Simple Poverty Scorecard® Poverty-Assessment Tool Ecuador

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A more-current scorecard than this one is in English at `SimplePovertyScorecard.com`.
Un índice más actualizado que éste en Castellano está en `SimplePovertyScorecard.com`.

Abstract

The Simple Poverty Scorecard poverty-assessment tool uses ten low-cost indicators from Ecuador's 2005/6 Living Standards Survey to estimate the likelihood that a household has consumption below a given poverty line. Field workers can collect responses in about ten minutes. The scorecard's accuracy is reported for a range of poverty lines. The scorecard is a practical way for pro-poor programs in Ecuador to measure poverty rates, to track changes in poverty rates over time, and to segment clients for differentiated services.

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Simple Poverty Scorecard® Poverty-Assessment Tool

			Name	Identifier
Interview ID:				
Interview date:		Participant:		
Country:	ECU	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	10	
	C. Two	17	
	D. One	21	
	E. None	29	
2. Do all household members ages 5 to 16 attend school?	A. No	0	
	B. No one in the age range	2	
	C. Yes	5	
3. What is the main material of the roof of the residence?	A. Tile, palm leaves, straw, or leaves	0	
	B. Tin, asbestos (*Eternit*), or other	4	
	C. Reinforced concrete/flagstone/concrete	8	
4. What type of toilet arrangement does the household have?	A. None, latrine, flush toilet and pit, Flush toilet and septic tank not inside the residence	0	
	B. Flush toilet to sewer system not inside the residence	2	
	C. Flush toilet and septic tank inside the residence	4	
	D. Flush toilet to sewer system inside the residence	7	
5. Does the household have a shower?	A. No	0	
	B. Yes	5	
6. What fuel does the household use for cooking?	A. Firewood/charcoal or other	0	
	B. Gas, electricity, or no one cooks	4	
7. Does the household have a car?	A. No	0	
	B. Yes	18	
8. Does the household have a refrigerator?	A. No	0	
	B. Yes	6	
9. How many color televisions does the household have?	A. None	0	
	B. One	4	
	C. Two	9	
	D. Three or more	14	
10. Does the household have a blender?	A. No	0	
	B. Yes	4	

Score:

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1. Introduction

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

The direct approach to poverty measurement via surveys is difficult and costly, asking households about a lengthy list of expenditure items such as "In the past two weeks, did anyone in the household buy any rice? If yes, how often do you buy rice? How much do you usually buy each time? How much does it cost? Now, then in the past two weeks, did anyone in the household buy any oatmeal? . . ."

In contrast, the indirect approach via the scorecard is simple, quick, and inexpensive. It uses 10 verifiable indicators (such as "What fuel does the household use for cooking?" or "What type of toilet arrangement does the household have?") to get a score that is highly correlated with poverty status as measured by the exhaustive survey.

The scorecard here differs from "proxy means tests" (Coady, Grosh, and Hoddinott, 2002) in that it is tailored to the capabilities and purposes not of national governments but rather of local, pro-poor organizations. The feasible poverty-

measurement options for these 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). Results from these approaches are not comparable across organizations nor across countries, they may be costly, and their accuracy is unknown.

If an organization wants to know what share of its participants are below a poverty line (say, USD1.25/day at 2005 purchase-power parity for the Millennium Development Goals, or the poorest half below the national poverty line as required of USAID microenterprise partners), or if it wants to measure movement across a poverty line (for example, to report to the Microcredit Summit Campaign), then it needs an expenditure-based, objective tool with known accuracy. While expenditure surveys are costly even for governments, many small, local organizations can implement an inexpensive scorecard that can serve for monitoring, management, and targeting.

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, not because they do not work, but because they are presented (when they are presented at all) as tables of regression coefficients incomprehensible to lay people (with cryptic indicator names such as "`HHSIZE_2`", negative values, many decimal places, and

standard errors). Thanks to the predictive-modeling phenomenon known as the "flat max" (discussed later), simple scorecards can be about accurate as complex ones.

The technical approach here is also innovative in how it associates scores with poverty likelihoods, in the extent of its accuracy tests, and in how it derives sample-size formulas. Although these techniques are simple and/or standard, they have rarely or never been applied to proxy means tests.

The scorecard is based on the 2005/6 Living Standards Survey (*Encuesta de Condiciones de Vida*) conducted by the Instituto Nacional de Estadística y Censos (INEC). 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 non-negative integers, and total scores range from 0 (most likely below a poverty line) to 100 (least likely below a poverty line). Non-specialists can collect data and tally scores on paper in the field in five to ten minutes.

The scorecard can be used to estimate three basic quantities. First, it can estimate a 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 simply the average poverty likelihood among the households in the group.

Third, the scorecard can estimate changes in the poverty rate for a group of households between two points in time. This estimate is simply the change in the average poverty likelihood of the households in the group over time.

The scorecard can also be used for targeting. To help managers choose a targeting cut-off, this paper reports several measures of targeting accuracy for a range of possible cut-offs (Figure 13):

- Percentage of all households who are targeted
- Percentage of targeted households who are below a poverty line
- Percentage of households who are below a poverty line and who are targeted
- Number of poor households targeted for each non-poor household targeted

This paper presents a single scorecard whose indicators and points are derived from household expenditure data and Ecuador's national poverty line. Scores from this scorecard are calibrated to poverty likelihoods for seven poverty lines.

The scorecard is constructed and calibrated using a sub-sample of the data from the 2005/6 ECV. Its accuracy is validated on a different sub-sample. While all three scoring estimators are unbiased when applied to the population they were derived for (that is, they match the true value on average in repeated samples from the same population from which the scorecard was 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 survey approach is unbiased by assumption.) There is

[1] For example, a nationally representative sample at a different point in time or a non-representative sub-group (Tarozzi and Deaton, 2007).

bias because scoring must assume that the future relationship between indicators and poverty will be the same as in the data used to build the scorecard.[2] Of course, this assumption—ubiquitous and inevitable in predictive modeling—holds only partly.

When applied to the validation sample for Ecuador, the absolute difference between scorecard estimates of groups' poverty rates and the true rates is +0.8 percentage points for the national line and 0.6 percentage points on average across all seven lines. These differences are due to sampling variation and not bias; the average difference would be zero if the whole 2005/6 ECV were to be repeatedly redrawn and divided into sub-samples before repeating the entire scorecard-building process.

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

Section 2 below describes data and poverty lines. Section 3 places the new scorecard here in the context of existing exercises for Ecuador. Sections 4 and 5 describe scorecard construction and offer practical guidelines for use. Sections 6 and 7 detail the estimation of households' poverty likelihoods and of groups' poverty rates at a point in time. Section 8 discusses estimating changes in poverty rates. Section 9 covers targeting. The final section is a summary.

[2] Bias may also result from changes in the quality of data collection, from imperfect adjustment of poverty lines across time or geographic regions, or from sampling variation across expenditure surveys.

2. Data and poverty lines

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

2.1 Data

The scorecard is based on data from the 2005/6 ECV.[3] 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 testing 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 household 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

[3] `http://www.inec.gov.ec/web/guest/descargas/basedatos/inv_socd/con_vid`, accessed December 26, 2008

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 count more.

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

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

If an organization serves one person per household, however, then the household-level rate is relevant. For example, if a microfinance organization serves only one person in a household, then it might prefer to report household-level poverty rates.

Based on the 2005/6 ECV, this paper reports (Figure 3) household-level poverty rates and person-level poverty rates for eight geographic regions of Ecuador. The scorecard is constructed using household-level rates, scores are calibrated to household-level poverty likelihoods, and accuracy is measured for household-level rates. This use

of household-level rates reflects the belief that they are the relevant measure for most pro-poor organizations.

Still, 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 rates, calibrate scores to person-level poverty likelihoods, and measure accuracy for person-level rates, but it has not been done here.

2.2.2 Poverty lines

The national poverty line of USD1.89 per person per day is defined as the food poverty line (the cost of 2,141 calories, that is, USD1.06) plus the average non-food expenditure for households whose food expenditure per capita is close to the food poverty line (INEC, 2007). The scorecard here is constructed using the national line.

For Ecuador as a whole, the national line implies a household-level poverty rate of 30.8 percent and a person-level poverty rate of 39.3 percent (Figure 3).

Because local pro-poor organizations may want to use different or various poverty lines, this paper calibrates scores from its single scorecard to poverty likelihoods for seven lines (figures in parentheses below are per-person, per-day poverty lines for all-Ecuador, with household-level and person-level poverty rates):

- National line (1.89, 30.8 percent, 39.3 percent)
- Food line (1.06, 9.1 percent, 13.2 percent)
- USAID "extreme" line (1.27, 13.9 percent, 19.6 percent)
- USD1.25/day 2005 PPP (0.64, 2.2 percent, 3.5 percent)
- USD2.50/day 2005 PPP (1.29, 14.7 percent, 20.5 percent)
- USD3.75/day 2005 PPP (1.93, 31.7 percent, 40.3 percent)
- USD5.00/day 2005 PPP (2.57, 46.2 percent, 55.2 percent)

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

The USD1.25/day line (2005 PPP) is derived from:

- 2005 PPP exchange rate for "individual consumption expenditure by households":[4] USD0.50 per USD1.00[5]
- Average national Consumer Price Index (CPI) during the course of the 2005/6 ECV (November 2005 to October 2006):[6] 104.92
- Average national CPI in 2005: 102.08

[4] `http://siteresources.worldbank.org/ICPINT/Resources/icp-final-tables.pdf`, accessed December 26, 2008.
[5] This means that USD1.00 in the United States buys as much as USD0.50 in Ecuador.
[6] `http://www.inec.gov.ec/c/document_library/get_file?folderId=1268555&name=DLFE-17501.xls`, accessed December 23, 2008.

Thus, the USD1.25/day 2005 PPP line for Ecuador on average between November 2005 and October 2006 is:[7]

$$(\text{2005 PPP exchange rate}) \cdot \text{USD}1.25 \cdot \left(\frac{\text{CPI}_{\text{ECV average}}}{\text{CPI}_{\text{2005 average}}} \right) =$$

$$\left(\frac{\text{USD}0.50}{\text{USD}1.00} \right) \cdot \text{USD}1.25 \cdot \left(\frac{104.92}{102.08} \right) = \text{USD}0.64.$$

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

The lines just discussed apply to all of Ecuador. These are adjusted here for regional differences in prices as reflected in the "Basic Family Basket" (Figure 14) that INEC generates for eight cities.[8] This is done using:

- L, a given all-Ecuador poverty line
- p_i, population proportions by region ($i = 1$ to 8)
- π_i, regional price deflators based on the "Basic Family Basic" for November 2008

The regional cost-of-living-adjusted poverty line L_i for region i is then:

$$L_i = \frac{L \cdot \pi_i}{\sum_{j=1}^{8} p_j \cdot \pi_j}.$$

The all-Ecuador line L is the person-weighted average of regional lines L_i, and the differences in regional lines reflect the differences in regional price deflators.

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[7] Sillers (2006) provides this formula.

[8] `http://www.inec.gov.ec/c/document_library/get_file?folderId=104043&name=DLFE-16811.xls`, accessed December 23, 2008. The eight cities are associated with provinces as described in the note to Figure 3. The measure of expenditure in the 2005/6 ECV database is not adjusted for inflation during the course of the 12-month survey. The units of the national poverty line are not documented but are here assumed to be in average nominal dollars for the 12-month survey.

3. The context of poverty-assessment tools for Ecuador

Ecuador has a unique poverty-assessment pedigree because it has served as a running example for the state-of-the-art in "poverty mapping" (World Bank, 2004; Elbers, Lanjouw, and Lanjouw, 2003 and 2000; Elbers *et al.*, 2003; Demombynes *et al.*, 2002; Hentschel *et al.*, 2000). Poverty mapping first constructs poverty-assessment tools based on indicators found in both a national expenditure survey (in Ecuador, the 1994 ECV with about 4,500 households) and a census (in Ecuador, the 1990 Population Census with about 2 million households). Poverty mapping then applies the tools to census data to estimate measures of well-being (for example, poverty rates) for smaller areas than would be possible with only data from a national expenditure survey. Finally, the estimates are summarized in "poverty maps" that show how measures of well-being vary across areas in a way that makes sense to lay people.

The gold-standard approach to poverty mapping has much in common with the approach to the scorecard in this paper in that they both:

- Build poverty-assessment tools with nationally representative expenditure survey data and then apply them to other data on groups that may not be nationally representative
- Use simple, verifiable indicators that are quick and inexpensive to collect
- Report the statistical precision of their estimates
- Have similar accuracy
- Report sample-size formulas (or equivalently, standard-error formulas)
- Provide unbiased estimates
- Estimate poverty likelihoods for individual households or persons
- Estimate poverty rates for groups as averages of individual poverty likelihoods, both at a point in time and for changes between two points in time
- Seek to be used in practice and so aim to be understood by managers and policymakers

Poverty mapping has advantages over the approach in this paper in that it:

- Has formally established theoretical properties
- Can be applied straightforwardly to common measures of well-being
- Requires less data to construct and calibrate a tool
- Uses only indicators that appear in a census

The scorecard in this paper has advantages in that it:

- Is simpler in terms of both construction and application
- Tests accuracy empirically
- Has only one scorecard per country, and only ten indicators per scorecard
- Associates poverty likelihoods with scores non-parametrically
- Reports the scorecard's indicators and points

The two central differences between the two approaches are:

- Purpose: Poverty mapping seeks to help governments design pro-poor policies, while the scorecard seeks to help small, local pro-poor organizations to manage their outreach when implementing policies
- Targeting: Poverty mapping is said to be inappropriate for targeting individual households or persons, while the scorecard supports such targeting as a legitimate, potentially useful application

The rest of this section fleshes out the comparison. Why build a scorecard when Ecuador already has excellent poverty maps? Because non-government users would benefit from a tool that they can use and because targeting can be useful.

3.1 Hentschel, Lanjouw, Lanjouw, and Poggi

Hentschel, Lanjouw, Lanjouw, and Poggi ("HLLP", 2000) follow an approach that, other than its application to poverty mapping, is similar to the approach here. In particular, they use ordinary least-squares on data from Ecuador's 1994 ECV to relate indicators to the logarithm of per-capita household expenditure, building one poverty-assessment tool for each of eight regions (metropolitan Quito, metropolitan Guayaquil, urban Litoral, rural Litoral, urban Sierra, rural Sierra, urban Amazonia, and rural Amazonia). While the tools' indicators and points are not reported, the categories include:

- Household demographics:
    - Household size
    - Age composition
    - Sex composition
- Education of each family member
- Occupation of each family member
- Quality of housing:
    - Materials
    - Size
- Access to public services:
    - Electricity
    - Water
- Principal language spoken
- Location

To account for statistical variability when estimating poverty rates, HLLP convert their estimates of the logarithm of expenditure into estimates of poverty likelihoods. Using the same data that was used to construct the tool, they test targeting efficiency[9] and find that, among households in the bottom quintile of expenditure, 60 percent are also in the bottom quintile of estimated poverty likelihood. When HLLP run the same test on data not used to construct the tool—as this paper does—they find that 51 percent of those truly in the bottom quintile are also estimated to be in the bottom quintile. The 15 percent loss in measured accuracy is close to the 17-percent loss found for a similar poverty-assessment tool for Peru (Copestake *et al.*, 2005) and highlights the importance of testing on data different from that used in tool construction. When the same test is applied to the scorecard here using data different than that used to construct and calibrate the scorecard, 64 percent of households in the bottom quintile by expenditure are also in the bottom quintile by score, so the scorecard here targets more accurately than that of HLLP.

Finally, HLLP apply their model to census data to produce a poverty map at the *cantón* level, the next level down from provinces. They compute standard errors from an analytic formula that works as long as their tool is not misspecified.[10]

[9] HLLP's test of targeting efficiency is ironic, given that they warn "against attempting to use our methodology to identify, say, individual households who are poor" (p. 158).
[10] Mathiassen (2007) also derives a formula for standard errors for this approach.

For a given sample size, it is possible to compare the estimated standard errors for estimates of groups' poverty rates for HLLP versus the scorecard here. Such a comparison is necessarily imperfect because:

- The all-Ecuador poverty rate is 35 percent for HLLP but about 47.8 percent[11] for the USD 5.00/day 2005 PPP line here (Figure 2). All else constant, this favors HLLP because it is easier to achieve low standard errors as the true poverty rate is further from 50 percent
- The databases are different, 1994 ECV for HLLP versus 2005/6 ECV here
- HLLP uses only indicators in a census, while the paper here uses some other indicators, albeit simple, quick, and verifiable ones. This makes the task more difficult for HLLP
- HLLP measure theoretical accuracy supposing that their tool is correctly specified for all small areas, whereas this paper measures empirical accuracy on data different from that used in scorecard construction. All else constant, this makes the task more difficult for the scorecard here
- HLLP measure accuracy for small areas, whereas this paper measures it for a representative sample of all Ecuador. All else constant, this makes the task more difficult for HLLP

The net effect of these factors is unknown, but if they more or less cancel out, then comparing Figure 1 in HLLP with Figure 10 for the USD 5.00/day 2005 PPP line here suggests that the approaches have about the same precision. Given that both approaches are unbiased, the choice of which one to use then hinges on non-statistical criteria such as cost and ease-of-understanding.

[11] For a conservative comparison, this is the relevant line because its poverty rate is closest to that of HLLP without being further from 50 percent than HLLP's rate.

3.2 Elbers, Lanjouw, and Lanjouw (2003 and 2000), and Demombynes *et al.* (2002)

Three papers further develop the poverty mapping approach in Ecuador. Elbers, Lanjouw, and Lanjouw (2003) summarize technical aspects; Elbers, Lanjouw, and Lanjouw (2000) explore the computation of aggregate measures of well-being derived from their tool; and Demombynes *et al.* (2002) check the approach's generality by applying it not only to Ecuador but also Madagascar and South Africa.

Like HLLP, these papers make regional poverty-assessment tools with the 1994 ECV and apply them to the 1990 Census. The tool comes from a regression on the logarithm of per-capita household expenditure. The process in Elbers, Lanjouw, and Lanjouw (2003), however, is more complex than in HLLP in that it:

- Uses generalized least squares and accounts for heteroscedasticity
- Helps control for the possibility that the true tool for sub-groups is not the same as for a larger region by including local-level characteristics as indicators
- Decomposes errors into an idiosyncratic part that depends on sample size and a model part that depends on the sampling variability of tool parameters
- Estimates standard errors that account for cluster effects and that require Monte Carlo simulation

The only tool whose indicators and points are reported is for the rural Litoral region (Elbers, Lanjouw, and Lanjouw, 2000). The 37 indicators are:

- Household demographics:
    - Age:
        - Household head
        - Spouse of head
        - Eldest child, second-eldest child, . . . seventh-eldest child
    - Sex of household head
    - Household size (and its square and cube)
    - Language spoken in the household
- Years of school for:
    - Household head
    - Spouse of head
    - Eldest child, second-eldest child, . . . seventh-eldest child
- Number of family members employed in:
    - Agriculture
    - Low-productivity non-agriculture
    - High-productivity non-agriculture
- Residence characteristics:
    - Persons per bedroom (and its square and cube)
    - Type of toilet arrangement
    - Type of sewage connection
    - Type of garbage disposal
    - Source of drinking water
    - Electricity connection
    - Telephone connection
    - Type of wall
    - Cooking fuel
    - Presence of shower
- Tenancy status of residence

As in HLLP, these papers use census data to produce a poverty map with finer granularity than the national expenditure survey alone would permit. It is again possible to compare their estimated standard errors for estimates of groups' poverty rates with those of the scorecard here, this time for the rural Litoral region. As before,

this comparison is imperfect, for reasons already discussed. If the confounding factors more or less cancel out, then comparing Table 1 in Elbers, Lanjouw, and Lanjouw (2003) with Figure 10 for the USD5.00/day 2005 PPP poverty line[12] here suggests that both tools have about the same precision.

3.3 Accuracy of estimated standard errors in small areas

The poverty-mapping work discussed above provides finer granularity for estimates of aggregate measures of well-being (such as poverty rates) while estimating standard errors and so enabling comparisons across areas that account for statistical precision. This greatly improves the practice of poverty mapping.

These standard errors are derived under the assumption that the poverty-assessment tool is the correct one, that is, that no omitted indicators carry systematic information about well-being that is not already captured in the included indicators.[13] This is a potential issue because poverty-assessment tools cannot possibly include all relevant factors; for example, expenditure may depend on area-specific factors (such

[12] This is the relevant line because its all-Ecuador household poverty rate is closest to the 51 percent in Table 1 of Elbers, Lanjouw, and Lanjouw (2003).

[13] "An important consideration is whether we can assume that the parameter estimates from the regression model estimated, say, at the regional level, apply at sub-regional levels. Throughout this exercise we implicitly assume that, within a region, the model of consumption is the same for all households irrespective of the province, county, or community in which they reside. We cannot test this assumption, and at very fine levels of disaggregation it might be less appealing" (HLLP, p. 159).

water, soil, weather, market access, and local leadership) that are not in the tool and that are not perfectly correlated with indicators that are in the tool.

Tarozzi and Deaton (2007) test whether poverty-mapping's estimates of standard errors are likely to be accurate by constructing a poverty-assessment tool from Mexican census data that includes a simple measure of expenditure. They find that standard errors are understated. Poverty-mapping's developers, however, do similar exercises with similar data for Mexico and Brazil and find that estimates of standard errors are accurate as long as the tool includes indicators of local characteristics (Elbers, Lanjouw, and Leite, 2008; Demombynes *et al.*, 2007). The debate will likely continue, and this paper cannot contribute to it because it does not use census data with household expenditure.

3.4 Can scorecards be used for targeting?

The developers of poverty mapping state that it (and by extension, the scorecard) is not appropriate for targeting. Because accuracy falls as the "small area" gets smaller, Elbers, Lanjouw, and Lanjouw (2003, p. 15) say that "it would be ill-advised to use this approach to determine the poverty of yet smaller groups or single households".

Other developers of poverty-assessment tools have echoed this interdiction. Nonetheless, this paper claims that the scorecard can be useful for targeting. The argument rests on two ideas:

- The 90-percent confidence interval for the poverty likelihood of an individual household or person often does exclude either poor or non-poor status
- Usefulness depends not on confidence intervals for a single household or person but rather on the benefits of successes and costs of mistakes when targeting is applied to a group, as well as the benefits and costs of alternatives means of targeting

3.4.1 90-percent confidence intervals do not always include both poor and non-poor status

Demombynes *et al.* (2002, p. 13) say that "any attempt to identify poor households in the census, for example, would be ill-advised because confidence bounds on household level poverty would likely encompass the entire range between [non-poor] and [poor]".[14]

But this is not the case. Consider the scorecard here applied to Ecuador's national poverty line and 100,000 samples of $n = 1$ from the validation sample. For the 3.2 percent of all households who score 0–14 (Figure 13), the 90-percent confidence interval for the poverty likelihood includes 100 percent (poor) but excludes 0 percent (non-poor). For the 56.0 percent of households who score 15–54, the 90-percent interval includes both poor and non-poor, but for the 40.8 percent of households who score 55 or

[14] Related to this, HHLP (p. 158) note that if the estimated poverty likelihood for a given household is 48 percent, then a lower-bound estimate of the standard error of that estimate is $0.49 = [0.48 \text{ x } (1 - 0.48)]^{0.5}$, implying a 90-percent confidence interval of +/– 80.3 percentage points. (This formula incorrectly assumes that scoring is always less precise than direct measurement.)

more, the 90-percent interval includes only the non-poor. In this example, the 90-percent interval does not include both poor and non-poor for 3.2 + 40.8 = 44.0 percent of households.

Of course, requiring 90-percent confidence is completely arbitrary. In practice, a lower level of accuracy might be acceptable. For example, 58.9 percent of households do not have both poor and non-poor in the 80-percent confidence interval.

3.4.2 Accuracy requirements depend on the objective

The level of confidence required depends on the objective (McCloskey, 1998). For targeting, the objective is to maximize coverage of the poor while minimizing leakage to the non-poor. As discussed in Section 9, increasing coverage inevitably means increasing leakage, so making the trade-off requires assigning values to the benefits and costs of possible targeting outcomes (Figure 11):

- *Inclusion*: Successfully targeting a household truly below a poverty line
- *Undercoverage*: Mistakenly not targeting a household truly below a poverty line
- *Leakage*: Mistakenly targeting a household truly above a poverty line
- *Exclusion*: Successfully not targeting a household truly above a poverty line

The appropriateness of a given approach to targeting depends not on the delivery of 90-percent confidence for all households but rather on whether benefits, net of costs of misclassification and implementation, exceed net benefits of alternatives. Rather than dismissing the scorecard for targeting because it is supposedly fails to meet an arbitrary accuracy standard, this paper aims to help users make their own choice.

For targeting, a strength of scorecards is that their simplicity makes them inexpensive to implement. Furthermore, their accuracy is known. Alternatives to scoring include geographic targeting (perhaps based on poverty maps), which is less expensive than scoring but also less accurate, and participatory wealth ranking, which is more expensive than scoring but probably has better (albeit unknown) accuracy.

Targeting using poverty-assessment tools is common, for example, among consumer lenders. Even though credit-risk scorecards are much less accurate than scorecards, lenders still rely on them because there is a large benefit to avoiding delinquency and because the scorecards have low costs and known accuracy (Anderson, 2007). Indeed, lenders worldwide bet large sums of their own money daily that scoring can usefully target individual households and people.

Finally, no one in practice targets only a single household or person, so what matters is accuracy for a group and a given score cut-off. For example, a local pro-poor organization could consult Figure 13 for Ecuador's national poverty line, consider how it values coverage, leakage, undercoverage, and exclusion, and decide to use the scorecard here to target households who score 39 or less. In this case, the organization could expect that about 30 percent of all Ecuadorian households would qualify and that, among those who qualify, about 71.0 percent would have per-capita expenditure below the national line. When targeting groups of 1,000 or more households, the 90-percent confidence interval around this 71.0 percent figure (not computed here) is probably small enough to be useful in practice.

4. Scorecard construction

About 110 potential indicators are initially prepared in the areas of:

- Family composition (such as household size and female headship)
- Education (such as school attendance of children)
- Housing (such as the main source of cooking fuel)
- Ownership of durable goods (such as cars and refrigerators)

Each indicator is first screened with the entropy-based "uncertainty coefficient" (Goodman and Kruskal, 1979) that measures how well it predicts poverty on its own. Figure 4 lists the indicators that were tested, ranked by uncertainty coefficient. Responses for each indicator are ordered starting with those most strongly associated with poverty.

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 blender is probably more likely to change in response to changes in poverty than is the education of the male head/spouse.

The scorecard itself is built using the national poverty line and Logit regression on the construction sub-sample (Figure 2). 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.

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

This algorithm is 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, more important, helps ensure that indicators are simple and make sense to users.

The single scorecard here applies to all of Ecuador. Evidence from India and Mexico (Schreiner, 2006a and 2005a), Sri Lanka (Narayan and Yoshida, 2005), and Jamaica (Grosh and Baker, 1995) suggests that segmenting scorecards by urban/rural does not improve accuracy much.

5. 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, 2005b). 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 max" (Hand, 2006; Baesens *et al.*, 2003; Lovie and Lovie, 1986; Kolesar and Showers, 1985; Stillwell, Hutton, 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 adopt it and use it properly. Of course, accuracy matters, but it is balanced against simplicity, ease-of-use, and "face validity". Programs are more likely to collect data, compute scores, and pay attention to the results if, in their view, scoring does not make a lot of "extra" work and if the whole process generally seems to make sense.

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

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

A field worker using the paper scorecard would:

- Record participant identifiers
- Read each question from the scorecard
- Circle the 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 filing or data entry

Of course, field workers must be trained. Quality outputs depend on quality inputs. If organizations or field workers gather their own data and 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).[15] IRIS Center (2007a) and Toohig (2007) are useful nuts-and-bolts guides for budgeting, training field workers and supervisors, logistics, sampling, interviewing, piloting, recording data, and controlling quality.

In particular, while collecting scorecard indicators is relatively easier than alternatives, it is still absolutely difficult. Training and explicit definitions of terms and concepts in the scorecard is essential. For the example of Nigeria, Onwujekwe, Hanson, and Fox-Rushby (2006) find distressingly low inter-rater and test-retest correlations for indicators as seemingly simple and obvious as whether the household owns an automobile. In contrast for Mexico, Martinelli and Parker (2007) find that errors by

[15] 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 in a spreadsheet or database at the central office.

interviewers and lies by respondents had negligible effects on targeting accuracy. For now, it is unknown whether these results are universal or country-specific.

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

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

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 downloaded to a database

The subjects to be scored can be:

- All participants (or all new participants)
- A representative sample of all participants (or of all new participants)
- All participants (or all new participants) in a representative sample of branches
- A representative sample of all participants (or of all new participants) in a representative sample of branches

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 level of confidence and a desired confidence interval.

Frequency of application can be:

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

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

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

An example set of choices were made by BRAC and ASA, two microlenders in Bangladesh (each with 7 million participants) who are applying the scorecard (Schreiner, 2006b). Their design is that loan officers in a random sample of branches will score all participants each time they visit a homestead (about once a year) as part of their standard due diligence prior to loan disbursement. Responses are recorded on paper in the field before being sent to a central office to be entered into a database. ASA's and BRAC's sampling plans cover 50,000–100,000 participants each.

6. Estimates of household poverty likelihoods

The sum of scorecard points for a household is called the *score*. For Ecuador, 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, scores of 10–14 have a poverty likelihood of 98.7 percent, and scores of 40–44 have a poverty likelihood of 42.0 percent (Figure 5).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 40–44 are associated with a poverty likelihood of 42.0 percent for the national line but 5.5 percent for the food line.[16]

6.1 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.

[16] Starting with Figure 5, most figures have seven versions, one for each poverty line. To keep them straight, they are grouped by poverty line. Single tables that pertain to all poverty lines are placed with the tables for the national line.

For the example of the national line (Figure 6), there are 3,137 (normalized) households in the calibration sub-sample with a score of 20–24, of whom 2,632 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 20–24 is then 83.9 percent, because 2,632 ÷ 3,137 = 83.9 percent.

To illustrate with the national line and a score of 40–44, there are 9,616 (normalized) households in the calibration sample, of whom 4,038 (normalized) are below the line (Figure 6). Thus, the poverty likelihood for this score is 4,038 ÷ 9,616 = 42.0 percent.

The same method is used to calibrate scores with estimated poverty likelihoods for the other 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 35–39 falls in the following ranges with probability:

- 3.2 percent below the USD 1.25/day 2005 PPP line
- 9.8 percent between the USD 1.25/day 2005 PPP and food lines
- 11.9 percent between the food and USD 2.50/day 2005 PPP lines
- 28.3 percent between the USD 2.50/day 2005 PPP and national lines
- 22.0 percent between the national and USD 5.00/day 2005 PPP lines
- 24.8 percent above the USD 5.00/day 2005 PPP line

Even though the scorecard is constructed partly based on judgment, the 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 Ecuador's 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. Non-specialists find it more intuitive to define the poverty likelihood as the share of households with a given score in the calibration sample who are below a poverty line. In the field, converting scores to poverty likelihoods requires no arithmetic at all, just a look-up table. This non-parametric calibration can also improve accuracy, especially with large calibration samples.

6.2 Accuracy of estimates of poverty likelihoods

As long as the relationship between indicators and poverty does not change and the scorecard is applied to households from the same population from which it was constructed, this calibration process produces unbiased estimates of poverty likelihoods. *Unbiased* means that in repeated samples from the same population, the average estimate matches the true poverty likelihood. The scorecard also produces unbiased

estimates of poverty rates at a point in time and of changes in poverty rates between two points in time.[17]

Of course, the relationship between indicators and poverty changes with time and across sub-groups within Ecuador's population, so the scorecard applied after October 2006 (as it must be in practice) and/or to non-nationally representative groups will generally be biased.

How accurate are estimates of poverty likelihoods? To measure, the scorecard is applied to 1,000 bootstrap samples of size $n = 16{,}384$ from the validation sub-sample (Figure 2). Bootstrapping entails:[18]

- Score each household in the validation sample
- Draw a new bootstrap sample *with replacement* from the validation sample
- For each score, compute the true poverty likelihood in the bootstrap sample, that is, the share of households with the score and 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, Figure 8 shows the average difference between estimated and true poverty likelihoods as well as confidence intervals for the differences.

[17] This follows because these estimates of groups' poverty rates are linear functions of the unbiased estimates of households' poverty likelihoods.
[18] Efron and Tibshirani, 1993.

For the national line, the average poverty likelihood across bootstrap samples for scores of 20–24 in the validation sample is too low by 4.3 percentage points (Figure 8). For scores of 25–29, the estimate is too high by 3.5 percentage points.[19]

For the validation sample, the 90-percent confidence interval for the differences for scores of 20–24 is +/–4.0 percentage points (Figure 8).[20] This means that in 900 of 1,000 bootstraps, the difference between the estimate and the true value is between –8.3 and –0.3 percentage points (because –4.3 – 4.0 = –8.3, and –4.3 + 4.0 = –0.3). In 950 of 1,000 bootstraps (95 percent), the difference is –4.3 +/–4.7 percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is –4.3 +/–6.4 percentage points.

For almost all score ranges below 50–54, Figure 8 shows differences—sometimes large ones—between estimated poverty likelihoods and true values. This is because the validation sub-sample is a single sample that—thanks to sampling variation—differs in distribution from the construction/calibration sub-samples and from Ecuador's population. For targeting, however, what matters is less the difference in all score ranges and more the difference in score ranges just above and below the targeting cut-off. This mitigates the effects of bias and sampling variation on targeting (Friedman, 1997). Section 9 below looks at targeting accuracy in detail.

[19] There are differences, in spite of 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 scorecard-building process.

[20] Confidence intervals are a standard, widely understood measure of precision.

Of course, if estimates of groups' poverty rates are to be usefully accurate, then errors for individual households must largely cancel out. As discussed later, this is generally the case.

Figure 9 (summarizing Figure 10 across poverty lines) shows that the absolute differences, when averaged across score ranges for a given poverty line, are 1.7 percentage points or less for the validation sample. The differences are due to sampling variation.

By construction, the scorecard here is unbiased. It may still, however, be *overfit* when applied after October 2006. That is, it may fit the 2005/6 ECV data so closely that it captures not only some timeless patterns but also some random patterns that, due to sampling variation, show up only in the 2005/6 ECV. Or the scorecard may be overfit in the sense that it becomes biased as the relationships between indicators and poverty change or when it is applied to non-nationally representative samples.

Overfitting can be mitigated by simplifying the scorecard and by not relying only on data but rather also considering experience, judgment, and theory. Of course, the scorecard here does this. Bootstrapping can also mitigate overfitting by reducing (but not eliminating) dependence on a single sampling instance. Combining scorecards can also help, at the cost of greater complexity.

Most errors in individual households' likelihoods, however, cancel out in the estimates of groups' poverty rates (see later sections). Furthermore, much of the differences may come from non-scorecard sources such as changes in the relationship

between indicators and poverty, sampling variation, changes in poverty lines, inconsistencies in data quality across time, and inconsistencies/imperfections in cost-of-living adjustments. These factors can be addressed only by improving data quantity and quality (which is beyond the scope of the scorecard) or by reducing overfitting (which likely has limited returns, given the scorecard's parsimony).

7. 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, 2008 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 83.9, 71.3, and 42.0 percent (national line, Figure 5). The group's estimated poverty rate is the households' average poverty likelihood of $(83.9 + 71.3 + 42.0) \div 3 = 65.7$ percent.[21]

7.1 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. For the national line, the scorecard is generally too high by about 0.8 percentage points; it estimates a poverty rate of 31.6 percent for the validation sample, but the true value is 30.8 percent (Figure 2). For all poverty lines, absolute differences for the validation sample are 1.7 percentage points or less, with an average of about 0.6 percentage points (Figure 9).[22]

[21] 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 71.3 percent. This is not the 65.7 percent found as the average of the three poverty likelihoods associated with each of the three scores.
[22] Figure 9 summarizes Figure 10 across all poverty lines.

As before, these differences are due to sampling variation in the validation sample and in the random division of the 2005/6 ECV into three sub-samples.

In terms of precision, the 90-percent confidence interval for a group's estimated poverty rate at a point in time and $n = 16{,}384$ is 0.5 percentage points or less (Figure 9). This means that in 900 of 1,000 bootstraps of this size, the difference between the estimate and the true value is within 0.5 percentage points of the average difference. 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 0.8 – 0.5 = 0.3 to 0.8 + 0.5 = 1.3 percentage points. (0.8 is the average difference, and +/–0.5 is its 90-percent confidence interval.)

7.2 Sample-size formula for estimates of poverty rates at a point in time

How many households should an organization sample if it wants to estimate their poverty rate at a point in time for a desired confidence interval and confidence level? This practical question was first addressed in Schreiner (2008a).[23]

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

With direct measurement, the poverty rate can be estimated as the number of households observed to be below the poverty line, divided by the number of all observed households. The formula for sample size n in this case is (Cochran, 1977):

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

where

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

c is the confidence interval as a proportion (for example, 0.02 for an interval of +/–2 percentage points), and

$\hat{p}$ is the expected (before measurement) proportion of households below the poverty line.

The scorecard, however, does not measure poverty directly, so this formula is not applicable. To derive a similar sample-size formula for the Ecuador scorecard, consider the scorecard applied to the validation sample. Figure 2 shows that the expected (before measurement) poverty rate $\hat{p}$ for the national line is 30.75 percent (that is, the average poverty rate in the construction and calibration sub-samples). In turn, a sample size n of 16,384 and a 90-percent confidence level correspond to a confidence interval of +/– 0.51 percentage points (Figure 10).[24] Plugging these into the direct-measurement sample-size formula (1) above gives not $n = 16{,}384$ but rather

[24] Due to rounding, Figure 10 displays 0.5, not 0.51.

$n = \left(\frac{1.64}{0.0051}\right)^2 \cdot 0.3075 \cdot (1 - 0.3075) = 22{,}020$. The ratio of the sample size for scoring (derived empirically) to the sample size for direct measurement (derived from theory) is $16{,}384 \div 22{,}020 = 0.74$.

Applying the same method to $n = 8{,}192$ (confidence interval of +/–0.74 percentage points) gives $n = \left(\frac{1.64}{0.0074}\right)^2 \cdot 0.3075 \cdot (1 - 0.3075) = 10{,}459$. This time, the ratio of the sample size using scoring to the sample size using direct measurement is $8{,}192 \div 10{,}459 = 0.78$. This ratio for $n = 8{,}192$ is close to that for $n = 16{,}384$. Indeed, applying this same procedure for all $n \geq 256$ in Figure 10 gives ratios that average to 0.73. This can be used to define a sample-size formula for the scorecard applied to the population in the validation sample:

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

where $\alpha = 0.73$ and z, c, and $\hat{p}$ are defined as in (1) above. It is this α that appears in Figure 9 as "α for sample size".

To illustrate the use of (2), suppose $c = 0.0394$ (confidence interval of +/–3.94 percentage points) and $z = 1.64$ (90-percent confidence). Then (2) gives $n = 0.73 \cdot \left(\frac{1.64}{0.0394}\right)^2 \cdot 0.3075 \cdot (1 - 0.3075) = 270$, which is close to the sample size of 256 for these parameters in Figure 10.

When the sample-size factor α is less than 1.0, it means that the scorecard is more precise than direct measurement. This occurs for all of seven poverty lines in Figure 9.

Of course, the sample-size formulas here are specific to Ecuador, its poverty lines, its poverty rates, and this scorecard. The derivation method, however, is valid for any poverty-assessment tool following the approach in this paper.

In practice after October 2006, an organization would select a poverty line (say, the national line), select a desired confidence level (say, 90 percent, or $z = 1.64$), select a desired confidence interval (say, +/–2.0 percentage points, or $c = 0.02$), make an assumption about $\hat{p}$ (perhaps based on a previous measurement such as the 30.75 percent national average for the 2005/6 ECV in Figure 2), look up α (here, 0.73 for the national line), assume that the scorecard will still work in the future and/or for non-nationally representative sub-groups,[25] and then compute the required sample size. In this illustration, $n = 0.73 \cdot \left(\frac{1.64}{0.02}\right)^2 0.3075 \cdot (1 - 0.3075) = 1{,}046$.

If the scorecard has already been applied to a sample n, then $\hat{p}$ is the scorecard's estimated poverty rate, and the confidence interval c is +/– $z \cdot \sqrt{\frac{\alpha \cdot \hat{p} \cdot (1 - \hat{p})}{n}}$.

[25] This paper reports accuracy for the scorecard applied to the validation sample, but it cannot test accuracy for later years or for other groups. Still, performance after the 1995/6 ECV will probably resemble that in the 1995/6 ECV, with some deterioration as time passes.

8. 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 2005/6 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 generate their own data and measure change through time.

8.1 Warning: Change is not impact

Scoring can estimate change. Of course, poverty could get better or worse, and scoring does not indicate what caused change. This point is often forgotten or confused, so it bears repeating: the scorecard simply estimates change, and it does not, in and of itself, indicate the reason for the change. In particular, estimating the impact of program participation requires knowing what would have happened to participants if they had not been participants (Moffitt, 1991). 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. Even

measuring simple change usually requires assuming that the population is constant over time and that program drop-outs do not differ from non-drop-outs.

8.2 Calculating estimated changes in poverty rates over time

Consider the illustration begun in the previous section. On Jan. 1, 2008, a program samples three households who score 20, 30, and 40 and so have poverty likelihoods of 83.9, 71.3, and 42.0 percent (national line, Figure 5). The group's baseline estimated poverty rate is the households' average poverty likelihood of (83.9 + 71.3 + 42.0) ÷ 3 = 65.7 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, 2009, 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 25, 35, and 45 (poverty likelihoods of 81.4, 53.2, and 34.0 percent, national line, Figure 5). Their average poverty likelihood at follow-up is now (81.4 + 53.2 + 34.0) ÷ 3 = 56.2 percent, an improvement of 65.7 – 56.2 = 9.5 percentage points.

This suggests that about one of eleven participants crossed the poverty line in 2008.[26] Among those who started below the line, about one in seven (9.4 ÷ 65.6 = 14.5 percent) ended up above the line.[27]

8.3 Accuracy for estimated change in two independent samples

With data only for 2005/6, it is not possible to measure the accuracy of scorecard estimates of changes in groups' poverty rates over time. In practice, of course, Ecuador's scorecard can still be applied to estimate change. The following sub-sections suggest approximate sample-size formula that may be used until there is additional data.

Under direct measurement, the sample-size formula for estimates of changes in poverty rates in two equal-sized independent samples is:

$$n = 2 \cdot \left(\frac{z}{c}\right)^2 \cdot \hat{p} \cdot (1 - \hat{p}), \tag{3}$$

where z, c, and $\hat{p}$ are defined as in (1). Before measurement, $\hat{p}$ is assumed equal at both baseline and follow-up. n is the sample size at both baseline and follow-up.[28]

[26] This is a net figure; some people start above the line and end below it, and vice versa.
[27] The scorecard does not reveal the reasons for this change.
[28] This means that, for a given precision and with direct measurement, estimating the change in a poverty rate between two points in time requires four times as many measurements (not twice as many) as does estimating a poverty rate at a point in time.

The method developed in the previous section can be used again to derive a sample-size formula for indirect measurement via scoring:

$$n = \alpha \cdot 2 \cdot \left(\frac{z}{c}\right)^2 \cdot \hat{p} \cdot (1 - \hat{p}) \,. \tag{4}$$

As before, α is the average across sample sizes ≥ 256 of the ratio between the empirical sample size required by scoring for a given precision and the theoretical sample size required under direct measurement.

For Peru and India (Schreiner, 2008a and 2008b), the average α across poverty lines is 1.6 and 1.2, so 1.5 may be a reasonably conservative figure for Ecuador.

To illustrate the use of (4) 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, $\alpha = 1.50$, and $\hat{p} = 0.3075$ (from Figure 2). Then the baseline sample size is $n = 1.50 \cdot 2 \cdot \left(\frac{1.64}{0.02}\right)^2 \cdot 0.3075 \cdot (1 - 0.3075) = 4{,}296$, and the follow-up sample size is also 4,296.

8.4 Accuracy for estimated change for one sample, scored twice

In general, the direct-measurement sample-size formula for this case is:[29]

$$n = \left(\frac{z}{c}\right)^2 \cdot \left[\hat{p}_{12} \cdot (1 - \hat{p}_{12}) + \hat{p}_{21} \cdot (1 - \hat{p}_{21}) + 2 \cdot \hat{p}_{12} \cdot \hat{p}_{21}\right], \tag{5}$$

where z and c are defined as in (1), $\hat{p}_{12}$ is the expected (before measurement) share of all sampled cases that move from below the poverty line to above it, and $\hat{p}_{21}$ is the expected share of all sampled cases that move from above the line to below it.

How can a user set $\hat{p}_{12}$ and $\hat{p}_{21}$? Before measurement, a reasonable assumption is that the change in the poverty rate is zero. Then $\hat{p}_{12} = \hat{p}_{21} = \hat{p}_*$ and (5) becomes:

$$n = 2 \cdot \left(\frac{z}{c}\right)^2 \hat{p}_* . \tag{6}$$

Still, $\hat{p}_*$ could be anything between 0–1, so (6) is not enough to compute sample size. The estimate of $\hat{p}_*$ must be based on data available before baseline measurement.

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

Suppose that the observed relationship between $\hat{p}_*$ and the variance of the baseline poverty rate $p_{baseline} \cdot (1 - p_{baseline})$ is—as in Peru, see Schreiner (2008a)—close to $\hat{p}_* = 0.0085 + 0.206 \cdot [p_{baseline} \cdot (1 - p_{baseline})]$. Of course, $p_{baseline}$ is not known before baseline measurement, but it is reasonable to use as its expected value a previously observed poverty rate. Given this and a poverty line, a sample-size formula for a single sample directly measured twice for Ecuador (once after October 2006 and then again later) is:

$$n = 2 \cdot \left(\frac{z}{c}\right)^2 \cdot \{0.0085 + 0.206 \cdot [p_{2006} \cdot (1 - p_{2006})]\}. \quad (7)$$

As usual, (7) is multiplied by α to get scoring's sample-size formula:

$$n = \alpha \cdot 2 \cdot \left(\frac{z}{c}\right)^2 \cdot \{0.0085 + 0.206 \cdot [p_{2004} \cdot (1 - p_{2004})]\}. \quad (8)$$

In Peru (the only other country for which there is an estimate, Schreiner, 2008a), the average α across years and poverty lines is about 1.8.

To illustrate the use of (8), 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 first be scored in 2007. The before-baseline poverty rate is 30.75 percent ($p_{2006} = 0.3075$, Figure 2), and suppose $\alpha = 1.8$. Then the baseline sample size is $n = 1.8 \cdot 2 \cdot \left(\frac{1.64}{0.02}\right)^2 \cdot \{0.0085 + 0.206 \cdot [0.3075 \cdot (1 - 0.3075)]\} =$ 1,268. Of course, the same group of 1,268 households is scored at follow-up as well.

For a given confidence level and confidence interval, sample sizes are smaller when one sample is scored twice than when there are two independent samples.

9. 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* (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).

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

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

Figure 12 shows the distribution of households by targeting outcome for the scorecard applied to the validation sample. For an example cut-off of 15–19, outcomes for the national line are:

- Inclusion: 5.2 percent are below the line and correctly targeted
- Undercoverage: 25.7 percent are below the line and mistakenly not targeted
- Leakage: 0.2 percent are above the line and mistakenly targeted
- Exclusion: 69.0 percent are above the line and correctly not targeted

Increasing the cut-off to 20–24 improves inclusion and undercoverage but worsens leakage and exclusion:

- Inclusion: 8.0 percent are below the line and correctly targeted
- Undercoverage: 22.8 percent are below the line and mistakenly not targeted
- Leakage: 0.5 percent are above the line and mistakenly targeted
- Exclusion: 68.7 percent are above the line and correctly not targeted

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

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

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

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

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

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

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

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

Figure 12 shows "Total Accuracy" for all cut-offs for the Ecuador scorecard. For the national line in the validation sample, total net benefit is greatest (81.6) for a cut-off of 35–39, with about four in five Ecuadorian 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 valued inclusion more (say, twice as much) than exclusion, it could reflect this by setting the benefit for inclusion to 2 and the benefit for exclusion to 1. Then the chosen cut-off would maximize (2 x Households correctly included) + (1 x Households correctly excluded).[30]

[30] 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 that BPAC considers accuracy both in terms of the estimated poverty rate and in terms of targeting inclusion. After normalizing by the number of people below the poverty line, the formula is:

BPAC = (Inclusion + |Undercoverage – Leakage|) x [100 ÷ (Inclusion+Undercoverage)].

As an alternative to assigning benefits and costs to targeting outcomes and then choosing a cut-off to maximize total net benefit, a program could set a cut-off to achieve a desired poverty rate among targeted households. The third column of Figure 13 ("% targeted who are poor") shows, for the Ecuador scorecard applied to the validation sample, the expected poverty rate among households who score at or below a given cut-off. For the example of the national line, targeting households who score 35–39 or less would target 29.6 percent of all Ecuadorian households and produce a poverty rate among those targeted of 71.0 percent.

Figure 13 also reports two other measures of targeting accuracy. The first is a version of coverage ("% of poor who are targeted"). For the example of the national line and a cut-off of 35–39, 68.1 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 and a cut-off of 35–39, covering 2.5 poor households means leaking to 1 non-poor household.

Although inclusion (and therefore targeting accuracy) appears in the BPAC formula, BPAC is in fact maximized (for a given poverty line and a single-step scorecard) when the difference between the estimated poverty rate and its true value is minimized, regardless of inclusion. Thus, selecting a scorecard on the basis of BPAC is equivalent to selecting on the basis of the difference between the estimated poverty rate and its true value (what IRIS calls "PIE"). It would therefore be clearer to drop the BPAC nomenclature and simply discuss directly the accuracy and precision of the estimated poverty rate.

10. Conclusion

Pro-poor programs in Ecuador can use the scorecard to segment clients for differentiated services as well as to estimate:

- The likelihood that a household has consumption below a given poverty line
- The poverty rate of a population at a point in time
- The change in the poverty rate of a population 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 in order to speed up their participants' progress out of poverty.

The scorecard is built with a sub-sample of data from the 2005/6 ECV, tested with a different sub-sample, and calibrated to seven poverty lines (national, food, USAID "extreme", USD 1.25/day 2005 PPP, USD 2.50/day 2005 PPP, USD 3.75/day 2005 PPP, and USD 5.00/day 2005 PPP).

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

When the scorecard is applied to the validation sample, the absolute difference between estimates versus true poverty rates for groups of households at a point in time is always less than 1.7 percentage points and averages—across the seven poverty lines—about 0.6 percentage points. For $n = 16{,}384$ and 90-percent confidence, the

precision of these differences is +/–0.5 percentage points or less, and for $n = 1{,}024$, precision is +/–2.1 percentage points or less.

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

Although the statistical technique is innovative, and although technical accuracy is important, the design of the scorecard here 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 10 indicators that are inexpensive to collect and that are straightforward to verify. Points are all zeros or positive integers, and scores range from 0 (most likely below a poverty line) to 100 (least likely below a poverty line). Scores are related to poverty likelihoods via simple look-up tables, and targeting cut-offs are likewise simple to apply. The design attempts to facilitate adoption by helping managers understand and trust scoring and by allowing non-specialists to generate scores quickly in the field.

In sum, the scorecard is a practical, objective way for pro-poor programs in Ecuador to monitor 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 expenditure survey.

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Figure 2: Sample sizes and household poverty rates by sub-sample and poverty line

		% with expenditure below a poverty line						
			National	USAID	International 2005 PPP			
Sub-sample	**Households**	**National**	**Food**	**'Extreme'**	**$1.25/day**	**$2.50/day**	**$3.75/day**	**$5.00/day**
All Ecuador	13,520	30.8	9.1	13.9	2.2	14.7	31.7	46.2
Construction								
Selecting indicators and weights	4,565	30.5	8.9	13.9	2.3	14.5	31.6	45.3
Calibration								
Associating scores with likelihoods	4,485	31.0	9.1	13.7	2.3	14.7	31.7	45.6
Validation								
Measuring accuracy	4,470	30.8	9.3	14.1	2.0	14.9	31.9	47.8
Change in poverty rate (percentage points)								
From construction/calibration to validation		–0.1	–0.3	–0.2	+0.4	–0.3	–0.2	–2.3

Source: 2005/6 ECV

Figure 3: Average poverty lines and poverty rates by region (household level)

	Line or rate	Poverty line (USD/person/day) and poverty rate (%)						
			National	USAID	International 2005 PPP			
		National	Food	'Extreme'	$1.25/day	$2.50/day	$3.75/day	$5.00/day
Cuenca	Line	1.99	1.12	1.39	0.68	1.35	2.03	2.70
	Rate	27.8	9.0	13.3	1.8	12.6	28.9	42.2
Machala	Line	1.83	1.03	1.34	0.62	1.24	1.87	2.49
	Rate	21.3	3.3	9.6	0.9	7.9	22.3	41.2
Guayaquil	Line	1.89	1.06	1.15	0.64	1.28	1.93	2.57
	Rate	38.8	15.5	18.1	3.2	22.3	39.2	54.3
Esmeraldas	Line	1.91	1.07	1.34	0.65	1.30	1.95	2.60
	Rate	29.2	5.9	13.2	0.6	11.9	30.1	47.0
Loja	Line	1.95	1.09	1.16	0.66	1.32	1.98	2.64
	Rate	43.3	17.4	19.7	6.2	25.0	44.4	56.5
Manta	Line	1.86	1.04	1.22	0.63	1.26	1.89	2.52
	Rate	45.0	12.8	19.6	1.3	21.2	45.8	61.4
Quito	Line	1.93	1.08	1.33	0.65	1.31	1.96	2.62
	Rate	22.6	6.2	10.6	1.8	10.1	23.5	35.5
Ambato	Line	1.77	0.99	0.99	0.60	1.20	1.80	2.40
	Rate	39.4	17.3	17.2	6.5	23.7	40.5	53.1
All Ecuador:	Line	1.89	1.06	1.27	0.64	1.29	1.93	2.57
	Rate	30.8	9.1	13.9	2.2	14.7	31.7	46.2

Cuenca includes the province of Axuay. Machala includes the province of El Oro.
Guayaquil includes the provinces of Guayas, Los Ríos, and Santa Elena. Esmeraldas includes the province of Esmeraldas.
Loja includes the provinces of Loja and Zamora-Chinchipe. Manta includes the province of Manabí.
Quito includes the provinces of Pichincha, Carchi, Imbabura, and Santo Domingo de los Tsáchilas.
Ambato includes the provinces of Tungurahua, Bolívar, Cotopaxi, Chimborazo, Morona Santiago, Napo, Pastaza, Sucumbíos, and Puerto Francisco de Orellana. Galápagos is not included anywhere.

Figure 3: Average poverty lines and poverty rates by region (person level)

	Line or rate	Poverty line (USD/person/day) and poverty rate (%)						
			National	USAID	International 2005 PPP			
		National	Food	'Extreme'	$1.25/day	$2.50/day	$3.75/day	$5.00/day
Cuenca	Line	1.99	1.12	1.39	0.68	1.35	2.03	2.70
	Rate	34.1	11.7	16.9	1.9	16.3	35.6	49.1
Machala	Line	1.83	1.03	1.34	0.62	1.24	1.87	2.49
	Rate	26.7	4.7	13.2	1.1	11.3	28.0	49.5
Guayaquil	Line	1.89	1.06	1.15	0.64	1.28	1.93	2.57
	Rate	51.1	21.9	25.3	5.1	31.1	51.3	66.3
Esmeraldas	Line	1.91	1.07	1.34	0.65	1.30	1.95	2.60
	Rate	38.3	9.1	19.1	0.7	17.3	39.2	56.5
Loja	Line	1.95	1.09	1.16	0.66	1.32	1.98	2.64
	Rate	52.0	23.3	26.0	9.6	33.1	53.0	64.4
Manta	Line	1.86	1.04	1.22	0.63	1.26	1.89	2.52
	Rate	53.7	18.4	26.9	1.7	28.7	54.6	68.9
Quito	Line	1.93	1.08	1.33	0.65	1.31	1.96	2.62
	Rate	28.8	8.2	14.4	2.7	13.7	29.8	43.1
Ambato	Line	1.77	0.99	0.99	0.60	1.20	1.80	2.40
	Rate	48.8	24.5	24.4	10.9	31.8	49.8	62.0
All Ecuador:	Line	1.89	1.06	1.26	0.64	1.28	1.93	2.57
	Rate	39.3	13.2	19.6	3.5	20.5	40.3	55.2

Cuenca includes the province of Axuay. Machala includes the province of El Oro.
Guayaquil includes the provinces of Guayas, Los Ríos, and Santa Elena. Esmeraldas includes the province of Esmeraldas.
Loja includes the provinces of Loja and Zamora-Chinchipe. Manta includes the province of Manabí.
Quito includes the provinces of Pichincha, Carchi, Imbabura, and Santo Domingo de los Tsáchilas.
Ambato includes the provinces of Tungurahua, Bolívar, Cotopaxi, Chimborazo, Morona Santiago, Napo, Pastaza, Sucumbíos, and Puerto Francisco de Orellana. Galápagos is not included anywhere.

Figure 4: Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly indicative of poverty)
1988	Does the household have a land-line telephone, car, oven of any type, computer, or a clothes-washing machine? (No; Yes)
1918	What type of toilet arrangement does the household have? (None, latrine, flush toilet and pit, flush toilet and septic tank not inside the residence; Flush toilet to sewer system not inside the residence; Flush toilet and septic tank inside the residence; Flush toilet to sewer system inside the residence)
1799	Where is the bathroom located? (None or outside the yard; Outside the residence but inside the yard; Inside the residence)
1676	What type of toilet arrangement does the household use? (None; Latrine; Flush toilet and pit; Flush toilet and septic tank; Flush toilet to sewer system)
1666	Where is the source of water located? (Outside the yard; Outside the residence but inside the yard; Inside the residence;)
1665	What is the main source of water for the household? (Other piped source, well, river, watershed, stream, or other outside of the yard; Other piped source, well, river, watershed, stream, or other in the yard or inside the house; Public network outside of the residence; Public tank or tap, water truck, or tricycle vendor; Public network inside the residence)
1646	Does the household have a car, oven of any type, computer, or a clothes-washing machine? (No; Yes)
1638	Does the household share a shower with other households? (There is no shower; Yes; No)
1612	What is the main material of the floor of the residence? (Reeds, earth, or other; Plywood or untreated planks; Cement/bricks; Parquet/treated planks/concrete slab, ceramic tile/stone/vinyl, marble/fake marble)
1595	Does the household have a shower? (No; Yes)
1537	Does the household have land-line telephone service? (No; Yes)
1513	Does the household have a land-line telephone? (No; Yes)
1453	Does the household have a television (black and white, or color)? (No; Yes)
1435	How many color televisions does the household have? (None; One; Two; Three or more)
1406	How many household members are 16-years-old or younger? (Four or more; Three; Two; One; None)
1398	How many household members are 18-years-old or younger? (Four or more; Three; Two; One; None)
1384	How many household members are 17-years-old or younger? (Four or more; Three; Two; One; None)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly indicative of poverty)
1382	How many household members are 20-years-old or younger? (Four or more; Three; Two; One; None)
1367	How many household members are 25-years-old or younger? (Five or more; Four; Three; Two; One; None)
1323	How many household members are 15-years-old or younger? (Four or more; Three; Two; One; None)
1236	Does the household have a refrigerator? (No; Yes)
1176	What is the main means of access to the residence? (Path, river, or ocean; Gravel or dirt road; Cobblestones or other; Highway/paved road)
1170	How many household members are 12-years-old or younger? (Three or more; Two; One; None)
1164	How many bathrooms do the members of this household use? (None; One; Two or more)
1163	How many household members are 14-years-old or younger? (Three or more; Two; One; None)
1134	How many televisions (be they black and white or color) does the household have? (None; One; Two; Three or more)
1132	How many household members are 13-years-old or younger? (Three or more; Two; One; None)
1123	How many household members are 11-years-old or younger? (Three or more; Two; One; None)
1080	How many household members are there? (Seven or more; Six; Five; Four; One, two, or three)
1035	If any household members work in agriculture, does the household have any cows, bulls, or calves? (No; Yes; No one works in agriculture)
1031	If any household members work in agriculture, does the household have any guinea pigs or rabbits? (No; Yes; No one works in agriculture)
1030	If any household members work in agriculture, does the household have any pigs? (No; Yes; No one works in agriculture)
1030	Does any household member work in agriculture, whether as a day laborer, owner of a commercial farm, independent family farmer, or unpaid agricultural helper? (Yes; No)
1004	Does the household have a computer? (No; Yes)
1003	Does the household have a stove? (No; Yes)
979	In what capacity does the female head/spouse work? (Non-agricultural day laborer, wage or salary employee in agriculture, agricultural day laborer, owner of a corporate farm, independent family farmer, agricultural worker in the household without pay, or agricultural worker outside of the household without pay; Not working; No female head/spouse; Self-employed, household worker without pay, worker outside of the household without pay, or domestic employee; Private employee or worker; Government employee or worker, or business owner)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly indicative of poverty)
941	Does the household have a car? (No; Yes)
903	What is the main source of water for the household? (Other piped source, well, river, watershed, or stream, or other; Public tank or tap, water truck, or tricycle vendor; Public network)
866	What is the main material of the roof of the residence? (Tile, palm leaves, straw, or leaves; Tin, asbestos (Eternit), or other; Reinforced concrete/flagstone/concrete)
829	In what capacity does the male head/spouse work? (Non-agricultural day laborer, wage or salary employee in agriculture, agricultural day laborer, owner of a corporate farm, independent family farmer, agricultural worker in the household without pay, or agricultural worker outside of the household without pay; Domestic worker; Not working; Self-employed, household worker without pay, worker outside of the household without pay; No male head/spouse; Private employee or worker; Government employee or worker, or business owner)
812	Does the household have a blender? (No; Yes)
809	How many household members have an activated cellular telephone? (None; One; Two; Three or more)
801	In the past 12 months, did any household members own land, rent land, sharecrop land or give use rights to land used for agricultural purposes (lots, fields, or pastures), or did they rent-in land or sharecrop-in land, or harvest or receive any agricultural products from land it owns, rents, sharecrops, sold, or has use-rights to, or raise any farm animals such as chickens, turkeys, guinea pigs, rabbits, pigs, lambs, cattle, etc. in the farm or the yard, even if not close to the house? (Yes; No)
779	What is the type of residence? (Emergency housing, rural house, shack, shanty, hut, other; Detached house; Rented rooms; Apartment)
767	Does the household have a clothes washing machine? (No; Yes)
749	Do all household members ages 5 to 16 attend school? (No; No one in the age range; Yes)
736	Do all household members ages 5 to 17 attend school? (No; No one in the age range; Yes)
735	Does the household have a mixer? (No; Yes)
719	Does the household have a Betamax/VHS/DVD/VCD? (No; Yes)
718	Does the household have an iron? (No; Yes)
707	Does the household have an oven of any type? (No; Yes)
706	Do all household members ages 5 to 18 attend school? (No; No one in the age range; Yes)
678	Does the household have a waffle iron or sandwich maker? (No; Yes)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly indicative of poverty)
674	What is the main material of the walls of the residence? (Adobe/mud, wood, wattle and daub, reeds, or other; Reinforced concrete, cinder blocks/bricks, asbestos, or cement (Fibrolit))
662	Do all household members ages 5 to 20 attend school? (No; No one in the age range; Yes)/
646	Do all household members ages 5 to 15 attend school? (No; No one in the age range; Yes)
645	Do all household members ages 5 to 14 attend school? (No; No one in the age range; Yes)
626	How many household members are 4-years-old or younger? (Two or more; One; None)
624	What does the household use for cooking? (Firewood/charcoal or other; Gas, electricity, or no one cooks)
590	Do all household members ages 5 to 13 attend school? (No; No one in the age range; Yes)
588	Do all household members ages 5 to 12 attend school? (No; No one in the age range; Yes)
558	Does the household have a stereo system? (No; Yes)
545	Do all household members ages 5 to 11 attend school? (No; in the age range; Yes)
527	Do any household members work as day laborers, whether in agriculture or non-agriculture? (Yes; No)
510	Does the male head/spouse know how to read and write? (No; Yes; No male head/spouse)
507	In the past two weeks, did the household have enough food to feed all household members? (No; Yes)
504	Are any household members independent family farmers? (Yes; No)
500	Does the household have a hotplate? (Yes; No)
488	Does any household member work as an agricultural day laborer? (Yes; No)
444	In his own estimation, what is the race/ethnicity of the male head/spouse? (Native; Afro-Ecuatorian or biracial; Mestizo; Caucasian or other; No male head/spouse)
435	Do all household members ages 5 to 25 attend school? (No; in the age range; Yes)
411	What sort of formal title do the household members hold for this residence? (None; Adverse possession or other document; Title in process of being registered or contract for sale; Residence is not owned; Registered title)
399	How many rooms does the household use, not counting kitchens, bathrooms, garages, or rooms used only for business? (One; Two; Three; Four; Five or more)
397	Do any household members own land, rent-out land, sharecrop-out land, or give usufruct rights to land for agricultural purposes (lots, fields, or pastures)? (Yes; No)
388	Does the household have cable? (No; Yes)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly indicative of poverty)
385	In the past two weeks, did the household have difficulty or problems with covering expenses for food? (Yes; No)
348	For the current school year, are any household members enrolled in a private school? (No; Yes)
306	What is the main source of lighting used by the household? (Solar panels, candles/oil lamps/gas lamps, or none; Public electric company or private electrical generator)
294	Does anyone in the household speak a native language? (Yes; No)
285	Does anyone in the household consider themselves to be native? (Yes; No)
283	How many rooms does the household use only for sleeping? (None; One; Two; Three; Four or more)
281	Does anyone in the household consider themselves indigenous, black, or biracial? (Yes; No)
266	Does the female head/spouse know how to read and write? (No; No female head/spouse; Yes)
265	Does the household have a typewriter? (No; Yes)
257	In her own estimation, what is the race/ethnicity of the female head/spouse? (Native; Afro-Ecuatorian or biracial; No female head/spouse; Mestizo; Caucasian or other)
245	Do any household members work as a wage or salary employees, whether for the government, private firms, or in agriculture? (No; Yes)
238	What is the current marital status of the male head/spouse? (Cohabiting; Separated or widowed; Married or never-married; Divorced or no male head/spouse)
213	What is the tenancy status of the household in its residence? (Received as a gift or in return for service, or other; Owned free-and-clear; Rented, pre-paid or pre-rented, or owned with an outstanding mortgage loan)
211	What is the current marital status of the female head/spouse? (Cohabiting; Widowed or no female head/spouse; Married; Never-married, separated, or divorced)
191	Where do the members of this household normally cook? (In a room also used for sleeping or in the yard, hallway, or other; In the living or dining room room; In a room used only for cooking, or no one cooks)
190	Does the household have a bicycle, motorcycle, or car? (No; Yes)
163	Does the household have a fan? (No; Yes)
146	Does the household have non-agricultural land? (No; Yes)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly indicative of poverty)
134	Does anyone in the household consider themselves to be mestizo? (No; Yes)
130	Do any household members work as business owners of agricultural or non-agricultural firms or are otherwise self-employed? (No; Yes)
126	In the past 12 months, did any family member own a business, enterprise, store, or factory or provide some service as an independent professional, business owner, or self-employed person (taxi driver, hairdresser, tailor, medical doctor, lawyer, etc.? (No; Yes)
101	How old is the male head/spouse? (21 or younger; 22 to 37; 61 or older; 38 to 46; 47 to 60; No male head/spouse)
93	Does the household have a sewing machine? (No; Yes)
85	In this household, are there rooms used only for family businesses? (Yes; No)
74	Do any household members work as non-agricultural day laborers? (Yes; No)
64	Does the household have a black and white television? (Yes; No)
58	What is the structure of household headship? (Both male and female heads/spouses; Male head/spouse only; Female head/spouse only)
55	Is anyone in the household disabled or handicapped? (Yes; No)
44	How many houses or apartments does the household own? (One; None; Two or more)
34	Does the household have a radio/tape recorder? (No; Yes)
33	How old is the female head/spouse? (72 or more; 24 to 40; No female head/spouse; 41 to 55; 23 or less; 56 to 71)
33	Does anyone in the household consider themselves to be black or biracial? (Yes; No)
20	Do any household members work as domestic employees? (Yes; No)
10	Does this household share any bathrooms with other households? (Yes; No)

Source: 2005/6 ECV and the national poverty line.

National Poverty Line Tables

(and tables pertaining to all seven poverty lines)

Figure 5 (National poverty 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	98.6
10–14	98.7
15–19	96.6
20–24	83.9
25–29	81.4
30–34	71.3
35–39	53.2
40–44	42.0
45–49	34.0
50–54	15.8
55–59	10.6
60–64	4.8
65–69	0.9
70–74	0.0
75–79	0.7
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.

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

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	750	÷	750	=	100.0
5–9	997	÷	1,011	=	98.6
10–14	1,447	÷	1,467	=	98.7
15–19	2,065	÷	2,136	=	96.6
20–24	2,632	÷	3,137	=	83.9
25–29	3,367	÷	4,136	=	81.4
30–34	4,607	÷	6,458	=	71.3
35–39	5,580	÷	10,481	=	53.2
40–44	4,038	÷	9,616	=	42.0
45–49	3,535	÷	10,413	=	34.0
50–54	1,514	÷	9,572	=	15.8
55–59	786	÷	7,437	=	10.6
60–64	414	÷	8,565	=	4.8
65–69	75	÷	8,579	=	0.9
70–74	0	÷	3,824	=	0.0
75–79	24	÷	3,371	=	0.7
80–84	0	÷	3,269	=	0.0
85–89	0	÷	3,207	=	0.0
90–94	0	÷	2,003	=	0.0
95–100	0	÷	567	=	0.0

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.
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 <Food	=>Food and <$2.50/day	=>$2.50/day and <National	=>National and <$5.00/day	=>$5.00/day
Score	<USD0.64	=>USD0.64 and <USD1.06	=>USD1.06 and <USD1.27	=>USD1.27 and <USD1.89	=>USD1.89 and <USD2.57	=>USD2.57
0–4	62.9	32.4	1.4	3.3	0.0	0.0
5–9	25.2	43.7	12.6	17.1	1.4	0.0
10–14	17.0	44.0	21.3	16.4	1.3	0.0
15–19	13.0	37.9	17.3	28.4	2.9	0.5
20–24	7.6	26.0	23.8	26.6	12.1	4.0
25–29	4.7	21.2	18.2	37.3	16.9	1.7
30–34	3.7	18.2	13.5	36.0	20.2	8.5
35–39	3.2	9.8	11.9	28.3	22.0	24.8
40–44	0.4	5.1	6.6	29.9	28.6	29.5
45–49	0.1	1.0	5.8	27.1	25.0	41.1
50–54	0.0	1.1	1.5	13.2	20.3	63.9
55–59	0.0	1.2	0.0	9.3	17.5	71.9
60–64	0.0	0.0	0.7	4.1	10.7	84.5
65–69	0.0	0.0	0.0	0.9	5.1	94.1
70–74	0.0	0.0	0.0	0.0	3.5	96.6
75–79	0.0	0.0	0.0	0.7	0.6	98.7
80–84	0.0	0.0	0.0	0.0	0.4	99.6
85–89	0.0	0.0	0.0	0.0	0.0	100.0
90–94	0.0	0.0	0.0	0.0	0.0	100.0
95–100	0.0	0.0	0.0	0.0	0.0	100.0

Note: All poverty likelihoods in percentage units.
The USAID 'extreme' line and the $3.75/day 2005 PPP line are omitted because they are very close to the $2.50/day 2005 PPP line and the national line.

Figure 8 (National poverty 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

	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	–0.5	1.2	1.4	2.0
10–14	+0.5	1.9	2.2	2.7
15–19	+2.7	3.2	3.8	4.7
20–24	–4.3	4.0	4.7	6.4
25–29	+3.5	4.3	5.1	6.7
30–34	+2.4	3.9	4.7	6.0
35–39	+4.2	3.2	3.7	4.7
40–44	–4.6	4.0	4.2	4.8
45–49	+6.3	2.8	3.4	4.1
50–54	–0.1	2.3	2.8	3.4
55–59	+0.9	2.3	2.7	3.8
60–64	–0.1	1.6	2.0	2.6
65–69	–1.0	0.9	1.1	1.5
70–74	–1.1	1.1	1.2	1.4
75–79	+0.6	0.2	0.2	0.3
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 9 (All poverty lines): Differences, precision of differences, and sample-size α 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			
	National	Food	'Extreme'	$1.25/day	$2.50/day	$3.75/day	$5.00/day
Estimate minus true value	+0.8	+0.1	–0.6	+0.6	+0.2	+0.4	–1.7
Precision of difference	0.5	0.3	0.4	0.1	0.4	0.5	0.5
α for sample size	0.73	0.75	0.82	0.47	0.75	0.75	0.70

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 poverty 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 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+1.6	57.6	77.8	85.4
4	+0.3	32.6	39.4	48.9
8	–0.1	22.8	27.0	36.0
16	+0.8	15.7	19.5	25.4
32	+0.9	11.4	13.7	18.6
64	+0.9	8.1	9.6	12.3
128	+0.8	5.6	6.3	8.3
256	+0.8	3.9	4.7	6.2
512	+0.8	2.9	3.4	4.4
1,024	+0.8	2.0	2.4	3.0
2,048	+0.8	1.5	1.7	2.3
4,096	+0.8	1.0	1.2	1.5
8,192	+0.8	0.7	0.9	1.1
16,384	+0.8	0.5	0.6	0.8

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

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

Figure 12 (National poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to 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	0.8	30.1	0.0	69.2	69.9	–95.1
5–9	1.7	29.1	0.0	69.1	70.9	–88.6
10–14	3.2	27.7	0.1	69.1	72.3	–79.2
15–19	5.2	25.7	0.2	69.0	74.1	–65.9
20–24	8.0	22.8	0.5	68.7	76.7	–46.4
25–29	11.3	19.6	1.4	67.8	79.1	–22.5
30–34	15.7	15.1	3.4	65.8	81.5	+13.0
35–39	21.0	9.8	8.6	60.6	81.6	+64.0
40–44	25.3	5.6	13.9	55.2	80.5	+54.8
45–49	28.1	2.8	21.5	47.6	75.7	+30.2
50–54	29.6	1.3	29.6	39.6	69.1	+4.0
55–59	30.2	0.6	36.4	32.8	63.0	–17.9
60–64	30.6	0.2	44.6	24.6	55.2	–44.5
65–69	30.8	0.1	53.0	16.2	47.0	–71.8
70–74	30.8	0.0	56.8	12.4	43.2	–84.1
75–79	30.8	0.0	60.1	9.0	39.9	–94.9
80–84	30.8	0.0	63.4	5.8	36.6	–105.5
85–89	30.8	0.0	66.6	2.6	33.4	–115.9
90–94	30.8	0.0	68.6	0.6	31.4	–122.4
95–100	30.8	0.0	69.2	0.0	30.8	–124.3

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

Figure 13 (National poverty line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), for the scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.8	100.0	2.4	Only poor targeted
5–9	1.8	99.2	5.7	125.5:1
10–14	3.2	98.4	10.3	60.3:1
15–19	5.4	96.3	16.7	25.7:1
20–24	8.5	94.5	26.0	17.0:1
25–29	12.6	89.2	36.5	8.2:1
30–34	19.1	82.4	51.0	4.7:1
35–39	29.6	71.0	68.1	2.5:1
40–44	39.2	64.4	81.9	1.8:1
45–49	49.6	56.6	91.0	1.3:1
50–54	59.2	50.0	95.9	1.0:1
55–59	66.6	45.4	98.1	0.8:1
60–64	75.2	40.7	99.3	0.7:1
65–69	83.8	36.7	99.8	0.6:1
70–74	87.6	35.2	100.0	0.5:1
75–79	91.0	33.9	100.0	0.5:1
80–84	94.2	32.7	100.0	0.5:1
85–89	97.4	31.7	100.0	0.5:1
90–94	99.4	31.0	100.0	0.4:1
95–100	100.0	30.8	100.0	0.4:1

Figure 14: Price deflators as of November 2008 by city for the "Basic Family Basket" of goods

City	Deflator
Cuenca	527.52
Machala	485.55
Guayaquil	507.12
Esmeraldas	501.08
Loja	515.72
Manta	492.28
Quito	510.71
Ambato	468.76

Source:
http://www.inec.gov.ec/c/document_library/get_file?folderId=16147&name=DLFE-20403.pdf

National Food Poverty Line Tables

Figure 5 (National food line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	95.3
5–9	68.9
10–14	61.0
15–19	50.9
20–24	33.6
25–29	25.9
30–34	21.9
35–39	13.1
40–44	5.5
45–49	1.1
50–54	1.1
55–59	1.2
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

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.

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

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	715	÷	750	=	95.3
5–9	697	÷	1,011	=	68.9
10–14	895	÷	1,467	=	61.0
15–19	1,088	÷	2,136	=	50.9
20–24	1,054	÷	3,137	=	33.6
25–29	1,070	÷	4,136	=	25.9
30–34	1,412	÷	6,458	=	21.9
35–39	1,368	÷	10,481	=	13.1
40–44	530	÷	9,616	=	5.5
45–49	112	÷	10,413	=	1.1
50–54	109	÷	9,572	=	1.1
55–59	91	÷	7,437	=	1.2
60–64	0	÷	8,565	=	0.0
65–69	0	÷	8,579	=	0.0
70–74	0	÷	3,824	=	0.0
75–79	0	÷	3,371	=	0.0
80–84	0	÷	3,269	=	0.0
85–89	0	÷	3,207	=	0.0
90–94	0	÷	2,003	=	0.0
95–100	0	÷	567	=	0.0

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.
Number of all households normalized to sum to 100,000.

Figure 8 (National food 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

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+2.5	6.3	7.4	8.7
5–9	+0.6	10.9	12.4	16.8
10–14	–1.7	8.7	10.2	13.5
15–19	–2.9	6.8	8.3	11.1
20–24	–6.4	5.9	6.4	8.2
25–29	+3.3	4.2	5.2	7.4
30–34	+9.3	2.7	3.3	4.3
35–39	+2.5	1.9	2.2	3.0
40–44	–3.5	2.8	3.0	3.5
45–49	–1.6	1.2	1.4	1.6
50–54	–0.7	0.9	1.0	1.3
55–59	+0.2	0.8	0.9	1.2
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 (National food 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 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.6	46.1	62.4	83.9
4	+0.3	20.4	24.0	35.0
8	+0.2	13.9	16.6	22.9
16	+0.1	9.4	11.4	16.4
32	+0.2	7.1	8.3	11.4
64	+0.1	4.7	5.9	8.1
128	+0.1	3.5	4.1	5.4
256	+0.1	2.6	3.1	4.0
512	+0.1	1.8	2.2	2.8
1,024	+0.1	1.3	1.6	2.1
2,048	+0.1	0.9	1.1	1.5
4,096	+0.1	0.6	0.8	1.0
8,192	+0.1	0.4	0.5	0.7
16,384	+0.1	0.3	0.4	0.5

Figure 12 (National food line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to 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	0.7	8.6	0.1	90.6	91.3	–84.4
5–9	1.4	7.9	0.4	90.3	91.7	–66.1
10–14	2.3	7.0	0.9	89.8	92.1	–40.2
15–19	3.5	5.8	1.8	88.9	92.4	–4.4
20–24	4.9	4.4	3.6	87.1	91.9	+43.7
25–29	5.9	3.4	6.8	83.9	89.8	+27.2
30–34	6.8	2.5	12.3	78.4	85.3	–31.8
35–39	8.1	1.3	21.5	69.2	77.2	–131.4
40–44	8.8	0.5	30.4	60.3	69.1	–226.8
45–49	9.1	0.2	40.5	50.2	59.3	–335.3
50–54	9.3	0.1	49.9	40.8	50.0	–436.6
55–59	9.3	0.0	57.3	33.4	42.7	–516.0
60–64	9.3	0.0	65.9	24.8	34.1	–608.1
65–69	9.3	0.0	74.5	16.2	25.5	–700.3
70–74	9.3	0.0	78.3	12.4	21.7	–741.4
75–79	9.3	0.0	81.6	9.0	18.4	–777.6
80–84	9.3	0.0	84.9	5.8	15.1	–812.8
85–89	9.3	0.0	88.1	2.6	11.9	–847.2
90–94	9.3	0.0	90.1	0.6	9.9	–868.8
95–100	9.3	0.0	90.7	0.0	9.3	–874.9

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

Figure 13 (National food line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), for the scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.8	93.3	7.5	13.9:1
5–9	1.8	79.3	15.0	3.8:1
10–14	3.2	72.4	25.1	2.6:1
15–19	5.4	65.9	38.0	1.9:1
20–24	8.5	57.2	52.3	1.3:1
25–29	12.6	46.4	63.1	0.9:1
30–34	19.1	35.8	73.5	0.6:1
35–39	29.6	27.2	86.6	0.4:1
40–44	39.2	22.4	94.5	0.3:1
45–49	49.6	18.4	97.9	0.2:1
50–54	59.2	15.6	99.4	0.2:1
55–59	66.6	14.0	100.0	0.2:1
60–64	75.2	12.4	100.0	0.1:1
65–69	83.8	11.1	100.0	0.1:1
70–74	87.6	10.6	100.0	0.1:1
75–79	91.0	10.2	100.0	0.1:1
80–84	94.2	9.9	100.0	0.1:1
85–89	97.4	9.5	100.0	0.1:1
90–94	99.4	9.4	100.0	0.1:1
95–100	100.0	9.3	100.0	0.1:1

USAID "Extreme" Poverty Line Tables

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	96.7
5–9	78.2
10–14	72.9
15–19	62.4
20–24	54.4
25–29	41.2
30–34	32.3
35–39	23.8
40–44	11.2
45–49	6.3
50–54	2.4
55–59	1.7
60–64	0.6
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Surveyed cases weighted to represent Ecuador's households.

Based on the 2005/6 ECV.

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	726	÷	750	=	96.7
5–9	790	÷	1,011	=	78.2
10–14	1,070	÷	1,467	=	72.9
15–19	1,333	÷	2,136	=	62.4
20–24	1,705	÷	3,137	=	54.4
25–29	1,702	÷	4,136	=	41.2
30–34	2,083	÷	6,458	=	32.3
35–39	2,496	÷	10,481	=	23.8
40–44	1,076	÷	9,616	=	11.2
45–49	652	÷	10,413	=	6.3
50–54	231	÷	9,572	=	2.4
55–59	125	÷	7,437	=	1.7
60–64	49	÷	8,565	=	0.6
65–69	0	÷	8,579	=	0.0
70–74	0	÷	3,824	=	0.0
75–79	0	÷	3,371	=	0.0
80–84	0	÷	3,269	=	0.0
85–89	0	÷	3,207	=	0.0
90–94	0	÷	2,003	=	0.0
95–100	0	÷	567	=	0.0

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.
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

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	–0.9	2.6	2.9	3.6
5–9	+8.4	10.7	12.7	15.6
10–14	+3.3	8.2	9.6	11.9
15–19	–4.7	6.3	7.6	9.9
20–24	–2.1	5.8	6.7	8.8
25–29	–2.0	5.0	6.1	8.1
30–34	–0.4	4.2	4.9	6.6
35–39	+4.3	2.7	3.0	4.0
40–44	–6.1	4.4	4.7	5.1
45–49	–1.3	1.6	1.9	2.5
50–54	–1.8	1.5	1.7	2.0
55–59	+0.6	0.8	0.9	1.2
60–64	+0.6	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	–0.9	1.0	1.1	1.3
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 (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 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+0.9	54.5	68.4	87.9
4	–0.4	25.7	31.6	42.5
8	–0.3	18.2	22.7	29.5
16	–0.1	12.5	15.2	19.7
32	–0.4	9.0	10.8	14.5
64	–0.5	6.1	7.3	9.8
128	–0.5	4.4	5.2	7.0
256	–0.6	3.2	3.9	5.1
512	–0.6	2.3	2.7	3.6
1,024	–0.6	1.6	1.8	2.4
2,048	–0.6	1.1	1.3	1.8
4,096	–0.6	0.8	0.9	1.2
8,192	–0.6	0.6	0.7	0.9
16,384	–0.6	0.4	0.5	0.6

Figure 12 (USAID "extreme" line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to 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	0.7	13.3	0.0	85.9	86.6	–89.6
5–9	1.4	12.6	0.3	85.6	87.0	–77.2
10–14	2.4	11.6	0.8	85.1	87.6	–59.7
15–19	3.8	10.2	1.5	84.4	88.2	–34.6
20–24	5.6	8.4	2.9	83.1	88.7	+0.4
25–29	7.3	6.7	5.3	80.6	87.9	+41.9
30–34	9.3	4.7	9.8	76.2	85.5	+30.5
35–39	11.4	2.7	18.2	67.8	79.2	–29.2
40–44	12.8	1.3	26.4	59.6	72.4	–87.5
45–49	13.6	0.5	36.0	49.9	63.5	–156.0
50–54	14.0	0.1	45.2	40.7	54.7	–221.4
55–59	14.0	0.0	52.6	33.4	47.4	–273.7
60–64	14.0	0.0	61.1	24.8	38.8	–334.6
65–69	14.0	0.0	69.7	16.2	30.2	–395.6
70–74	14.1	0.0	73.5	12.4	26.5	–422.5
75–79	14.1	0.0	76.9	9.0	23.1	–446.5
80–84	14.1	0.0	80.2	5.8	19.8	–469.7
85–89	14.1	0.0	83.4	2.6	16.6	–492.5
90–94	14.1	0.0	85.4	0.6	14.6	–506.8
95–100	14.1	0.0	85.9	0.0	14.1	–510.8

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 (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), for the scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.8	95.8	5.1	23.0:1
5–9	1.8	81.8	10.2	4.5:1
10–14	3.2	75.8	17.4	3.1:1
15–19	5.4	71.5	27.3	2.5:1
20–24	8.5	66.2	40.0	2.0:1
25–29	12.6	57.9	52.0	1.4:1
30–34	19.1	48.8	66.3	1.0:1
35–39	29.6	38.5	81.0	0.6:1
40–44	39.2	32.7	91.1	0.5:1
45–49	49.6	27.4	96.6	0.4:1
50–54	59.2	23.6	99.3	0.3:1
55–59	66.6	21.1	99.8	0.3:1
60–64	75.2	18.7	99.8	0.2:1
65–69	83.8	16.8	99.8	0.2:1
70–74	87.6	16.1	100.0	0.2:1
75–79	91.0	15.5	100.0	0.2:1
80–84	94.2	14.9	100.0	0.2:1
85–89	97.4	14.4	100.0	0.2:1
90–94	99.4	14.1	100.0	0.2:1
95–100	100.0	14.1	100.0	0.2:1

USD1.25/Day 2005 PPP Poverty Line Tables

Figure 5 (USD1.25/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	62.9
5–9	25.2
10–14	17.0
15–19	13.0
20–24	7.6
25–29	4.7
30–34	3.7
35–39	3.2
40–44	0.4
45–49	0.1
50–54	0.0
55–59	0.0
60–64	0.0
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.

Figure 6 (USD1.25/day line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	472	÷	750	=	62.9
5–9	255	÷	1,011	=	25.2
10–14	250	÷	1,467	=	17.0
15–19	278	÷	2,136	=	13.0
20–24	239	÷	3,137	=	7.6
25–29	195	÷	4,136	=	4.7
30–34	240	÷	6,458	=	3.7
35–39	340	÷	10,481	=	3.2
40–44	40	÷	9,616	=	0.4
45–49	7	÷	10,413	=	0.1
50–54	0	÷	9,572	=	0.0
55–59	0	÷	7,437	=	0.0
60–64	0	÷	8,565	=	0.0
65–69	0	÷	8,579	=	0.0
70–74	0	÷	3,824	=	0.0
75–79	0	÷	3,371	=	0.0
80–84	0	÷	3,269	=	0.0
85–89	0	÷	3,207	=	0.0
90–94	0	÷	2,003	=	0.0
95–100	0	÷	567	=	0.0

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.
Number of all households normalized to sum to 100,000.

Figure 8 (USD1.25/day 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

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Score	**Diff.**	**90-percent**	**95-percent**	**99-percent**
0–4	+18.5	11.9	13.9	18.0
5–9	–8.6	10.9	12.8	16.4
10–14	+2.5	5.7	6.8	8.8
15–19	+2.7	4.2	4.8	6.4
20–24	+2.2	2.2	2.5	3.8
25–29	+3.6	0.7	0.8	1.1
30–34	+1.2	1.4	1.7	2.1
35–39	+2.7	0.3	0.3	0.4
40–44	+0.4	0.1	0.1	0.1
45–49	–0.7	0.7	0.7	0.9
50–54	+0.0	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 (USD1.25/day 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 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+1.2	3.8	8.5	56.1
4	+0.6	6.2	10.3	23.7
8	+0.5	4.5	8.0	14.2
16	+0.5	4.3	6.0	9.1
32	+0.6	3.1	3.8	5.7
64	+0.6	2.1	2.7	3.9
128	+0.6	1.4	1.7	2.3
256	+0.6	1.1	1.3	1.8
512	+0.6	0.7	0.9	1.2
1,024	+0.6	0.5	0.6	0.8
2,048	+0.6	0.4	0.4	0.6
4,096	+0.6	0.3	0.3	0.4
8,192	+0.6	0.2	0.2	0.3
16,384	+0.6	0.1	0.2	0.2

Figure 12 (USD1.25/day line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to 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	0.4	1.6	0.4	97.7	98.1	–42.1
5–9	0.7	1.3	1.0	97.0	97.7	+25.9
10–14	1.0	1.0	2.3	95.8	96.8	–14.3
15–19	1.2	0.7	4.1	93.9	95.1	–109.4
20–24	1.5	0.5	7.0	91.0	92.5	–257.1
25–29	1.6	0.4	11.1	87.0	88.6	–460.8
30–34	1.7	0.2	17.3	80.7	82.4	–780.5
35–39	1.9	0.1	27.7	70.3	72.2	–1,305.5
40–44	1.9	0.1	37.3	60.7	62.6	–1,792.6
45–49	2.0	0.0	47.6	50.4	52.4	–2,317.7
50–54	2.0	0.0	57.2	40.8	42.8	–2,803.5
55–59	2.0	0.0	64.6	33.4	35.4	–3,181.0
60–64	2.0	0.0	73.2	24.8	26.8	–3,615.7
65–69	2.0	0.0	81.8	16.2	18.2	–4,051.2
70–74	2.0	0.0	85.6	12.4	14.4	–4,245.2
75–79	2.0	0.0	89.0	9.0	11.0	–4,416.3
80–84	2.0	0.0	92.3	5.8	7.7	–4,582.3
85–89	2.0	0.0	95.5	2.6	4.5	–4,745.0
90–94	2.0	0.0	97.5	0.6	2.5	–4,846.7
95–100	2.0	0.0	98.0	0.0	2.0	–4,875.5

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

Figure 13 (USD1.25/day line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), for the scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.8	52.1	19.9	1.1:1
5–9	1.8	40.9	36.5	0.7:1
10–14	3.2	30.2	49.5	0.4:1
15–19	5.4	23.1	62.9	0.3:1
20–24	8.5	17.2	74.4	0.2:1
25–29	12.6	12.6	80.5	0.1:1
30–34	19.1	9.1	88.7	0.1:1
35–39	29.6	6.4	95.7	0.1:1
40–44	39.2	4.9	96.6	0.1:1
45–49	49.6	4.0	100.0	0.0:1
50–54	59.2	3.3	100.0	0.0:1
55–59	66.6	3.0	100.0	0.0:1
60–64	75.2	2.6	100.0	0.0:1
65–69	83.8	2.4	100.0	0.0:1
70–74	87.6	2.2	100.0	0.0:1
75–79	91.0	2.2	100.0	0.0:1
80–84	94.2	2.1	100.0	0.0:1
85–89	97.4	2.0	100.0	0.0:1
90–94	99.4	2.0	100.0	0.0:1
95–100	100.0	2.0	100.0	0.0:1

USD2.50/Day 2005 PPP Poverty Line Tables

Figure 5 (USD2.50/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	96.7
5–9	81.5
10–14	82.3
15–19	68.2
20–24	57.4
25–29	44.1
30–34	35.3
35–39	24.9
40–44	12.1
45–49	6.8
50–54	2.7
55–59	1.2
60–64	0.7
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

Surveyed cases weighted to represent Ecuador's households.

Based on the 2005/6 ECV.

Figure 6 (USD2.50/day line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	726	÷	750	=	96.7
5–9	824	÷	1,011	=	81.5
10–14	1,206	÷	1,467	=	82.3
15–19	1,458	÷	2,136	=	68.2
20–24	1,799	÷	3,137	=	57.4
25–29	1,823	÷	4,136	=	44.1
30–34	2,282	÷	6,458	=	35.3
35–39	2,610	÷	10,481	=	24.9
40–44	1,160	÷	9,616	=	12.1
45–49	712	÷	10,413	=	6.8
50–54	255	÷	9,572	=	2.7
55–59	91	÷	7,437	=	1.2
60–64	61	÷	8,565	=	0.7
65–69	0	÷	8,579	=	0.0
70–74	0	÷	3,824	=	0.0
75–79	0	÷	3,371	=	0.0
80–84	0	÷	3,269	=	0.0
85–89	0	÷	3,207	=	0.0
90–94	0	÷	2,003	=	0.0
95–100	0	÷	567	=	0.0

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.
Number of all households normalized to sum to 100,000.

Figure 8 (USD2.50/day 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

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	–1.8	2.0	2.3	2.9
5–9	+5.0	10.3	12.2	15.2
10–14	+8.1	8.0	9.5	12.0
15–19	–1.0	6.2	7.7	9.6
20–24	–0.2	5.6	6.8	8.2
25–29	+1.7	5.0	6.1	8.0
30–34	+3.8	3.9	4.7	6.0
35–39	+5.9	2.5	3.0	3.9
40–44	–5.3	4.1	4.3	4.8
45–49	–1.1	1.6	1.9	2.6
50–54	–1.5	1.4	1.6	1.9
55–59	+0.2	0.8	0.9	1.2
60–64	+0.7	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 (USD2.50/day 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 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	50.0	72.6	89.8
4	+0.5	25.2	30.5	42.2
8	+0.5	18.2	21.9	30.0
16	+0.7	12.4	15.3	19.7
32	+0.4	8.9	10.7	14.5
64	+0.4	6.3	7.3	9.9
128	+0.4	4.4	5.3	6.9
256	+0.3	3.2	3.8	5.1
512	+0.3	2.2	2.7	3.5
1,024	+0.3	1.5	1.9	2.4
2,048	+0.2	1.1	1.3	1.8
4,096	+0.2	0.8	0.9	1.2
8,192	+0.2	0.6	0.7	0.9
16,384	+0.2	0.4	0.5	0.7

Figure 12 (USD2.50/day line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to 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	0.7	14.1	0.0	85.1	85.9	–90.0
5–9	1.6	13.3	0.2	84.9	86.5	–77.7
10–14	2.7	12.2	0.6	84.6	87.2	–60.4
15–19	4.1	10.7	1.3	83.9	88.0	–36.2
20–24	6.0	8.8	2.5	82.7	88.7	–2.2
25–29	7.8	7.0	4.8	80.3	88.1	+37.6
30–34	10.0	4.9	9.1	76.0	86.0	+38.5
35–39	12.1	2.8	17.5	67.6	79.7	–17.8
40–44	13.6	1.3	25.6	59.5	73.1	–72.5
45–49	14.4	0.4	35.2	50.0	64.4	–136.9
50–54	14.8	0.1	44.4	40.8	55.5	–198.9
55–59	14.9	0.0	51.8	33.4	48.2	–248.5
60–64	14.9	0.0	60.3	24.8	39.7	–306.1
65–69	14.9	0.0	68.9	16.2	31.1	–363.9
70–74	14.9	0.0	72.7	12.4	27.3	–389.6
75–79	14.9	0.0	76.1	9.0	23.9	–412.3
80–84	14.9	0.0	79.4	5.8	20.6	–434.3
85–89	14.9	0.0	82.6	2.6	17.4	–455.9
90–94	14.9	0.0	84.6	0.6	15.4	–469.4
95–100	14.9	0.0	85.1	0.0	14.9	–473.2

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

Figure 13 (USD2.50/day line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), for the scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.8	97.9	4.9	47.7:1
5–9	1.8	88.3	10.5	7.6:1
10–14	3.2	82.1	17.8	4.6:1
15–19	5.4	76.6	27.7	3.3:1
20–24	8.5	70.9	40.5	2.4:1
25–29	12.6	61.8	52.5	1.6:1
30–34	19.1	52.2	67.1	1.1:1
35–39	29.6	40.8	81.3	0.7:1
40–44	39.2	34.6	91.3	0.5:1
45–49	49.6	29.1	97.0	0.4:1
50–54	59.2	25.0	99.6	0.3:1
55–59	66.6	22.3	100.0	0.3:1
60–64	75.2	19.8	100.0	0.2:1
65–69	83.8	17.7	100.0	0.2:1
70–74	87.6	17.0	100.0	0.2:1
75–79	91.0	16.3	100.0	0.2:1
80–84	94.2	15.8	100.0	0.2:1
85–89	97.4	15.2	100.0	0.2:1
90–94	99.4	14.9	100.0	0.2:1
95–100	100.0	14.9	100.0	0.2:1

USD3.75/Day 2005 PPP Poverty Line Tables

Figure 5 (USD3.75/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	98.6
10–14	100.0
15–19	96.6
20–24	86.0
25–29	82.7
30–34	72.9
35–39	54.3
40–44	42.9
45–49	35.2
50–54	16.4
55–59	11.0
60–64	5.2
65–69	1.0
70–74	0.0
75–79	0.7
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.

Figure 6 (USD3.75/day line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	750	÷	750	=	100.0
5–9	997	÷	1,011	=	98.6
10–14	1,467	÷	1,467	=	100.0
15–19	2,065	÷	2,136	=	96.6
20–24	2,697	÷	3,137	=	86.0
25–29	3,422	÷	4,136	=	82.7
30–34	4,708	÷	6,458	=	72.9
35–39	5,686	÷	10,481	=	54.3
40–44	4,123	÷	9,616	=	42.9
45–49	3,667	÷	10,413	=	35.2
50–54	1,574	÷	9,572	=	16.4
55–59	820	÷	7,437	=	11.0
60–64	441	÷	8,565	=	5.2
65–69	86	÷	8,579	=	1.0
70–74	0	÷	3,824	=	0.0
75–79	24	÷	3,371	=	0.7
80–84	0	÷	3,269	=	0.0
85–89	0	÷	3,207	=	0.0
90–94	0	÷	2,003	=	0.0
95–100	0	÷	567	=	0.0

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.
Number of all households normalized to sum to 100,000.

Figure 8 (USD3.75/day 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

	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	–0.5	1.2	1.4	2.0
10–14	+0.7	1.0	1.1	1.4
15–19	+2.7	3.2	3.8	4.7
20–24	–2.5	3.8	4.7	6.4
25–29	+4.6	4.3	5.2	6.6
30–34	+3.2	3.9	4.7	6.0
35–39	+3.2	3.2	3.7	4.9
40–44	–6.5	4.8	5.1	5.8
45–49	+5.4	2.9	3.3	4.2
50–54	–1.3	2.4	2.8	3.6
55–59	+1.3	2.3	2.7	3.8
60–64	–0.5	1.7	2.0	2.8
65–69	–1.2	1.1	1.2	1.5
70–74	–1.1	1.1	1.2	1.4
75–79	+0.6	0.2	0.2	0.3
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 (USD3.75/day 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 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	59.5	78.2	87.3
4	–0.3	32.1	38.6	49.1
8	–0.6	22.6	26.9	35.7
16	+0.3	15.9	19.5	27.2
32	+0.4	11.7	13.5	18.3
64	+0.4	8.1	9.5	12.5
128	+0.4	5.7	6.7	8.6
256	+0.4	4.0	4.8	6.1
512	+0.4	2.9	3.4	4.5
1,024	+0.5	2.1	2.4	3.0
2,048	+0.4	1.5	1.7	2.3
4,096	+0.4	1.0	1.2	1.6
8,192	+0.4	0.7	0.9	1.1
16,384	+0.4	0.5	0.6	0.8

Figure 12 (USD3.75/day line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to 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	0.8	31.1	0.0	68.1	68.9	–95.3
5–9	1.7	30.1	0.0	68.1	69.9	–89.0
10–14	3.2	28.7	0.0	68.1	71.3	–79.8
15–19	5.2	26.7	0.2	68.0	73.1	–66.9
20–24	8.1	23.8	0.4	67.7	75.8	–48.0
25–29	11.3	20.5	1.3	66.8	78.1	–24.8
30–34	15.9	16.0	3.2	64.9	80.8	+9.7
35–39	21.3	10.6	8.3	59.9	81.2	+59.7
40–44	25.8	6.1	13.4	54.8	80.6	+58.0
45–49	28.8	3.0	20.8	47.4	76.2	+34.8
50–54	30.5	1.3	28.7	39.5	70.0	+10.1
55–59	31.2	0.7	35.4	32.7	63.9	–11.2
60–64	31.6	0.3	43.6	24.6	56.2	–36.8
65–69	31.8	0.1	52.0	16.2	48.0	–63.1
70–74	31.9	0.0	55.7	12.4	44.3	–74.9
75–79	31.9	0.0	59.1	9.0	40.9	–85.4
80–84	31.9	0.0	62.4	5.8	37.6	–95.7
85–89	31.9	0.0	65.6	2.6	34.4	–105.8
90–94	31.9	0.0	67.6	0.6	32.4	–112.0
95–100	31.9	0.0	68.1	0.0	31.9	–113.8

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

Figure 13 (USD3.75/day line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), for the scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.8	100.0	2.4	Only poor targeted
5–9	1.8	99.2	5.5	125.5:1
10–14	3.2	99.0	10.0	95.0:1
15–19	5.4	96.6	16.3	28.5:1
20–24	8.5	94.9	25.3	18.4:1
25–29	12.6	89.6	35.5	8.6:1
30–34	19.1	83.1	49.8	4.9:1
35–39	29.6	72.0	66.9	2.6:1
40–44	39.2	65.9	81.0	1.9:1
45–49	49.6	58.1	90.5	1.4:1
50–54	59.2	51.6	95.8	1.1:1
55–59	66.6	46.8	97.9	0.9:1
60–64	75.2	42.0	99.2	0.7:1
65–69	83.8	38.0	99.8	0.6:1
70–74	87.6	36.4	100.0	0.6:1
75–79	91.0	35.0	100.0	0.5:1
80–84	94.2	33.8	100.0	0.5:1
85–89	97.4	32.7	100.0	0.5:1
90–94	99.4	32.0	100.0	0.5:1
95–100	100.0	31.9	100.0	0.5:1

USD5.00/Day 2005 PPP Poverty Line Tables

Figure 5 (USD5.00/day line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	100.0
15–19	99.5
20–24	96.0
25–29	98.3
30–34	91.5
35–39	75.2
40–44	70.5
45–49	58.9
50–54	36.1
55–59	28.1
60–64	15.5
65–69	5.9
70–74	3.5
75–79	1.3
80–84	0.4
85–89	0.0
90–94	0.0
95–100	0.0

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.

Figure 6 (USD5.00/day line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	750	÷	750	=	100.0
5–9	1,011	÷	1,011	=	100.0
10–14	1,467	÷	1,467	=	100.0
15–19	2,126	÷	2,136	=	99.5
20–24	3,010	÷	3,137	=	96.0
25–29	4,064	÷	4,136	=	98.3
30–34	5,911	÷	6,458	=	91.5
35–39	7,881	÷	10,481	=	75.2
40–44	6,783	÷	9,616	=	70.5
45–49	6,137	÷	10,413	=	58.9
50–54	3,455	÷	9,572	=	36.1
55–59	2,087	÷	7,437	=	28.1
60–64	1,326	÷	8,565	=	15.5
65–69	510	÷	8,579	=	5.9
70–74	132	÷	3,824	=	3.5
75–79	44	÷	3,371	=	1.3
80–84	13	÷	3,269	=	0.4
85–89	0	÷	3,207	=	0.0
90–94	0	÷	2,003	=	0.0
95–100	0	÷	567	=	0.0

Surveyed cases weighted to represent Ecuador's households.
Based on the 2005/6 ECV.
Number of all households normalized to sum to 100,000.

Figure 8 (USD5.00/day 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

	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	+0.9	1.2	1.4	2.0
10–14	+0.0	0.0	0.0	0.0
15–19	+1.3	1.6	1.9	2.3
20–24	–3.7	2.0	2.0	2.0
25–29	+3.7	2.5	2.8	3.8
30–34	+3.1	2.7	3.2	4.4
35–39	+0.0	2.8	3.4	4.3
40–44	–3.5	3.1	3.4	4.4
45–49	–1.9	3.0	3.6	4.8
50–54	–9.0	6.1	6.4	6.8
55–59	–3.0	3.3	4.2	5.6
60–64	–0.6	2.7	3.1	4.0
65–69	–1.6	1.9	2.3	3.0
70–74	+0.5	1.6	1.9	2.6
75–79	–4.0	3.3	3.5	3.8
80–84	–0.2	0.5	0.7	0.8
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 10 (USD5.00/day 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 validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	+1.1	67.2	73.6	92.8
4	–2.1	32.6	40.1	51.5
8	–2.7	23.9	29.4	40.2
16	–1.8	17.6	21.5	28.7
32	–1.7	12.0	14.4	20.8
64	–1.5	8.2	10.1	13.5
128	–1.7	6.1	7.2	10.0
256	–1.6	4.2	5.1	6.6
512	–1.7	3.1	3.6	5.0
1,024	–1.6	2.1	2.6	3.2
2,048	–1.7	1.5	1.8	2.2
4,096	–1.7	1.1	1.3	1.7
8,192	–1.7	0.8	0.9	1.2
16,384	–1.7	0.5	0.6	0.9

Figure 12 (USD5.00/day line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to 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	0.8	47.0	0.0	52.2	53.0	–96.9
5–9	1.7	46.0	0.0	52.2	53.9	–92.7
10–14	3.2	44.6	0.0	52.2	55.4	–86.5
15–19	5.3	42.5	0.1	52.2	57.5	–77.7
20–24	8.4	39.4	0.1	52.1	60.6	–64.6
25–29	12.3	35.4	0.3	51.9	64.3	–47.7
30–34	18.1	29.7	1.0	51.2	69.3	–22.1
35–39	26.0	21.8	3.6	48.6	74.7	+16.3
40–44	32.9	14.9	6.3	45.9	78.8	+50.9
45–49	39.1	8.6	10.5	41.7	80.9	+78.1
50–54	43.4	4.4	15.8	36.4	79.8	+67.0
55–59	45.6	2.2	21.0	31.2	76.7	+56.0
60–64	46.9	0.9	28.3	23.9	70.7	+40.7
65–69	47.5	0.3	36.3	15.9	63.4	+24.0
70–74	47.6	0.2	40.0	12.2	59.8	+16.3
75–79	47.8	0.0	43.2	9.0	56.8	+9.6
80–84	47.8	0.0	46.4	5.8	53.6	+2.8
85–89	47.8	0.0	49.6	2.6	50.4	–3.9
90–94	47.8	0.0	51.6	0.6	48.4	–8.1
95–100	47.8	0.0	52.2	0.0	47.8	–9.3

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

Figure 13 (USD5.00/day line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), for the scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	0.8	100.0	1.6	Only poor targeted
5–9	1.8	99.2	3.7	125.5:1
10–14	3.2	99.6	6.7	230.9:1
15–19	5.4	98.9	11.1	92.4:1
20–24	8.5	99.1	17.6	114.6:1
25–29	12.6	97.6	25.8	41.2:1
30–34	19.1	94.8	37.9	18.4:1
35–39	29.6	87.9	54.4	7.3:1
40–44	39.2	83.9	68.8	5.2:1
45–49	49.6	78.9	81.9	3.7:1
50–54	59.2	73.3	90.8	2.7:1
55–59	66.6	68.4	95.4	2.2:1
60–64	75.2	62.3	98.0	1.7:1
65–69	83.8	56.7	99.3	1.3:1
70–74	87.6	54.3	99.6	1.2:1
75–79	91.0	52.5	99.9	1.1:1
80–84	94.2	50.7	100.0	1.0:1
85–89	97.4	49.0	100.0	1.0:1
90–94	99.4	48.1	100.0	0.9:1
95–100	100.0	47.8	100.0	0.9:1