	÷	1,536	=	100.0
5–9	1,485	÷	1,485	=	100.0
10–14	3,085	÷	3,108	=	99.3
15–19	4,653	÷	4,763	=	97.7
20–24	6,036	÷	6,250	=	96.6
25–29	6,973	÷	7,645	=	91.2
30–34	9,008	÷	9,923	=	90.8
35–39	10,397	÷	12,349	=	84.2
40–44	7,897	÷	10,595	=	74.5
45–49	6,688	÷	10,991	=	60.9
50–54	5,062	÷	9,562	=	52.9
55–59	2,177	÷	6,484	=	33.6
60–64	1,066	÷	4,840	=	22.0
65–69	1,022	÷	2,971	=	34.4
70–74	728	÷	2,698	=	27.0
75–79	191	÷	2,184	=	8.7
80–84	74	÷	1,736	=	4.3
85–89	0	÷	398	=	0.0
90–94	0	÷	483	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 8 (200% of national line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) from the validation sample, 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	–0.5	0.4	0.4	0.4
15–19	–2.2	1.1	1.1	1.2
20–24	–1.0	0.9	1.1	1.4
25–29	–1.8	1.6	1.7	2.1
30–34	–1.0	1.2	1.5	1.9
35–39	+0.4	1.5	1.7	2.1
40–44	+5.3	1.9	2.2	2.9
45–49	–2.4	2.2	2.4	3.1
50–54	–1.4	2.2	2.6	3.5
55–59	–2.2	2.5	2.9	3.6
60–64	–7.8	5.7	6.0	6.8
65–69	+14.3	3.3	4.0	4.9
70–74	+15.6	2.5	2.9	3.8
75–79	+1.9	2.0	2.3	3.1
80–84	+3.3	0.6	0.7	0.9
85–89	–10.4	8.2	8.8	10.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 10 (200% of national line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.1	70.3	75.3	84.6
4	+0.6	33.3	39.1	53.0
8	+0.2	24.3	28.7	38.6
16	+0.1	17.4	21.1	26.9
32	+0.2	11.7	14.1	18.4
64	+0.3	8.7	10.8	14.9
128	+0.4	6.0	7.2	9.7
256	+0.5	4.2	5.0	6.5
512	+0.4	2.9	3.6	5.0
1,024	+0.4	2.1	2.6	3.4
2,048	+0.5	1.5	1.9	2.4
4,096	+0.5	1.1	1.3	1.6
8,192	+0.4	0.8	0.9	1.2
16,384	+0.5	0.5	0.6	0.9

Figure 12 (200% of national line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.5	66.7	0.0	31.7	33.3	–95.5
5–9	3.0	65.3	0.0	31.7	34.7	–91.1
10–14	6.1	62.2	0.0	31.7	37.8	–82.1
15–19	10.9	57.4	0.0	31.7	42.5	–68.2
20–24	17.0	51.3	0.2	31.5	48.5	–50.1
25–29	24.1	44.2	0.7	31.0	55.1	–28.4
30–34	33.3	35.0	1.5	30.3	63.5	–0.5
35–39	43.6	24.6	3.4	28.3	71.9	+32.8
40–44	51.0	17.2	6.6	25.1	76.2	+59.2
45–49	58.2	10.1	10.5	21.3	79.4	+84.7
50–54	63.3	4.9	14.9	16.8	80.2	+78.2
55–59	65.7	2.6	19.0	12.8	78.5	+72.2
60–64	67.0	1.3	22.5	9.2	76.2	+67.0
65–69	67.6	0.7	24.9	6.8	74.3	+63.5
70–74	67.9	0.3	27.3	4.5	72.4	+60.1
75–79	68.2	0.1	29.2	2.5	70.7	+57.2
80–84	68.2	0.1	30.9	0.8	69.0	+54.7
85–89	68.3	0.0	31.2	0.5	68.8	+54.2
90–94	68.3	0.0	31.7	0.0	68.3	+53.5
95–100	68.3	0.0	31.7	0.0	68.3	+53.5

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

Figure 13 (200% of national line): For a given score cut-off, the percentage of all households who are targeted, the percentage of targeted households who are poor, the percentage of poor households who are targeted, and the number of poor households who are successful targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.5	100.0	2.2	Only poor targeted
5–9	3.0	100.0	4.4	Only poor targeted
10–14	6.1	99.7	9.0	346.1:1
15–19	10.9	99.6	15.9	255.7:1
20–24	17.1	98.9	24.8	92.8:1
25–29	24.8	97.2	35.3	35.3:1
30–34	34.7	95.8	48.7	22.8:1
35–39	47.1	92.7	63.9	12.7:1
40–44	57.7	88.5	74.8	7.7:1
45–49	68.6	84.7	85.2	5.6:1
50–54	78.2	81.0	92.8	4.3:1
55–59	84.7	77.6	96.3	3.5:1
60–64	89.5	74.8	98.1	3.0:1
65–69	92.5	73.0	98.9	2.7:1
70–74	95.2	71.4	99.5	2.5:1
75–79	97.4	70.0	99.8	2.3:1
80–84	99.1	68.8	99.9	2.2:1
85–89	99.5	68.6	100.0	2.2:1
90–94	100.0	68.3	100.0	2.2:1
95–100	100.0	68.3	100.0	2.2:1

USAID "Extreme" Poverty Line

Figure 5 (USAID "extreme" line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	64.3
5–9	72.7
10–14	52.2
15–19	49.7
20–24	35.2
25–29	23.3
30–34	17.3
35–39	6.7
40–44	6.0
45–49	4.6
50–54	2.7
55–59	0.0
60–64	0.3
65–69	1.9
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (USAID "extreme" line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	988	÷	1,536	=	64.3
5–9	1,080	÷	1,485	=	72.7
10–14	1,623	÷	3,108	=	52.2
15–19	2,366	÷	4,763	=	49.7
20–24	2,199	÷	6,250	=	35.2
25–29	1,784	÷	7,645	=	23.3
30–34	1,713	÷	9,923	=	17.3
35–39	826	÷	12,349	=	6.7
40–44	637	÷	10,595	=	6.0
45–49	503	÷	10,991	=	4.6
50–54	254	÷	9,562	=	2.7
55–59	0	÷	6,484	=	0.0
60–64	16	÷	4,840	=	0.3
65–69	56	÷	2,971	=	1.9
70–74	0	÷	2,698	=	0.0
75–79	0	÷	2,184	=	0.0
80–84	0	÷	1,736	=	0.0
85–89	0	÷	398	=	0.0
90–94	0	÷	483	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 8 (USAID "extreme" line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) from the validation sample, 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	–26.6	14.8	15.0	15.5
5–9	–2.1	5.0	6.0	7.7
10–14	–13.2	8.3	8.7	9.2
15–19	+0.4	3.1	3.7	4.8
20–24	+0.4	2.6	3.1	3.8
25–29	–2.7	2.5	2.7	3.2
30–34	–7.2	4.6	4.7	5.1
35–39	–4.9	3.1	3.2	3.4
40–44	+3.1	0.6	0.7	0.9
45–49	+1.4	0.7	0.8	1.0
50–54	+0.6	0.6	0.7	1.0
55–59	–2.0	1.3	1.4	1.5
60–64	+0.3	0.0	0.0	0.0
65–69	+1.9	0.0	0.0	0.0
70–74	–0.3	0.2	0.3	0.3
75–79	–1.7	1.4	1.5	1.8
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 10 (USAID "extreme" line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–3.7	59.0	71.5	82.5
4	–1.7	23.4	30.6	43.1
8	–1.7	16.8	20.2	26.9
16	–2.0	11.8	13.8	18.3
32	–1.6	8.2	10.1	13.9
64	–1.5	5.6	6.8	8.9
128	–1.6	4.1	4.8	6.1
256	–1.6	3.0	3.6	4.8
512	–1.6	2.0	2.4	3.2
1,024	–1.6	1.4	1.8	2.4
2,048	–1.6	1.0	1.2	1.6
4,096	–1.6	0.8	0.9	1.1
8,192	–1.6	0.5	0.6	0.8
16,384	–1.6	0.4	0.4	0.6

Figure 12 (USAID "extreme" line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.4	14.3	0.2	84.1	85.5	–81.4
5–9	2.5	13.2	0.5	83.8	86.3	–64.7
10–14	4.4	11.3	1.7	82.6	87.0	–32.7
15–19	6.7	9.0	4.2	80.1	86.8	+11.9
20–24	8.9	6.8	8.3	76.0	84.9	+47.4
25–29	10.8	4.9	14.0	70.3	81.1	+11.0
30–34	13.0	2.7	21.7	62.6	75.7	–37.9
35–39	14.4	1.3	32.6	51.6	66.1	–107.6
40–44	14.9	0.8	42.8	41.5	56.4	–172.1
45–49	15.3	0.4	53.4	30.9	46.2	–239.5
50–54	15.5	0.2	62.7	21.6	37.1	–299.0
55–59	15.6	0.1	69.0	15.2	30.9	–339.2
60–64	15.6	0.1	73.9	10.4	26.0	–370.0
65–69	15.6	0.1	76.9	7.4	23.1	–388.9
70–74	15.7	0.1	79.5	4.7	20.4	–405.9
75–79	15.7	0.0	81.7	2.6	18.3	–419.5
80–84	15.7	0.0	83.4	0.9	16.6	–430.5
85–89	15.7	0.0	83.8	0.5	16.2	–433.1
90–94	15.7	0.0	84.3	0.0	15.7	–436.2
95–100	15.7	0.0	84.3	0.0	15.7	–436.2

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

Figure 13 (USAID "extreme" line): For a given score cut-off, the percentage of all households who are targeted, the percentage of targeted households who are poor, the percentage of poor households who are targeted, and the number of poor households who are successful targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.5	89.9	8.8	8.9:1
5–9	3.0	83.5	16.0	5.1:1
10–14	6.1	72.6	28.3	2.6:1
15–19	10.9	61.5	42.6	1.6:1
20–24	17.1	51.8	56.4	1.1:1
25–29	24.8	43.5	68.6	0.8:1
30–34	34.7	37.6	83.0	0.6:1
35–39	47.1	30.6	91.8	0.4:1
40–44	57.7	25.8	94.6	0.3:1
45–49	68.6	22.3	97.2	0.3:1
50–54	78.2	19.8	98.6	0.2:1
55–59	84.7	18.5	99.5	0.2:1
60–64	89.5	17.5	99.5	0.2:1
65–69	92.5	16.9	99.5	0.2:1
70–74	95.2	16.5	99.7	0.2:1
75–79	97.4	16.1	100.0	0.2:1
80–84	99.1	15.9	100.0	0.2:1
85–89	99.5	15.8	100.0	0.2:1
90–94	100.0	15.7	100.0	0.2:1
95–100	100.0	15.7	100.0	0.2:1

$1.25/Day 2005 PPP Poverty Line

Figure 5 ($1.25/day 2005 PPP line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	10.2
5–9	1.9
10–14	0.0
15–19	2.8
20–24	2.0
25–29	1.6
30–34	1.4
35–39	0.4
40–44	0.2
45–49	0.0
50–54	0.4
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 2005 PPP line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	157	÷	1,536	=	10.2
5–9	28	÷	1,485	=	1.9
10–14	0	÷	3,108	=	0.0
15–19	133	÷	4,763	=	2.8
20–24	123	÷	6,250	=	2.0
25–29	122	÷	7,645	=	1.6
30–34	135	÷	9,923	=	1.4
35–39	54	÷	12,349	=	0.4
40–44	19	÷	10,595	=	0.2
45–49	0	÷	10,991	=	0.0
50–54	42	÷	9,562	=	0.4
55–59	0	÷	6,484	=	0.0
60–64	0	÷	4,840	=	0.0
65–69	0	÷	2,971	=	0.0
70–74	0	÷	2,698	=	0.0
75–79	0	÷	2,184	=	0.0
80–84	0	÷	1,736	=	0.0
85–89	0	÷	398	=	0.0
90–94	0	÷	483	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 8 ($1.25/day 2005 PPP line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) from the validation sample, 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	–5.6	4.7	5.1	5.9
5–9	–9.6	6.5	6.8	7.5
10–14	–2.3	1.7	1.8	2.0
15–19	–0.8	1.1	1.3	1.7
20–24	–1.0	1.0	1.2	1.5
25–29	+1.3	0.2	0.2	0.3
30–34	+1.0	0.3	0.3	0.4
35–39	–0.4	0.4	0.4	0.6
40–44	–0.1	0.2	0.2	0.3
45–49	+0.0	0.0	0.0	0.0
50–54	+0.4	0.0	0.0	0.0
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 10 ($1.25/day 2005 PPP line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–1.0	1.4	1.4	54.4
4	–0.4	5.3	10.7	15.9
8	–0.3	4.9	6.8	9.3
16	–0.3	3.4	4.0	5.8
32	–0.2	2.0	2.7	3.5
64	–0.2	1.6	1.8	2.7
128	–0.2	1.1	1.3	1.8
256	–0.1	0.8	0.9	1.2
512	–0.2	0.6	0.7	0.9
1,024	–0.2	0.4	0.5	0.7
2,048	–0.1	0.3	0.3	0.4
4,096	–0.1	0.2	0.3	0.3
8,192	–0.2	0.1	0.2	0.2
16,384	–0.2	0.1	0.1	0.2

Figure 12 ($1.25/day 2005 PPP line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.3	0.9	1.2	97.6	97.9	–4.2
5–9	0.5	0.7	2.5	96.3	96.8	–112.6
10–14	0.6	0.6	5.6	93.3	93.8	–367.4
15–19	0.8	0.4	10.1	88.7	89.5	–751.6
20–24	1.0	0.2	16.2	82.6	83.6	–1,262.0
25–29	1.0	0.2	23.8	75.0	76.1	–1,901.2
30–34	1.1	0.1	33.7	65.2	66.2	–2,733.3
35–39	1.2	0.0	45.9	52.9	54.1	–3,765.1
40–44	1.2	0.0	56.5	42.3	43.5	–4,653.9
45–49	1.2	0.0	67.5	31.4	32.5	–5,579.2
50–54	1.2	0.0	77.0	21.8	23.0	–6,384.3
55–59	1.2	0.0	83.5	15.3	16.5	–6,930.1
60–64	1.2	0.0	88.3	10.5	11.7	–7,337.6
65–69	1.2	0.0	91.3	7.5	8.7	–7,587.7
70–74	1.2	0.0	94.0	4.8	6.0	–7,814.8
75–79	1.2	0.0	96.2	2.6	3.8	–7,998.6
80–84	1.2	0.0	97.9	0.9	2.1	–8,144.8
85–89	1.2	0.0	98.3	0.5	1.7	–8,178.3
90–94	1.2	0.0	98.8	0.0	1.2	–8,219.0
95–100	1.2	0.0	98.8	0.0	1.2	–8,219.0

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

Figure 13 ($1.25/day 2005 PPP line): For a given score cut-off, the percentage of all households who are targeted, the percentage of targeted households who are poor, the percentage of poor households who are targeted, and the number of poor households who are successful targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.5	19.4	25.1	0.2:1
5–9	3.0	16.4	41.8	0.2:1
10–14	6.1	9.4	48.7	0.1:1
15–19	10.9	7.1	65.4	0.1:1
20–24	17.1	5.6	81.2	0.1:1
25–29	24.8	4.1	85.7	0.0:1
30–34	34.7	3.0	89.0	0.0:1
35–39	47.1	2.4	96.8	0.0:1
40–44	57.7	2.1	100.0	0.0:1
45–49	68.6	1.7	100.0	0.0:1
50–54	78.2	1.5	100.0	0.0:1
55–59	84.7	1.4	100.0	0.0:1
60–64	89.5	1.3	100.0	0.0:1
65–69	92.5	1.3	100.0	0.0:1
70–74	95.2	1.2	100.0	0.0:1
75–79	97.4	1.2	100.0	0.0:1
80–84	99.1	1.2	100.0	0.0:1
85–89	99.5	1.2	100.0	0.0:1
90–94	100.0	1.2	100.0	0.0:1
95–100	100.0	1.2	100.0	0.0:1

$2.50/Day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	49.5
5–9	61.7
10–14	35.8
15–19	32.1
20–24	24.2
25–29	15.5
30–34	9.1
35–39	4.5
40–44	3.6
45–49	2.2
50–54	1.5
55–59	0.0
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 ($2.50/day 2005 PPP line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	761	÷	1,536	=	49.5
5–9	916	÷	1,485	=	61.7
10–14	1,112	÷	3,108	=	35.8
15–19	1,529	÷	4,763	=	32.1
20–24	1,510	÷	6,250	=	24.2
25–29	1,186	÷	7,645	=	15.5
30–34	905	÷	9,923	=	9.1
35–39	556	÷	12,349	=	4.5
40–44	384	÷	10,595	=	3.6
45–49	241	÷	10,991	=	2.2
50–54	144	÷	9,562	=	1.5
55–59	0	÷	6,484	=	0.0
60–64	16	÷	4,840	=	0.3
65–69	0	÷	2,971	=	0.0
70–74	0	÷	2,698	=	0.0
75–79	0	÷	2,184	=	0.0
80–84	0	÷	1,736	=	0.0
85–89	0	÷	398	=	0.0
90–94	0	÷	483	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 8 ($2.50/day 2005 PPP line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) from the validation sample, 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	–9.8	7.7	8.1	9.1
5–9	–0.4	5.4	6.4	8.0
10–14	–9.7	6.7	7.1	7.9
15–19	–10.5	6.8	7.0	8.1
20–24	–2.3	2.4	2.8	3.7
25–29	–2.0	2.0	2.2	2.9
30–34	–5.3	3.5	3.5	3.8
35–39	–2.8	1.9	2.1	2.3
40–44	+2.8	0.3	0.3	0.4
45–49	+1.0	0.4	0.5	0.6
50–54	+1.4	0.1	0.1	0.1
55–59	–0.6	0.5	0.5	0.6
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	–1.7	1.4	1.5	1.8
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 10 ($2.50/day 2005 PPP line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–2.5	50.0	58.3	78.6
4	–1.7	20.1	25.6	37.7
8	–1.5	14.3	17.7	23.1
16	–1.6	10.2	12.6	16.0
32	–1.5	7.4	8.8	11.7
64	–1.4	5.1	6.2	7.9
128	–1.4	3.5	4.1	5.7
256	–1.4	2.6	3.0	4.3
512	–1.3	1.8	2.1	2.7
1,024	–1.4	1.2	1.5	2.1
2,048	–1.3	0.9	1.1	1.4
4,096	–1.4	0.6	0.8	1.0
8,192	–1.4	0.5	0.6	0.7
16,384	–1.4	0.3	0.4	0.5

Figure 12 ($2.50/day 2005 PPP line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.0	9.7	0.5	88.8	89.8	–76.1
5–9	2.0	8.7	1.1	88.3	90.2	–53.4
10–14	3.3	7.4	2.8	86.5	89.8	–11.7
15–19	5.2	5.5	5.7	83.6	88.8	+46.7
20–24	6.8	3.8	10.3	79.0	85.9	+3.5
25–29	8.1	2.6	16.7	72.6	80.7	–56.4
30–34	9.4	1.3	25.3	64.0	73.4	–137.3
35–39	10.2	0.4	36.8	52.5	62.7	–245.0
40–44	10.4	0.3	47.3	42.1	52.5	–342.7
45–49	10.6	0.1	58.1	31.2	41.8	–444.2
50–54	10.6	0.1	67.6	21.7	32.3	–533.5
55–59	10.6	0.1	74.1	15.3	25.9	–593.8
60–64	10.6	0.1	78.9	10.4	21.0	–639.2
65–69	10.6	0.1	81.9	7.4	18.1	–667.0
70–74	10.6	0.1	84.6	4.7	15.4	–692.3
75–79	10.7	0.0	86.7	2.6	13.3	–712.2
80–84	10.7	0.0	88.4	0.9	11.6	–728.5
85–89	10.7	0.0	88.8	0.5	11.2	–732.2
90–94	10.7	0.0	89.3	0.0	10.7	–736.8
95–100	10.7	0.0	89.3	0.0	10.7	–736.8

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

Figure 13 ($2.50/day 2005 PPP line): For a given score cut-off, the percentage of all households who are targeted, the percentage of targeted households who are poor, the percentage of poor households who are targeted, and the number of poor households who are successful targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.5	65.8	9.5	1.9:1
5–9	3.0	64.7	18.3	1.8:1
10–14	6.1	53.8	30.9	1.2:1
15–19	10.9	47.8	48.7	0.9:1
20–24	17.1	39.9	64.1	0.7:1
25–29	24.8	32.6	75.7	0.5:1
30–34	34.7	27.0	87.8	0.4:1
35–39	47.1	21.7	95.9	0.3:1
40–44	57.7	18.0	97.3	0.2:1
45–49	68.6	15.4	98.9	0.2:1
50–54	78.2	13.5	99.1	0.2:1
55–59	84.7	12.5	99.5	0.1:1
60–64	89.5	11.9	99.5	0.1:1
65–69	92.5	11.5	99.5	0.1:1
70–74	95.2	11.2	99.5	0.1:1
75–79	97.4	11.0	100.0	0.1:1
80–84	99.1	10.8	100.0	0.1:1
85–89	99.5	10.7	100.0	0.1:1
90–94	100.0	10.7	100.0	0.1:1
95–100	100.0	10.7	100.0	0.1:1

$3.75/Day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	77.3
5–9	89.2
10–14	78.5
15–19	72.8
20–24	55.2
25–29	42.7
30–34	33.5
35–39	18.6
40–44	16.6
45–49	7.1
50–54	6.8
55–59	1.6
60–64	0.3
65–69	3.5
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

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

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,187	÷	1,536	=	77.3
5–9	1,325	÷	1,485	=	89.2
10–14	2,438	÷	3,108	=	78.5
15–19	3,466	÷	4,763	=	72.8
20–24	3,447	÷	6,250	=	55.2
25–29	3,261	÷	7,645	=	42.7
30–34	3,328	÷	9,923	=	33.5
35–39	2,295	÷	12,349	=	18.6
40–44	1,757	÷	10,595	=	16.6
45–49	785	÷	10,991	=	7.1
50–54	652	÷	9,562	=	6.8
55–59	104	÷	6,484	=	1.6
60–64	16	÷	4,840	=	0.3
65–69	104	÷	2,971	=	3.5
70–74	0	÷	2,698	=	0.0
75–79	0	÷	2,184	=	0.0
80–84	0	÷	1,736	=	0.0
85–89	0	÷	398	=	0.0
90–94	0	÷	483	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 8 ($3.75/day 2005 PPP line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) from the validation sample, 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	–14.0	8.4	8.7	9.2
5–9	+1.5	3.8	4.4	5.8
10–14	–3.3	3.1	3.6	4.6
15–19	+0.9	3.0	3.4	4.5
20–24	+1.6	2.9	3.3	4.6
25–29	–1.3	2.5	2.9	3.8
30–34	–7.7	5.0	5.2	5.6
35–39	–7.2	4.5	4.6	4.8
40–44	+5.0	1.3	1.5	2.0
45–49	–0.7	1.1	1.2	1.9
50–54	+1.9	0.9	1.1	1.6
55–59	–1.8	1.3	1.4	1.5
60–64	–2.4	1.7	1.8	2.0
65–69	+3.5	0.0	0.0	0.0
70–74	–0.3	0.2	0.3	0.3
75–79	–1.7	1.4	1.5	1.8
80–84	–1.0	0.8	0.9	1.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 10 ($3.75/day 2005 PPP line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–3.6	62.0	69.3	85.2
4	–1.3	28.6	35.5	49.4
8	–1.5	19.8	23.9	31.7
16	–1.6	14.3	17.0	21.7
32	–1.5	10.3	12.0	15.0
64	–1.3	6.7	8.0	11.2
128	–1.5	4.8	5.7	7.6
256	–1.4	3.5	4.1	5.4
512	–1.4	2.3	2.7	3.6
1,024	–1.4	1.7	2.1	2.7
2,048	–1.3	1.3	1.5	1.9
4,096	–1.3	0.9	1.0	1.4
8,192	–1.3	0.6	0.7	0.9
16,384	–1.3	0.5	0.5	0.7

Figure 12 ($3.75/day 2005 PPP line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.4	24.6	0.1	73.9	75.3	–88.7
5–9	2.7	23.2	0.3	73.8	76.5	–77.8
10–14	5.3	20.7	0.9	73.2	78.4	–56.1
15–19	8.7	17.2	2.1	71.9	80.6	–24.3
20–24	12.2	13.8	5.0	69.1	81.2	+12.9
25–29	15.6	10.4	9.2	64.8	80.4	+55.4
30–34	19.5	6.5	15.3	58.8	78.2	+41.2
35–39	22.6	3.3	24.4	49.6	72.2	+5.8
40–44	24.0	1.9	33.6	40.4	64.4	–29.6
45–49	25.0	1.0	43.7	30.4	55.3	–68.3
50–54	25.4	0.5	52.8	21.2	46.7	–103.4
55–59	25.7	0.3	59.0	15.0	40.7	–127.3
60–64	25.8	0.1	63.7	10.3	36.2	–145.4
65–69	25.8	0.1	66.7	7.4	33.2	–156.8
70–74	25.9	0.1	69.3	4.7	30.6	–167.1
75–79	25.9	0.0	71.5	2.6	28.5	–175.4
80–84	26.0	0.0	73.2	0.9	26.8	–181.9
85–89	26.0	0.0	73.6	0.5	26.4	–183.4
90–94	26.0	0.0	74.0	0.0	26.0	–185.2
95–100	26.0	0.0	74.0	0.0	26.0	–185.2

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

Figure 13 ($3.75/day 2005 PPP line): For a given score cut-off, the percentage of all households who are targeted, the percentage of targeted households who are poor, the percentage of poor households who are targeted, and the number of poor households who are successful targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.5	90.8	5.4	9.9:1
5–9	3.0	90.3	10.5	9.3:1
10–14	6.1	85.9	20.3	6.1:1
15–19	10.9	80.3	33.7	4.1:1
20–24	17.1	70.9	46.8	2.4:1
25–29	24.8	62.7	59.9	1.7:1
30–34	34.7	56.0	74.9	1.3:1
35–39	47.1	48.0	87.1	0.9:1
40–44	57.7	41.7	92.6	0.7:1
45–49	68.6	36.4	96.1	0.6:1
50–54	78.2	32.5	97.9	0.5:1
55–59	84.7	30.3	99.0	0.4:1
60–64	89.5	28.9	99.5	0.4:1
65–69	92.5	27.9	99.5	0.4:1
70–74	95.2	27.2	99.6	0.4:1
75–79	97.4	26.6	99.8	0.4:1
80–84	99.1	26.2	100.0	0.4:1
85–89	99.5	26.1	100.0	0.4:1
90–94	100.0	26.0	100.0	0.4:1
95–100	100.0	26.0	100.0	0.4:1

$5.00/Day 2005 PPP Poverty Line

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	97.5
10–14	92.1
15–19	85.6
20–24	78.2
25–29	68.0
30–34	58.2
35–39	45.4
40–44	36.2
45–49	22.3
50–54	15.2
55–59	6.4
60–64	2.3
65–69	9.2
70–74	6.4
75–79	3.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

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

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,536	÷	1,536	=	100.0
5–9	1,448	÷	1,485	=	97.5
10–14	2,863	÷	3,108	=	92.1
15–19	4,078	÷	4,763	=	85.6
20–24	4,890	÷	6,250	=	78.2
25–29	5,199	÷	7,645	=	68.0
30–34	5,777	÷	9,923	=	58.2
35–39	5,604	÷	12,349	=	45.4
40–44	3,835	÷	10,595	=	36.2
45–49	2,450	÷	10,991	=	22.3
50–54	1,449	÷	9,562	=	15.2
55–59	417	÷	6,484	=	6.4
60–64	112	÷	4,840	=	2.3
65–69	274	÷	2,971	=	9.2
70–74	172	÷	2,698	=	6.4
75–79	66	÷	2,184	=	3.0
80–84	0	÷	1,736	=	0.0
85–89	0	÷	398	=	0.0
90–94	0	÷	483	=	0.0
95–100	0	÷	0	=	0.0

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

Figure 8 ($5.00/day 2005 PPP line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) from the validation sample, 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	+3.8	2.1	2.6	3.3
5–9	–2.5	1.3	1.3	1.3
10–14	+4.7	2.7	3.2	4.4
15–19	–1.6	2.0	2.4	3.2
20–24	–5.2	3.6	3.8	4.2
25–29	+2.1	2.3	2.8	4.0
30–34	–11.2	6.6	6.8	7.1
35–39	–6.3	4.1	4.3	4.7
40–44	+7.0	1.9	2.3	3.1
45–49	–1.2	1.8	2.3	3.2
50–54	–0.1	1.5	1.9	2.4
55–59	–2.9	2.2	2.4	2.8
60–64	–1.9	1.5	1.7	1.9
65–69	+6.2	1.3	1.5	1.8
70–74	+6.1	0.2	0.3	0.3
75–79	+1.3	1.0	1.2	1.6
80–84	–1.0	0.8	0.9	1.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 10 ($5.00/day 2005 PPP line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–1.5	61.0	72.9	87.4
4	–0.8	33.4	38.9	49.6
8	–0.8	23.3	28.2	36.6
16	–1.0	16.7	20.1	24.6
32	–1.0	11.5	14.0	18.6
64	–0.9	8.0	9.6	13.3
128	–1.0	5.7	6.7	8.5
256	–1.1	4.0	4.8	6.3
512	–1.0	2.9	3.4	4.2
1,024	–1.1	2.0	2.4	3.2
2,048	–1.1	1.4	1.7	2.1
4,096	–1.1	1.0	1.1	1.6
8,192	–1.1	0.7	0.8	1.1
16,384	–1.0	0.5	0.6	0.8

Figure 12 ($5.00/day 2005 PPP line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.5	39.6	0.1	58.8	60.3	–92.7
5–9	3.0	38.1	0.1	58.8	61.8	–85.4
10–14	5.7	35.4	0.4	58.5	64.2	–71.1
15–19	9.9	31.2	1.0	57.9	67.8	–49.5
20–24	15.1	26.0	2.1	56.8	71.9	–21.6
25–29	20.2	20.9	4.6	54.3	74.4	+9.4
30–34	26.7	14.4	8.0	50.9	77.6	+49.4
35–39	32.8	8.3	14.3	44.6	77.4	+65.2
40–44	36.1	5.0	21.6	37.3	73.4	+47.5
45–49	38.6	2.5	30.0	28.9	67.5	+26.9
50–54	40.0	1.1	38.2	20.7	60.7	+7.1
55–59	40.6	0.5	44.1	14.8	55.5	–7.2
60–64	40.9	0.2	48.7	10.2	51.1	–18.4
65–69	41.0	0.1	51.5	7.4	48.4	–25.4
70–74	41.0	0.1	54.2	4.7	45.7	–31.9
75–79	41.0	0.0	56.3	2.6	43.6	–37.1
80–84	41.1	0.0	58.0	0.9	42.0	–41.2
85–89	41.1	0.0	58.4	0.5	41.6	–42.2
90–94	41.1	0.0	58.9	0.0	41.1	–43.3
95–100	41.1	0.0	58.9	0.0	41.1	–43.3

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

Figure 13 ($5.00/day 2005 PPP line): For a given score cut-off, the percentage of all households who are targeted, the percentage of targeted households who are poor, the percentage of poor households who are targeted, and the number of poor households who are successful targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.5	96.3	3.6	26.3:1
5–9	3.0	98.1	7.2	52.8:1
10–14	6.1	93.4	13.9	14.2:1
15–19	10.9	90.6	24.0	9.7:1
20–24	17.1	87.8	36.6	7.2:1
25–29	24.8	81.3	49.0	4.3:1
30–34	34.7	76.9	64.9	3.3:1
35–39	47.1	69.6	79.8	2.3:1
40–44	57.7	62.5	87.8	1.7:1
45–49	68.6	56.2	93.9	1.3:1
50–54	78.2	51.2	97.4	1.0:1
55–59	84.7	48.0	98.9	0.9:1
60–64	89.5	45.7	99.5	0.8:1
65–69	92.5	44.3	99.7	0.8:1
70–74	95.2	43.1	99.8	0.8:1
75–79	97.4	42.1	99.9	0.7:1
80–84	99.1	41.5	100.0	0.7:1
85–89	99.5	41.3	100.0	0.7:1
90–94	100.0	41.1	100.0	0.7:1
95–100	100.0	41.1	100.0	0.7:1

Appendix A:
Guide to Interpretation of Scorecard Indicators

The following information comes from:

Oficina Nacional de Estadística. (2006) *Manual del Entrevistador: Encuesta Nacional de Ingresos y Gastos de los Hogares (ENIGH 2006–2007)*, Departamento de Encuestas, Santo Domingo, `http://one.gob.do/enigh/IMG/pdf/Manual_del_Entrevistador_ENIGH.pdf`, retrieved April 5 2010. (the "manual")

1. <u>How many household members are 16-years-old or younger?</u>

According to p. 7 of the manual, the *household* comprises "the person or people, be they blood relatives or not, who normally live together in a specific residence, occupying either all or part of it, and who together as a group satisfy their basic necessities.

"As an exception, households heads are counted as household members as long as they maintain a link with the household, even if they have been absent for more than five months. People who have been with the household for less than five months also count as household members if they declare that they intend to remain part of the household. In general, however, people are not considered household members if they have been absent for more than five months over the course of the year.

"Domestic servants working in the residence are not considered to be household members, unless the domestics servants consider themselves to be such."

2. <u>What is highest level and grade that the female head/spouse has passed?</u>

According to pp. 72–73 of the manual:

Pre-school is the first educational level and is coordinated by the family and the community until basic education is started. Pre-school is intended for small children up to five years of age. The final year is mandatory for five-year-olds.

Grade school has two cycles. The first cycle lasts four years and covers first through fourth grades. Normally, children start grade school when they are six years old, and

they may not start unless they are at least five. The second cycle of grade school lasts four years and covers fifth through eighth grades.

High school starts with "middle school", a single course of studies followed by all students. In the second cycle, students specialize into one of three tracks: general, technical-professional, and fine arts. Students who graduate receive the title of *bachiller* in the corresponding track.

Post-secondary school/college is intended to promote scientific knowledge in a wide variety of areas. Some institutions are managed by the state (public), while others are private and are authorized by the state to provide professional education and award degrees. All colleges are organized in faculties that are in turn grouped in various disciplines by departments and by majors. Courses of study generally last 3 to 5 years, except for medicine, which can last seven years.

Post-graduate refers to education received after received the basic collage degree. This level include the master's degree and the doctorate. Courses of studies for master's degrees usually last two years. The doctorate is the degree that comes after the master's, and its course of study usually lasts two years.

3. Does any household member attend a private or semi-private school?

There is no additional information about this indicator.

4. How many household members work in a business whose main activity is agriculture, animal husbandry, hunting, fishing, mining, or quarrying?

There is no additional information about this indicator.

5. What is the main material of the roof?

According to pp. 37–38 of the manual:

"*Main material* refers to that which covers the majority of the structure.

"*Reinforced concrete* is a mixture of small stones with mortar made of sand and cement.

"*Tin* refers to corrugated metal sheets.

"*Asbestos* refers to corrugated sheets of asbestos coated with cement.

"*Yagua leaves* are derived from palm fronds and are usually found in rural areas.

"*Cane* is a material derived from palm fronds and is usually found in rural areas.

"*Other* comprises any other material that the respondent mentions and that is not found among any of the other options for roofing material.

6. What type of toilet arrangement does the household have?

There is no additional information about this indicator.

7. Does the residence have a water meter?

According to p. 41 of the manual, a "*water meter* is an instrument that records a household's usage of water."

A residence can have a water meter only if it is supplied with piped water, whether the pipe is inside or outside the residence.

8. What the the principal cooking fuel used by the household?

According to p. 53 of the manual:

"*Electricity* is the energy that comes from public networks or an electricial generator.

"*Propane* is a liquified gas derived from petroleum.

"*Charcoal* is a solid fuel derived from wood and normally used to cook food.

"*Firewood* is made from wood cut into pieces of a certain, not-very-small size.

"*Kerosene* is a liquid derivative of petroleum.

"The case of *does not cook* happens when household members eat food cooked and purchased outside the home.

"The option *other* includes all source of energy for cooking that have not been listed above, such as twigs, dry leaves, dried animal dung gathered in the fields, etc.

9. Does the household have a motorcycle, car, SUV, or pick-up?

According to p. 59 of the manual:

"*Car* refers to motor vehicles with four wheels whose main purpose is to transport people. Cars usually have room for five people.

"*SUV* refers to motor vehicles whose main purpose is to transport people but that have special features that enable them to handle different types of roads. SUVs generally have four-wheel drive.

"*Pick-up* refers to motor vehicles whose main purpose is to transport cargo and production goods. Pick-ups are considered work vehicles.

"*Motorcycles* are motorized means of transport. They have two wheels, and they can carry one or two people, unless they have a sidecar to carry an additional person.

"*Other* refers to other types of vehicles that the household owns that do not appear in the list above, including, for example, bicycles, trucks, etc."

10. Does the household have a VCR or DVD?

There is no additional information about this indicator.