A Simple Poverty Scorecard for Bangladesh

Shiyuan Chen and Mark Schreiner

24 April 2009

This document and related tools are at `http://www.microfinance.com/#Bangladesh`.

Abstract

This study uses the 2005 Bangladesh Household Income and Expenditure Survey (HIES) to construct an easy-to-use scorecard that estimates the likelihood that a household has expenditure below a given poverty line. The scorecard uses ten simple indicators that field workers can quickly collect and verify. Poverty scores can be computed on paper in the field in about five to ten minutes. The scorecard's accuracy and precision are reported for a range of poverty lines. The poverty scorecard is a practical way for pro-poor programs in Bangladesh to monitor poverty rates, track changes in poverty rates over time, and target services.

Acknowledgements

This paper was funded by the Microcredit Summit Campaign. It revises and expands a 2006 paper that used the 2000 HIES and that was funded by the Grameen Foundation. Special thanks go to Sajjad Zohir for acquiring the survey data from the Bangladesh Bureau of Statistics. Nobuo Yoshida of the World Bank generously provided household expenditure, national poverty lines by stratum for 2005, survey sampling weights, and price deflators. Thanks also go to Faizuddin Ahmed, Nigel Biggar, Sam Daley-Harris, Robert Driscoll, Brian McConnell, DSK Rao, Sangita Sigdyal, Salman Zaidi, and Hassan Zaman.

Authors

Shiyuan Chen is Senior Analyst with Microfinance Risk Management, L.L.C., 2441 Tracy Avenue, Kansas City, MO 64108–2935, U.S.A., +1 (816) 395–3545, `shiyuan@microfinance.com`. Mark Schreiner is the Director of Microfinance Risk Management, L.L.C., `mark@microfinance.com`. He is also Senior Scholar, Center for Social Development, Washington University in Saint Louis, Campus Box 1196, One Brookings Drive, Saint Louis, MO 63130–4899, U.S.A.

Figure 1: A simple poverty scorecard for Bangladesh

Entity	**Name**	**ID**	**Date** (DD/MM/YY)	
Member:			Joined:	
Loan officer:			Today:	
Branch:			Household size:	

Indicator	Value	Points	Score
1. How many household members are 11-years-old or younger?	A. Four or more	0	
	B. Three	9	
	C. Two	12	
	D. One	19	
	E. None	31	
2. Does any household member work for a daily wage?	A. Yes	0	
	B. No	10	
3. What type of latrine does the household use?	A. Open field	0	
	B. *Kacha* latrine (temporary or permanent), *pacca* (pit or water seal), or sanitary	5	
4. How many rooms does the household occupy (excluding rooms used for business)?	A. One, two, or three	0	
	B. Four	7	
	C. Five or more	11	
5. What is the main construction material of the walls?	A. Mud brick, hemp/hay/ bamboo, or other	0	
	B. C.I. sheet/wood	2	
	C. Brick/cement	8	
6. What is the main construction material of the roof?	A. Tile/wood, hemp/hay/ bamboo, or other	0	
	B. C.I. sheet/wood	2	
	C. Cement	13	
7. What is the total cultivable agricultural land owned by the household?	A. None, or 0.5 acres or less	0	
	B. More than 0.5 acres, and 1.0 acres or less	4	
	C. More than 1.0 acres	6	
8. Does the household own a television?	A. No	0	
	B. Yes	7	
9. Does the household own a two-in-one cassette	A. No	0	
	B. Yes	5	
10. Does the household own a wristwatch?	A. No	0	
	B. Yes	4	

Microfinance Risk Management, L.L.C., `http://www.microfinance.com` **Score:**

Figure 1: A simple poverty scorecard for Bangladesh (no points)

Entity	**Name**	**ID**	**Date** (DD/MM/YY)	
Member:			Joined:	
Loan officer:			Today:	
Branch:			Household size:	

Indicator	Value
1. How many household members are 11-years-old or younger?	A. Four or more B. Three C. Two D. One E. None
2. Does any household member work for a daily wage?	A. Yes B. No
3. What type of latrine does the household use?	A. Open field B. *Kacha* latrine (temporary or permanent), *pacca* latrine (pit or water seal), or sanitary
4. How many rooms does the household occupy (excluding rooms used for business)?	A. One, two, or three B. Four C. Five or more
5. What is the main construction material of the walls?	A. Mud brick, hemp/hay/bamboo, or other B. C.I. sheet/wood C. Brick/cement
6. What is the main construction material of the roof?	A. Tile/wood, hemp/hay/bamboo, or other B. C.I. sheet/wood C. Cement
7. What is the total cultivable agricultural land owned by the household?	A. None, or 0.5 acres or less B. More than 0.5 acres, and 1.0 acres or less C. More than 1.0 acres
8. Does the household own a television?	A. No B. Yes
9. Does the household own a two-in-one cassette	A. No B. Yes
10. Does the household own a wristwatch?	A. No B. Yes

Microfinance Risk Management, L.L.C., `http://www.microfinance.com`

A Simple Poverty Scorecard for Bangladesh

1. Introduction

This paper presents an easy-to-use poverty scorecard that pro-poor programs in Bangladesh can use to estimate the likelihood that a household has expenditure below a given poverty line, to monitor groups' poverty rates at a point in time, to track changes in groups' poverty rates between two points in time, and to target services to households.

The direct approach to poverty measurement via surveys is difficult and costly, asking households about a lengthy list of expenditure categories such as "What was the value of firewood consumed that was bought in cash/credit or wages in-kind? What was the value of firewood consumed that was produced by the household or received? What was the sum of them? . . .").

In contrast, the indirect approach via poverty scoring is simple, quick, and inexpensive. It uses ten verifiable indicators (such as "What is the main construction material of the walls?" or "Does the household own a television?") to get a score that is highly correlated with poverty status as measured by the exhaustive survey.

The poverty 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). These approaches may be costly, their results are not comparable across organizations nor across countries, and their accuracy and precision are unknown.

Suppose an organization wants to know what share of its participants are below a poverty line; for example, it might want to report using the USD1.25/day poverty line at 2005 purchase-power parity for the Millennium Development Goals. Or it might want to report how many participants are among the poorest half of people below the national poverty line (as required of USAID microenterprise partners). Or suppose an organization wants to measure movement across a poverty line (for example, to report to the Microcredit Summit Campaign). In all these cases, the organization 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 poverty scoring 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. This is not because they do not work, but because they are presented (when they are presented at all) as tables of regression coefficients incomprehensible to non-

specialists (with cryptic indicator names such as "LGHHSZ_2", negative values, and many decimal places). Thanks to the predictive-modeling phenomenon known as the "flat max", simple scorecards are 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 formulas for standard errors. Although these techniques are simple and standard in the for-profit field of credit-risk scoring, they have rarely or never been applied to poverty scorecards.

The scorecard (Figure 1) is based on the 2005 Household Income and Expenditure Survey (HIES) conducted by the Bangladesh Bureau of Statistics (BBS). 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.

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

Second, poverty scoring 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, poverty scoring can estimate changes in the poverty rate for a given group of households (or for two independent representative samples of households from the same population) between two points in time. This estimate is the change in the average poverty likelihood of the group(s) of households over time.

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

This paper presents a single scorecard (Figure 1) whose indicators and points are derived from household expenditure data and the USD1.25/day/person 2005 PPP poverty line. Scores from this scorecard are calibrated to poverty likelihoods for six poverty lines.

The scorecard is constructed and calibrated using a sub-sample of the data from the 2005 HIES. Its accuracy is validated on a different sub-sample from the 2005 HIES as well as on the entire 2000 HIES.[1] While all three scoring estimators are unbiased when applied to the population from which they were derived (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.[2]

[1] Accuracy is not tested with the 1991/2 and 1995/6 Household Expenditure Surveys because they lack many indicators in the scorecard constructed from the 2005 HIES.
[2] Examples of "different populations" include a nationally representative sample at another point in time or a non-representative sub-group (Tarozzi and Deaton, 2007).

Thus, while the indirect scoring approach is less costly than the direct survey approach, it is also always biased in practice. (The direct survey approach is unbiased by definition.) There is 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 as well as the same in all sub-groups as it is in the population.[3] Of course, this assumption—ubiquitous and inevitable in predictive modeling—holds only partly.

When applied to the 2005 validation sample for Bangladesh with $n = 16{,}384$, the difference between scorecard estimates of groups' poverty rates and the true rates at a point in time is +0.02 percentage points for the upper national poverty line, and the average absolute difference is 0.7 percentage points across all six lines. Because the 2005 validation sample is representative of the same population as the data that was used to construct the scorecard and because all the data comes from the same time frame, the scorecard estimators are unbiased and any differences are due to sampling variation; the average difference would be zero if the whole 2005 HIES were to be repeatedly redrawn and divided into sub-samples before repeating the entire scorecard-building and accuracy-testing process.

For $n = 16{,}384$, the 90-percent confidence intervals for these estimates are +/− 0.5 percentage points or less for estimates of a poverty rate at a point in time for the

[3] Bias may also result from changes in the quality of data collection, from changes over time in the real value of poverty lines, from imperfect adjustment of poverty lines to account for differences in cost-of-living across time or geographic regions, or from sampling variation across expenditure surveys.

2005 validation sample. For n = 1,024, these intervals are +/–2.1 percentage points or less.

When the scorecard built from the 2005 construction and calibration samples is applied both to the 2005 validation sample and to the entire 2000 HIES with n = 16,384, the difference between scorecard estimates and true values for changes in groups' poverty rates is –1.3 percentage points for the upper national line. While the true change was –9.2 percentage points, the scorecard estimates a change of –10.5 percentage points. Across all six lines, the average estimated change is about 10 percent too big. For n = 16,384, the 90-percent confidence intervals for these estimates of change are +/–0.8 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 Bangladesh. 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, and Section 9 covers targeting. The final section is a summary.

2. Data and poverty lines

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

2.1 Data

The scorecard is based on data from the 10,080 households in the 2005 HIES. This is the best, most recent national expenditure survey available for Bangladesh. 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

In addition, the 2000 HIES is used in the validation of estimates of changes in poverty rates for two independent samples between two points in time.

2.2 Poverty rates and poverty lines

2.2.1 Rates

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

Beyond this general definition, there two special cases, *household-level poverty rates* and *person-level poverty rates*. With household-level rates, each household is

counted as if it had only one person, regardless of true household size, so all households are counted equally. With person-level rates (the "head-count index"), each household is weighted by the number of people in it, so larger households have greater weight.

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

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

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

Based on Bangladesh's 2005 and 2000 HIES, this paper reports poverty rates and poverty lines by 2005 stratum at both the household level and the person level (Figure

3). The poverty scorecard is constructed using the 2005 HIES and household-level lines, 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 most relevant for most pro-poor organizations.

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

2.2.2 Poverty lines

Bangladesh has two national poverty lines. For the country as a whole in 2005, the national upper (lower) line corresponds with a household-level poverty rate of 37.2 (23.1) percent and a person-level poverty rate of 40.0 (25.1) percent (Figure 3). At the household level from 2000 to 2005, poverty rates fell by 9.2 percentage points (upper line, Figure 2) and 8.9 percentage points (lower line).

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 six lines:

- Upper national
- Lower national
- USAID "extreme"
- USD1.25/day 2005 PPP
- USD1.75/day 2005 PPP
- USD2.50/day 2005 PPP

The upper and lower national lines by 2005 stratum come from Nobuo Yoshida of the World Bank (Figure 16).

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

The scorecard here is constructed using the USD1.25/day line (2005 PPP). This is derived from:

- 2005 PPP exchange rate for "individual consumption expenditure by households" (International Comparison Project, 2008): Taka 25.49 per $1.00
- Price deflators from Nobuo Yoshida of the World Bank: 1.00 for 2005 and 0.77 for 2000

Using the formula in Sillers (2006), the USD1.25/day 2005 PPP lines for Bangladesh in 2005 and 2000 are:

$$(\text{2005 PPP exchange rate}) \cdot \text{USD1.25} \cdot \frac{\text{CPI}_{2005}}{\text{CPI}_{2005}} =$$

$$\left(\frac{\text{Taka25.49}}{\text{USD1.00}}\right) \cdot \text{USD1.25} \cdot \frac{1.00}{1.00} = \text{Taka31.86.}$$

$$(\text{2005 PPP exchange rate}) \cdot \text{USD1.25} \cdot \frac{\text{CPI}_{2000}}{\text{CPI}_{2005}} =$$

$$\left(\frac{\text{Taka25.49}}{\text{USD1.00}}\right) \cdot \text{USD1.25} \cdot 0.77 = \text{Taka24.53.}$$

The USD1.75/day and USD2.50/day 2005 PPP lines are multiples of the USD1.25/day 2005 PPP lines.

The 2005 PPP lines just presented apply to Bangladesh as a whole. These are adjusted here for regional differences in cost-of-living as implicitly reflected in the upper national poverty lines (Figure 16). This is done using:

- L, a given national-level poverty line
- p_i, population proportions by stratum ($i = 1$ to 16)
- π_i, upper national poverty lines by stratum

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

$$L_i = \frac{L \cdot \pi_i}{\sum_{j=1}^{16} p_j \cdot \pi_j}.$$

The given all-Bangladesh poverty line L is the person-weighted average of the 16 stratum lines L_i, with the differences in the stratum lines reflecting regional differences in the cost of living.

3. The context of poverty scorecards for Bangladesh

This section discusses existing scorecards in terms of their goals, methods, poverty lines/benchmarks, indicators, accuracy, precision, and cost. There are at least eight existing poverty scorecards for Bangladesh; why one more? First, estimates from the scorecard here are tested out-of-sample, and accuracy, precision, and formulas for sample size and standard errors are reported. Second, the new scorecard here is based on the largest sample and on the latest nationally representative data. Third, the accuracy of the new scorecard compares well with that of others. And fourth, the scorecard here (or at least its predecessor based on the 2000 HIES, Schreiner, 2006a) is actually being used by local pro-poor organizations.

Comparing poverty scorecards is not a mere academic exercise because many local, pro-poor organizations in Bangladesh already use very simple rule-of-thumb scorecards (such as a single indicator for land ownership or an index based on a handful of housing characteristics) for targeting and for measuring change over time. A simple, inexpensive scorecard with greater accuracy could help managers to improve their efforts to alleviate poverty in Bangladesh.

3.1 Grameen Bank

The Grameen Bank—probably the world's best-known microfinance organization (Dowla and Barua, 2006; Rutherford, 2006)—designed its own poverty scorecard to measure the exit of its members from poverty through time.[4] The 13 indicators are:

- Characteristics of the residence:
  - — Is the roof made of tin or is the residence worth more than 25,000 Taka?
  - — Does the family use a sanitary latrine?
  - — Does drinking water come from a tube well, or has it been purified by boiling, pitcher filters, alum, bleach, or tablets?
- Do all children six and up go to primary school or have finished primary school?
- Ownership of assets:
  - — Do family members sleep on cots or beds?
  - — Do all family members have sufficient clothing for daily use?
  - — Do all family members have warm clothes for winter?
  - — Do all family members have mosquito nets?
- Status as a microfinance participant:
  - — Does the Grameen member pay a weekly installment of at least 200 Taka?
  - — Does the Grameen member have an average annual savings balance of at least 5,000 Taka?
- Does the family have diversified sources of income?
- Does the family eat three square meals per day throughout the year?
- Are all family members conscious about their health, with the ability to take immediate action and pay for medical expenses in the event of an illness?

For Grameen's purposes, a household has exited poverty if it can answer "Yes" to all 13 indicators.

Grameen's poverty scorecard is based on its in-house expertise and experience, and as such it is well-accepted by its staff. Some indicators, however, are subjective

[4] Founded by Mohammad Yunus (winner of the 2006 Nobel Peace Prize), Grameen in March 2009 had about 8 million members (almost all rural women), about $0.7 billion in loans outstanding, and about $1 billion in deposit balances. Grameen inspired much of the worldwide microfinance movement as well as two other similar microfinance titans in Bangladesh, BRAC (Smillie, 2009) and ASA (Rutherford, 2009).

(such as "Are all family members conscious of their health") or unverifiable ("Does the family eat three square meals throughout the year?"). Furthermore, two indicators ("Weekly installment is at least 200 taka" and "Average savings is at least 5,000 taka") are relevant only for microfinance participants.

Unlike the scorecard in this paper, Grameen's scorecard is not benchmarked to an expenditure-based poverty line. While Grameen's definition of poverty is completely sensible, it is not quantifiable in the units typically used in poverty analysis.[5] Its accuracy is defined, not tested. Also, from the point of view of an expenditure-based poverty line, Grameen's scorecard it is too stringent; some households with per-capita expenditure above a given poverty line will not answer "Yes" to all 13 indicators.

3.2 Gwatkin *et al.*

Gwatkin *et al.* (n.d.) apply to Bangladesh an approach used by USAID in 56 countries with Demographic and Health Surveys (Rutstein and Johnson, 2004). They use Principal Components Analysis to make a "wealth index" from simple, low-cost indicators available for the 10,500 households in Bangladesh's 2004 DHS. The index is like the poverty scorecard here except that, because it is based on a relative definition of poverty, its accuracy is unknown, and it can only be assumed to be a proxy for long-

[5] Of course, this may be a great strength.

term wealth/economic status.[6] Other examples of the PCA-index approach are Stifel and Christiaensen (2007), Zeller *et al.* (2006), Sahn and Stifle (2003 and 2000), and Filmer and Pritchett (2001).

The 20 indicators in Gwatkin *et al.* are similar in their simplicity and verifiability to those in the scorecard here:

- Characteristics of the residence:
  - — Presence of electricity
  - — Source of drinking water
  - — Type of fuel for cooking
  - — Type of toilet arrangement
  - — Type of floor
  - — Type of roof
  - — Type of walls
- Whether the household owns land
- Whether the household has a domestic worker not related to the head
- Ownership of consumer durables:
  - — Radio
  - — Television
  - — Telephone
  - — Bicycle
  - — Motorcycle or scooter
  - — *Almirah* (wardrobe)
  - — Table
  - — Chair or bench
  - — Watch or clock
  - — Cot or bed
  - — Sewing machine

[6] Still, because their indicators are similar and because the "flat max" is important, carefully built PCA indices and expenditure-based poverty scorecards probably pick up the same underlying construct (such as "permanent income", see Bollen, Glanville, and Stecklov, 2007), and they probably rank households much the same. Tests of how well PCA indices predict expenditure include Filmer and Scott (2008), Lindelow (2006), Wagstaff and Watanabe (2003), and Montgomery *et al.* (2000).

Gwatkin *et al.* has three basic goals for the PCA-based wealth index:

- Segment people by quintiles in order to see how health, population, and nutrition vary with socio-economic status
- Monitor (via exit surveys) how well health-service points reach the poor
- Measure coverage of services via small-scale local surveys

These last two goals resemble the monitoring goals here, and the first goal of ranking households by quintiles is akin to targeting. As here, Gwatkin *et al.* present a ready-to-use index, although their format is more difficult because it has two pages, all points have 5 decimal places, no points are zero, and some points are negative.

The central contrast between the scorecard here and the PCA index is the use/non-use of an absolute, expenditure-based poverty line. Thus, while both approaches can rank households, only the poverty scorecard can estimate quantitative, expenditure-based poverty status. Furthermore, relative accuracy (that is, ability to rank or target) is tested here more completely here than in Gwatkin *et al.*; generally, discussion of the accuracy of PCA indices rests on how well they correlate with health, education, or self-assessed poverty, even though their construction does not take any such correlation into account.

3.3 Wodon

Wodon (1997) seeks indicators for targeting the poor. To this end, he develops a set of poverty scorecards based on expenditure in the 1991/2 HES (predecessor to the HIES). Targeting strength is tested via ROC curves (equivalent to the columns "% of all households who are targeted" and "% of poor who are targeted" in Figure 15 here).

Wodon compares scorecards with only housing indicators against broader scorecards and also against a series of one-indicator scorecards. He uses Logit (as does this paper) to construct all these scorecards for three areas (urban, rural, and Bangladesh as a whole) and for both national poverty lines. In all cases, Wodon estimates poverty likelihoods, but he does not report points. The five indicators in the housing scorecards are:

- Type of wall
- Type of roof
- Number and size of bedrooms
- Type of toilet arrangement
- Source of drinking water

These are simple, inexpensive, and verifiable, but they are also likely to be highly correlated with each other; few houses with high-quality roofs have low-quality walls.

The 13 indicators in the broader scorecards are:

- Household demographics:
    - — Number of babies (and its square)
    - — Number of children (and its square)
    - — Number of adults (and its square)
    - — Age of the male head/spouse (and its square)
    - — Age of the female head/spouse (and its square)
    - — Family structure
- Highest educational level attained by:
    - — Male head/spouse
    - — Female head/spouse
    - — Any other family member
- Main occupation of the household head
- Amount of land owned
- Religion
- Geographic location

Wodon calls this a "determinants of poverty" scorecard because the indicators are determined before current poverty status and so are not themselves caused by current poverty status. This scorecard turns out to target better than the others.

In all Wodon's scorecards, the indicators are simple, inexpensive, and verifiable, although Wodon does not believe that they are feasible, saying (p. 2087) "it is unlikely that we would have the necessary information to use the determinants of poverty model in practice. Even if we did, the implementation of a policy under such a complex set of indicators might be too difficult." In fact, Grameen's scorecard above is implemented and is much more complex, and BRAC and ASA are implementing the predecessor to the scorecard in this paper (Schreiner, 2006a).

For measuring targeting accuracy, ROC curves are appropriate. Wodon's tests, however, are "in-sample", meaning that they use the same data that was used to construct the scorecard. In-sample tests overstate accuracy, because all scorecards are "overfit" to some extent, meaning they capture not only universal, timeless relationships between indicators and poverty but also relationships that change through time or that appear in a particular sample solely due to chance. A better way to test scorecard accuracy (for targeting or for other purposes) is with "out-of-sample" tests that use data not used to construct the scorecard. This paper uses only out-of-sample tests.

3.4 Haslett and Jones

Haslett and Jones (2004) use "poverty mapping" (Elbers, Lanjouw, and Lanjouw, 2003) to estimate poverty rates for Bangladesh at the lowest administrative rural unit (the union). They first construct a single poverty scorecard for Bangladesh as a whole using a single-stage, robust regression to estimate the logarithm of expenditure for the 7,440 households in the 2000 HIES, considering only indicators found also in the 2001 population census. The resulting poverty scorecard is then applied to the five-percent sample of the census data to estimate poverty rates for the lower and upper national lines for smaller areas than would be possible with only the 2000 HIES. Finally, Haslett and Jones make "poverty maps" that quickly show how estimated poverty rates vary across areas in a way that makes sense to lay people.

The poverty mapping in Haslett and Jones has much in common with the poverty scoring here in that they both:

- Build scorecards with nationally representative 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
- Select indicators based on statistics, judgment, and experience to reduce overfitting
- Provide unbiased estimates
- Report standard errors for their estimates (or, equivalently, confidence intervals)
- Estimate poverty rates for groups
- Seek to be useful in practice and so aim to be understood by non-specialists

Strengths of poverty mapping include that it:

- Has formally established theoretical properties
- Can be applied straightforwardly to measures of well-being beyond poverty rates
- Requires less data for construction and calibration
- Uses only indicators that appear in a census

Strengths of poverty scoring include that it:

- Is simpler in terms of both construction and application
- Tests accuracy empirically
- Associates poverty likelihoods with scores non-parametrically
- Estimates poverty likelihoods for individual households
- Reports simple formulas for standard errors and sample sizes

The basic difference between the two approaches is that poverty mapping seeks to help governments design pro-poor policies, while poverty scoring seeks to help small, local pro-poor organizations to manage their outreach when implementing policies.[7]

Haslett and Jones' 21 indicators for Bangladesh are:

- Demographics:
    - — Household size
    - — Square of the difference between household size and the *upazila* mean
    - — Proportion of household members who are:
        - Under five years of age
        - Female
        - Literate
    - — Dependency ratio (details not documented)
- Whether the household head has completed primary school
- Employment:
    - — Whether the main source of income is construction or transportation
    - — Proportion of household members who are:
        - Employers
        - Employees, family helpers, or other
        - Self-employed
- Characteristics of the residence:
    - — Type of house
    - — Presence of electricity
    - — Type of toilet arrangement
    - — Source of drinking water

[7] Another apparent difference is that the developers of poverty mapping say that it is inappropriate for targeting individual households or persons, while this paper supports such targeting as a legitimate, potentially useful application (Schreiner, 2008a).

- Ownership of real estate:
    - House
    - Agricultural land
- Location:
    - Urban/rural
    - Division
- Census means at the level of the *upazila*:
    - Household size
    - Share of households with agriculture as the main source of income

In addition, there are seven indicators that combine indicators. This complexity means that the scorecard cannot be used for on-the-spot targeting.

Because the census does not measure expenditure, Haslett and Jones cannot test accuracy out-of-sample. They do report standard errors for estimated poverty rates, averaged across *upazilas*. For the lower (upper) national line, the 90-percent confidence interval for their scorecard's estimate of the poverty rate is +/– 6.4 (6.8) percentage points. Using the formula in Section 7 below and noting that information in Haslett and Jones suggests that the average number of households per *upazila* in the five-percent census sample was about 2,500, the 90-percent confidence interval for the standard error of the estimated poverty rate for the 2005 scorecard in this paper applied to a sample of $n = 2{,}500$ from the 2000 HIES is +/–1.4 (1.5) percentage points for the upper (lower) national line.

While the confidence interval for the scorecard here is about four times narrower than that in Haslett and Jones, the comparison is imperfect, both because all *upazilas* do not have 2,500 households in the census sample and because the figure here comes from a single nationally representative sample while Haslett and Jones' figure is an

average across 507 *upazilas*, most of which are probably not nationally representative (Tarozzi, 2007; Tarozzi and Deaton, 2008). It would be better to consider both bias and standard error at the *upazila* level, but that is beyond the scope of this paper.

3.5 Kam *et al.*

Like Haslett and Jones, Kam *et al.* (2004) use the five-percent sample of Bangladesh's January 2001 population census to make poverty maps, this time at the *upazila* level. They build their scorecard not with expenditure from the 2000 HIES but rather with income from a nationally representative 2000/1 survey of 1,888 households by the International Rice Research Institute.

Kam *et al.* use two poverty lines based on the cost of 2,112 calories (or 1,800 calories) and 58 grams of protein derived from the consumption by rural households in the 2000 HIES, adding 40 percent for non-food purchases. Their scorecard is derived from ordinary least-squares regression on income with nine indicators:

- Education:
    - — Average years of schooling among working household members
    - — Number of adults who attended college
- Employment:
    - — Number of agricultural workers
    - — Number of non-agricultural workers
    - — Whether the household has a business
- Characteristics of the residence:
    - — Presence of electricity
    - — Quality of house
- Ownership of agricultural land
- Whether the household is Muslim

In addition, there are four more indicators that combine indicators. In general, the indicators in Kam *et al.* are simple, inexpensive, and verifiable.

Overall, Kam *et al.* is less useful than Haslett and Jones. For example, a central strength of poverty mapping as developed by Elbers, Lanjouw, and Lanjouw (2003) is the reporting of standard errors, something Kam *et al.* do not do.

3.6 Zeller, Alcaraz V., and Johannsen

Zeller, Alcaraz V., and Johannsen ("ZAJ", 2004) seek to help USAID microenterprise partners report on their participants' poverty rates. To do this, they use ordinary least-squares regression to predict the logarithm of per-capita expenditure for 799 households from a nationally representative survey conducted specifically for ZAJ. Indicators are selected from a pool of about 700 candidates by an automated forward stepwise routine that maximizes R^2. The poverty line is \$1.08/day 1993 PPP (Taka23.1/day), corresponding to a poverty rate in their sample of 36 percent.[8]

ZAJ build a series of nine scorecards, progressively restricting the pool of candidate indicators to be simpler, less expensive, and more verifiable. For each scorecard, they test variants with 8, 13, and 18 indicators. For this paper, the most relevant scorecard is ZAJ's Model 7, as it considers only indicators rated as "easily verifiable" by the survey firm.

[8] It is not reported whether this is a household-level or person-level rate.

The 13-indicator version uses:

- Household demographics:
    - — Household size (and its square)
    - — Age of the household head
- Whether the household head is a domestic worker
- Characteristics of the residence:
    - — Whether the house structure is good
    - — Whether there is an improved toilet
- Ownership of agricultural assets:
    - — Whether less than 50 decimals of land are owned, including homestead
    - — Value of milk cows owned
- Ownership of consumer durables:
    - — Value of radios, televisions, VCRs, and CD players
    - — Number of saris
    - — Number of mosquito nets
    - — Presence of blankets
- Geographic division
- Whether the household declares that it is not able to save

Compared with indicators in the scorecard here, these are greater in number, more complex, more expensive, and less verifiable. In particular, it is not clear what is a "good" house, nor how to verify whether a household can save. Also, households may have trouble valuing their milk cows, radios, televisions, VCRs, and CD players.

While ZAJ resembles this paper in that it seeks to estimate poverty rates for groups of households, it also differs in several ways. First, ZAJ do not discuss using its scorecards for targeting or for estimating changes in poverty rates for groups. Second, ZAJ do not report the points in its scorecards. Third, ZAJ's estimates are statistically biased, while those here are unbiased.[9] Fourth, ZAJ's measures of accuracy are

[9] This follows from the fact that the indicator function ZAJ use to convert estimated expenditure into poor/non-poor poverty status is non-linear and discontinuous.

overstated because they based on in-sample tests (and their automated indicator selection only worsens overfitting). Fifth, ZAJ report no standard errors. Sixth, ZAJ's approach does not use poverty likelihoods but rather labels a household as 100 percent below or above a poverty line, even though some households with estimated expenditure on one side of a given line have true expenditure on the other side of the line.

How does ZAJ compare with the scorecard here in terms of targeting accuracy? For Model 7 with 13 indicators and a poverty line of \$1.08/day 1993 PPP (poverty rate of 36.0 percent) applied in-sample to its special-purpose 2004 survey, ZAJ report undercoverage of 49.8 percent (half of households with true expenditure below the line have estimated expenditure above the line) and leakage of 23.5 percent (one-fourth of households with true expenditure above the line have estimated expenditure below the line). For the scorecard here and the upper national line (poverty rate of 37.2 percent, Figure 2) applied out-of-sample to the validation sample from the 2005 HIES with a cut-off of 25–29, undercoverage of 45.0 corresponds to leakage of 10.6. Thus, the scorecard here has less undercoverage and less leakage, and so better targeting.

3.7 IRIS Center

IRIS Center (2007a) updates ZAJ and shares most of its strengths and weaknesses. After comparing several statistical techniques (and therefore increasing the risk of overfitting), IRIS selects a two-stage approach. In the first stage, a linear probability model (akin to the Logit here) identifies households with extremely high or

extremely low estimated poverty likelihoods. A second linear probability model is then applied to the remaining households, and those with an estimated poverty likelihood of less than 50 percent being counted as "poor". This two-step approach was first used in poverty scoring by Grootaert and Braithwaite (1998), although it has been in the scoring literature for decades (see, for example, Myers and Forgy, 1963) and is a variant on the idea of "boosting" (Hand and Vinciotti, 2003; Friedman, 2001; Schapire, 2001). IRIS' 38 indicators are:[10]

- Household demographics:
  - — Number of members
  - — Number of males
  - — Number of females
  - — Number of under the age of 14 and over the age of 60
  - — Age of the household head
  - — Marital status of the household head
- Education:
  - — Highest class completed by the household head
  - — Number of members (excluding head) with no education
  - — Number of members (excluding head) whose highest class is primary school
- Employment:
  - — Whether the household head was a domestic worker in the past year
  - — Minimum wage acceptable to the main income-earning female member for eight hours of hard work during the post-harvest season
- Characteristics of the residence:
  - — Rooms
  - — Source of drinking water
  - — Whether a home improvement was made in the past three years
  - — Cost of any home improvements made in the past three years

[10] IRIS does not report the actual scorecard, only the questionnaire used to collect data, so the actual indicators may differ from those listed here.

- Ownership of agricultural assets:
  - Number of milk cows
  - Presence of a motor tiller
  - Total value of irrigated agricultural land
  - Whether the household had a very serious problem or failure in its animal production in the past three years
- Ownership of consumer durables:
  - Number of radios
  - Number of CD players
  - Number of televisions
  - Number of VCRs
  - Number of ceiling fans
  - Number of *kantha* (embroidered textiles)
  - Number of saris
  - Number of carts, wagons, or similar vehicles
  - Area of homestead land
- Food security in the past year
- Social participation:
  - Number of members in a trader's association
  - Number of members in a cultural group
  - Number of members in a political group
  - Number of members in a school committee
  - Number of first-degree relatives (mother, father, sister, brother) of the household head or spouse who got married in the past three years
- Whether any member has a withdrawable savings account of any type
- Location:
  - Region
  - Urban/rural

Besides having almost four times as many indicators as the scorecard here, the IRIS indicators are also more complex, more expensive, and less verifiable. For example, an enumerator cannot verify responses that are concerned with events in the past (such as home improvements, problems with animal husbandry, food security, family marriages, or hypothetical reservation wages). Households also cannot easily supply the value of past home improvements or of their irrigated land. Finally, households may be unwilling to reveal whether they have a savings account.

IRIS' preferred measure of accuracy is the "Balanced Poverty Accuracy Criterion", and USAID adopted BPAC as its criterion for certifying poverty scorecards (IRIS Center, 2005). BPAC depends on the difference between the estimated poverty rate and its true value (a difference that is minimized by minimizing the absolute difference between undercoverage and leakage) and on *inclusion*, that is, the share of households who truly have per capita expenditure below a given poverty line and who are also correctly classified as "below poverty line". The formula is:

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

A higher BPAC implies more accuracy; for IRIS' in-sample tests, BPAC is 72.1. For the scorecard here and the upper national poverty line (the line that gives a poverty rate closest to that of the poverty line used by IRIS), out-of-sample BPAC is 64.4. Analysis of poverty scorecards for Peru (Schreiner, 2009a) suggests that going from in-sample to out-of-sample can reduce BPAC by 8.5–17 percent, or in the case of Bangladesh, from 72.1 down to 65.9 or 59.8. Given the possibility of sampling variation on top of this, BPAC is probably about the same for IRIS as for the scorecard here.

The main distinction between the scorecard here and IRIS is transparency. In particular, IRIS does not report:

- What data their scorecard is based on (although it appears to be the same as in ZAJ)
- The points associated with scorecard indicators
- Standard errors
- Whether poverty rates are at the household- or person-level

3.8 Cortez *et al.*

Cortez *et al.* (2005) aim to improve the targeting of health services to individuals in Bangladesh. To this end, they construct a poverty scorecard with ordinary least-squares on the logarithm of per-capita expenditure from the 2000 HIES. Their initial scorecard has about 40 indicators selected for their statistical significance. To get a more feasible tool, Cortez *et al.* winnow this initial scorecard down to 14 indicators:

- Number of household members
- Education:
  - — Number of members aged 16 and up who never attended school
  - — Highest educational attainment by any household member
- Characteristics of the residence:
  - — Presence of electricity
  - — Type of wall
  - — Type of roof
  - — Type of toilet arrangement
  - — Source of drinking water
- Ownership of consumer durables:
  - — Electric fans
  - — Televisions
  - — Dining-room furniture
  - — Drawing-room furniture
  - — Freezer
  - — Telephone (landline or mobile)

As here, all indicators in Cortez *et al.* are simple, inexpensive, and verifiable. Furthermore, the points are simple, with only a single decimal place (compared the no-decimal-point scheme here). In general, Cortez *et al.* emphasize practicality, presenting a ready-to-use scorecard (as here), providing advice on implementation, and illustrating how to use the scorecard to estimate expenditure and to apply a targeting cut-off

defined at the 60th percentile of expenditure (without adjustments for regional differences in cost-of-living).

For all these similarities, there are also differences in that Cortez *et al.*:

- Do not report standard errors
- Estimate expenditure (not poverty likelihoods)
- Has 15 indicators (versus 10), two of which are continuous (versus none)

Cortez' scorecard uses the 2000 HIES,[11] and it can be reconstructed to enable comparisons with the scorecard here in terms of targeting accuracy and in terms of the bias and variance for estimated overall poverty rates.

Schreiner (2006a) uses ROC curves (as in Wodon) to show that the predecessor to the scorecard here (based on the 2000 HIES) is better at targeting. For example, targeting the lowest-scoring 30 percent of households in an out-of-sample test with Cortez *et al.* targets 51.4 percent of the poor and 14.4 percent of the non-poor. The predecessor of the scorecard here is slightly better, targeting 55.3 percent of the poor and 10.4 percent of the non-poor. This advantage is maintained across all targeting cut-offs.

To test the bias and precision of estimates of groups' poverty rates at a point in time, 10,000 bootstrap samples were drawn out-of-sample. For Cortez *et al.*, the difference between the estimated poverty rate and the true value has a mean of +2.3

[11] Cortez (p. 73) lists an indicator "Has no private toilet". Whether toilet arrangements are private or shared, however, is not in the 2000 HIES. Based on the reported mean, the indicator must be "Does the household use a temporary *kacha* latrine or open fields?"

percentage points and a standard error of 1.2 percentage points. For the predecessor to the scorecard here, the mean difference is +0.5 percentage points with a standard error of 0.9 percentage points. Thus, the scorecard here is both more accurate (less bias) and more precise (less variance).

4. Scorecard construction

About 100 potential indicators are initially prepared in the areas of:

- Family composition (such as household size)
- Education (such as school attendance of children)
- Housing (such as the main construction material of the walls)
- Ownership of durable goods (such as televisions and wristwatches)
- Employment (such as whether any household member works for a daily wage)

Each indicator is first screened with the entropy-based "uncertainty coefficient" (Goodman and Kruskal, 1979) that measures how well the indicator predicts poverty on its own. Figure 4 lists the candidate indicators, ranked by uncertainty coefficient. Responses for each indicator in Figure 4 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 television is probably more likely to change in response to changes in poverty than is the education of household members.

The scorecard itself is built using the $1.25/day 2005 PPP 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 helps ensure that indicators are simple and make sense to users.

The single poverty scorecard here applies to all of Bangladesh. Evidence from India and Mexico (Schreiner, 2006b 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, Barron, and Edwards, 1983; Dawes, 1979; Wainer, 1976; Myers and Forgy, 1963). The bottleneck is less technical and more human, not statistics but organizational change management. Accuracy is easier to achieve than adoption.

The scorecard here is designed to encourage understanding and trust so that users will 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 (Figure 1). 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)

The scorecard in Figure 1 is ready to be photocopied and can be used with a simple spreadsheet database (Microfinance Risk Management, L.L.C., 2009) that records identifying information for the participant, dates, indicator values, scores, and poverty likelihoods.

A field worker using the paper scorecard would:

- Record participant identifiers
- Read each question from the scorecard
- Circle each response and its points
- Write the points in the far-right column
- Add up the points to get the total score
- Implement targeting policy (if any)
- Deliver the paper scorecard to a central office for 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).[12] IRIS Center (2007b) and Toohig (2008) are useful nuts-and-bolts guides for planning, 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 most alternatives, it is still absolutely difficult. Training and explicit definitions of terms and

[12] 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.

concepts in the scorecard is essential. For the example of Nigeria, one test finds distressingly low inter-rater and test-retest correlations for indicators as seemingly simple and obvious as whether the household owns an automobile (Onwujekwe, Hanson, and Fox-Rushby, 2006)). In Mexico, in contrast, Martinelli and Parker (2007) find that errors by interviewers and lies by respondents have negligible effects on targeting accuracy. Grosh and Baker (1995) also find that gross underreporting of assets does not affect targeting. 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 confidence level 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 changes in poverty rates, it can be applied:

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

An example set of design choices is illustrated by BRAC and ASA, two microlenders in Bangladesh (each with 7 million participants) who are applying the predecessor to the poverty scorecard here (Schreiner, 2006a). Their design is that loan officers in a random sample of branches score all their clients each time they visit a homestead (about once a year) as part of their standard due diligence prior to loan disbursement. Responses are recorded on paper in the field before being sent to a

central office to be entered into a database. The sampling plans of ASA and BRAC 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 Bangladesh, 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 $1.25/day 2005 PPP line, scores of 10–14 have a poverty likelihood of 91.7 percent, and scores of 40–44 have a poverty likelihood of 39.9 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 39.9 percent for the $1.25/day 2005 PPP line but 27.2 percent for the upper national line.[13]

[13] Starting with Figure 5, many figures have 12 versions, one for each of the six poverty lines for the 2005 scorecard applied to the validation sample, and one for each of the six poverty lines for the 2005 scorecard applied to the 2000 HIES. To keep them straight, they are grouped by poverty line and by the data used for validation. Single tables that pertain to all poverty lines are placed with the tables for the upper national line.

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.

For the example of the $1.25/day 2005 PPP line (Figure 6), there are 6,892 (normalized) households in the calibration sub-sample with a score of 20–24, of whom 5,856 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 20–24 is then 85.0 percent, as 5,856 ÷ 6,892 = 85.0 percent.

To illustrate with the $1.25/day 2005 PPP line and a score of 40–44, there are 11,333 (normalized) households in the calibration sample, of whom 4,522 (normalized) are below the line (Figure 6). Thus, the poverty likelihood for this score is 4,522 ÷ 11,333 = 39.9 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:

- 15.7 percent below the USAID "extreme" line
- 3.2 percent between the USAID "extreme" and the lower national lines
- 16.9 percent between the lower national and the upper national lines
- 14.1 percent between the upper national and the $1.25/day 2005 PPP lines
- 36.1 percent between the $1.25/day 2005 PPP and $1.75/day 2005 PPP lines
- 10.7 percent between the $1.75/day 2005 PPP and $2.50/day 2005 PPP lines
- 3.4 percent above the $2.50/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 Bangladesh's poverty 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 households' poverty likelihoods

As long as the relationship between indicators and poverty does not change and the scorecard is applied to households that are representative of 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, as well as unbiased estimates of changes in poverty rates between two points in time.[14]

Of course, the relationship between indicators and poverty does change with time and also across sub-groups in Bangladesh's population, so the scorecard will generally be biased when applied after the end date of field work for the 2005 HIES (as it must be in practice) or when applied with non-nationally representative groups (as it probably would be for any local, pro-poor organization).

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

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

- Score each household in the validation sample
- Draw a new bootstrap sample *with replacement* from the validation sample
- For each score, compute the true poverty likelihood in the bootstrap sample, that is, the share of households with the score 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 and for $n = 16{,}384$, Figure 8 shows the average difference between estimated and true poverty likelihoods as well as confidence intervals for the differences.

For the $1.25/day 2005 PPP line in the validation sample, the average poverty likelihood across bootstrap samples for scores of 20–24 in the validation sample is too high by 0.9 percentage points (Figure 8). For scores of 25–29, the estimate is too low by 4.4 percentage points.[15]

The 90-percent confidence interval for the differences for scores of 25–29 is +/– 3.1 percentage points (Figure 8). This means that in 900 of 1,000 bootstraps, the

[15] These differences are not zero, 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 construction and calibration process.

difference between the estimate and the true value is between –7.5 and –1.3 percentage points (because –4.4 – 3.1 = –7.5, and –4.4 + 3.1 = –1.3). In 950 of 1,000 bootstraps (95 percent), the difference is –4.4 +/–3.2 percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is –4.4 +/–3.5 percentage points.

For almost all score ranges, Figure 8 shows differences—some of them large—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 Bangladesh's population. Differences when the 2005 scorecard is applied to the 2000 HIES also are due in part to changes in the relationships between indicators and poverty during the intervening five years. 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.

Of course, if estimates of groups' poverty rates are to be usefully accurate, then errors for individual households must largely cancel each other out. This is generally the case, as discussed in the next section.

Another possible source of bias is overfitting. By construction, the scorecard here is unbiased, but it may still be *overfit* when applied after the end of field work for the 2005 HIES. That is, it may fit the 2005 HIES 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 HIES. 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 scorecard construction—which is not done here—can also mitigate overfitting by reducing (but not eliminating) dependence on a single sampling instance. Combining scorecards can also help, at the cost of complexity.

Most errors in individual households' likelihoods, however, cancel out in the estimates of groups' poverty rates (see later sections). Furthermore, much of the differences between scorecard estimates and true values 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 across time and space. 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, 2009 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 85.0, 67.3, and 39.9 percent ($1.25/day 2005 PPP line, Figure 5). The group's estimated poverty rate is the households' average poverty likelihood of (85.0 + 67.3 + 39.9) ÷ 3 = 64.1 percent.[16]

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 Bangladesh scorecard applied to 1,000 bootstrap samples from the validation sample and from the 2005 HIES.

Summarizing Figure 10 across poverty lines and years for n = 16,384, Figure 9 shows that the absolute differences at a point in time between the estimated poverty rate and the true rate for the validation sample are 1.8 percentage points or less. The average absolute difference across the six poverty lines is 0.7 percentage points. At least

[16] The group's poverty rate is *not* the poverty likelihood associated with the average score. Here, the average score is (20 + 30 + 40) ÷ 3 = 30, and the poverty likelihood associated with the average score is 67.3 percent. This is not the 64.1 percent found as the average of the three poverty likelihoods associated with each of the three scores.

part of these differences is due to sampling variation in the validation sample as part of the division of the 2005 HIES into three sub-samples.

In terms of precision, the 90-percent confidence interval for a group's estimated poverty rate at a point in 2005 and with n = 16,384 is +/–0.5 percentage points or less (Figure 9). This means that in 900 of 1,000 bootstraps of this size, the difference between the estimate and the average estimate is 0.5 percentage points or less.

In the specific case of the $1.25/day 2005 PPP 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 –1.7 – 0.5 = –2.2 to –1.7 + 0.5 = –1.2 percentage points. This is because –1.7 is the average difference, and +/–0.5 is its 90-percent confidence interval. The average difference is –1.7 because the average scorecard estimate is too low by 1.7 percentage points; it estimates a poverty rate of 45.8 percent for the validation sample, but the true value is 47.5 percent (Figure 2).

For the Bangladesh scorecard applied to the 2000 HIES with n = 16,384, the absolute differences at a point in time are 3.2 percentage points or less (Figure 9), and the average absolute difference across lines is 1.6 percentage points. The 90-percent confidence interval is +/–0.5 percentage points or less.

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

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

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

c is the confidence interval as a proportion (*e.g.*, 0.2 for +/–2 percentage points),

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

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

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

n is the sample size.

For example, with a sample $n = 16{,}384$, 90-percent confidence ($z = 1.64$), and a poverty rate p of 47.5 percent (the true rate in the validation sample for \$1.25/day 2005 PPP in Figure 2), the confidence interval c is

$$+/- z \cdot \sqrt{\frac{p \cdot (1-p)}{n}} = +/- 1.64 \cdot \sqrt{\frac{0.475 \cdot (1-0.475)}{16{,}384}} = 0.64 \text{ percentage points.}$$

Poverty scorecards, however, do not measure poverty directly, so this formula is not immediately applicable. To derive a formula for the Bangladesh scorecard, consider Figure 10, which reports empirical confidence intervals c for the differences for the scorecard applied to 1,000 bootstrap samples of various sample sizes from the validation sample. For $n = 16{,}384$ and the \$1.25/day 2005 PPP line, the 90-percent confidence interval is 0.525 percentage points.[17] Thus, the ratio of confidence intervals with poverty scoring and direct measurement is $0.525 \div 0.64 = 0.82$.

Now consider the same case, but with $n = 8{,}192$. The confidence interval under direct measurement is $+/-1.64 \cdot \sqrt{\frac{0.475 \cdot (1-0.475)}{8{,}192}} = 0.90$ percentage points. The empirical confidence interval with the Bangladesh scorecard (Figure 10) is 0.745 percentage points. Thus for $n = 8{,}192$, the ratio is $0.745 \div 0.90 = 0.83$.

This ratio of 0.83 for $n = 8{,}182$ is not far from the ratio of 0.82 for $n = 16{,}384$. Indeed, across all sample sizes of 256 or more in Figure 10, the average ratio turns out to be 0.82, implying that confidence intervals for indirect estimates of poverty rates via the Bangladesh scorecard and this poverty line are about four-fifths as wide as those for direct estimates. This 0.82 appears in Figure 9 as the "α factor" because if $\alpha = 0.82$, then the formula relating confidence intervals c and standard errors σ for the Bangladesh scorecard is $c = +/- z \cdot \alpha \cdot \sigma$. The formula for the standard error σ for point-in-time estimates of poverty rates via scoring is $\alpha \cdot \sqrt{\frac{p \cdot (1-p)}{n}}$.

[17] Due to rounding, Figure 10 displays 0.5, not 0.525.

In general, α could be more or less than 1.00. When α is less than 1.00, it means that the scorecard is more precise than direct measurement. This occurs for eleven of the twelve cases in Figure 9.

The formula relating confidence intervals to standard errors for poverty scoring can be rearranged to give a formula for determining sample size n before measurement.[18] If $\hat{p}$ is the expected poverty rate before measurement, then the formula for n based on the desired confidence level that corresponds to z and the desired confidence interval $+/-c$ under poverty scoring is $n = \left(\frac{\alpha \cdot z}{c}\right)^2 \cdot \hat{p} \cdot (1 - \hat{p})$.

To illustrate how to use this, suppose $c = 0.042$ and $z = 1.64$ (90-percent confidence). Then the formula gives $n = \left(\frac{0.82 \cdot 1.64}{0.042}\right)^2 \cdot 0.475 \cdot (1 - 0.475) = 255$, close to the sample size of 256 observed for these parameters in Figure 10.

Of course, the α factors in Figure 9 are specific to Bangladesh, its poverty lines, its poverty rates, and this scorecard. The derivation of the formulas, however, is valid for any poverty scorecard following the approach in this paper.

In practice after the date of the end of field work for the 2005 HIES, an organization would select a poverty line (say, the USD1.25/day 2005 PPP line), select a

[18] IRIS Center (2007b and 2007c) says that a sample size of $n = 300$ 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.

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 47.5 percent national average for the 2005 HIES in Figure 2), look up α (here, 0.81), assume that the scorecard will still work in the future and/or for non-nationally representative sub-groups,[19] and then compute the required sample size. In this illustration,

$$n = \left(\frac{0.81 \cdot 1.64}{0.02}\right)^2 \cdot 0.475 \cdot (1 - 0.475) = 1{,}128.$$

[19] This paper reports accuracy for the scorecard applied to the validation sample and to the 2000 HIES, but it cannot test accuracy for later years or for other groups. Still, performance after the end of fieldwork for the 2005 HIES will probably resemble that in the 2005 HIES, 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.

8.1 Warning: Change is not impact

Scoring can estimate change. Of course, change could be for the better or for the worse, and scoring does not indicate what caused change. This point is often forgotten, confused, or ignored, so it bears repeating: poverty scoring simply estimates change, and it does not, in and of itself, indicate the reason for the change. In particular, estimating the impact of 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, poverty scoring 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 poverty scoring. Even measuring simple change usually requires assuming that the population is constant over time and that program drop-outs happen at random.

8.2 Calculating estimated changes in poverty rates over time

Consider the illustration begun in the previous section. On Jan. 1, 2009, a program samples three households who score 20, 30, and 40 and so have poverty

likelihoods of 85.0, 67.3, and 39.9 percent ($1.25/day 2005 PPP line, Figure 5). The group's baseline estimated poverty rate is the households' average poverty likelihood of (85.0 + 67.3 + 39.9) ÷ 3 = 64.1 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, 2010, the program samples three additional households who are in the same cohort as the three households originally sampled (or suppose that the program scores the same three original households a second time) and finds that their scores are now 25, 35, and 45 (poverty likelihoods of 74.7, 49.8, and 31.3 percent, $1.25/day 2005 PPP line, Figure 5). Their average poverty likelihood at follow-up is (74.7 + 49.8 + 31.3) ÷ 3 = 51.9 percent, an improvement of 64.1 – 51.9 = 12.2 percentage points.

This suggests that about one of eight participants crossed the poverty line in 2009. (This is a net figure; some people start above the line and end below it, and vice versa.) Among those who started below the line, about one in five (12.2 ÷ 64.1 = 19.0 percent) ended up above the line. Of course, poverty scoring does not reveal the reasons for this change.

8.3 Estimated changes in poverty rates in Bangladesh

Given the Bangladesh poverty scorecard built from the construction and calibration samples from the 2005 HIES, an estimate of the change in the poverty rate

between 2005 and 2000 in Bangladesh is the difference between the estimated poverty rate in the validation sample and the estimated poverty rate in the 2000 HIES.

In Figure 11 (summarizing Figure 12 across poverty lines), the difference between this estimate and the true value is +2.2 percentage points for the $1.25/day 2005 PPP line. This is because the true change was –6.8 percentage points, while the scorecard estimates a change of –4.6 percentage points. Across all six lines, the average absolute difference is 1.9 percentage points, while the average true change is 5.8 percentage points (Figure 2). In terms of precision, the 90-percent confidence interval is +/–0.8 percentage points or less (Figure 11).

Because the scorecard estimate is unbiased, this difference is due to changes over time in the relationship between indicators and poverty, sampling variation, and changes in poverty lines and/or data collection. The magnitude of the differences here are like those in other tests (Schreiner, 2009b, 2008b, and 2008c; Mathiassen, 2008).

8.4 Accuracy for estimated change in two independent samples

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

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

z, c, and p are defined as above, n is the sample size at both baseline and follow-up,[20] and α is the average (across a range of bootstrapped sample sizes) of the ratio of the observed confidence intervals from a poverty scorecard and the theoretical confidence intervals under the textbook formula for direct measurement for two equal-sized independent samples. The α factor for Bangladesh's poverty lines is always less than 1.00 (Figure 11), so scoring is again more precise than direct measurement.

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

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

To illustrate the use of the formula above to determine sample size for estimating changes in poverty rates across two independent samples, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is 2 percentage points ($c = 0.02$), the poverty line is the USD1.25/day 2005 PPP, $\alpha = 0.81$ (from Figure 11), and $\hat{p} = 0.475$ (from Figure 2). Then the baseline sample size is

$n = 2 \cdot \left(\frac{0.81 \cdot 1.64}{0.02} \right)^2 \cdot 0.475 \cdot (1 - 0.475) = 2{,}201$, and the follow-up sample is also 2,201.

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

8.5 Accuracy for estimated change for one sample, scored twice

The general formula relating the confidence interval c to the standard error σ when using scoring to estimate change for a single group of households, all of whom are scored at two points in time, is:[21]

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

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

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

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

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

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

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

Given this, a sample-size formula for a group of households to whom the Bangladesh poverty scorecard is applied twice (once after the end of field work for the 2005 HIES and then again later) is:

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

In Peru (the only other country for which there is an estimate, Schreiner 2009a), the average α across years and poverty lines is about 1.3.

To illustrate the use of this formula, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is 2.0 percentage points ($c = 0.02$), the poverty line is \$1.25/day 2005 PPP, and the sample will be scored first in 2009 and then again in 2012 ($y = 3$). The before-baseline poverty rate is 47.5 percent ($p_{2005} =$ 0.475, Figure 2), and suppose $\alpha = 1.3$. Then the baseline sample size is $n = 2 \cdot \left(\frac{1.3 \cdot 1.64}{0.02} \right)^2 \cdot \left\{ -0.02 + 0.016 \cdot 3 + 0.47 \cdot \left[0.475 \cdot \left(1 - 0.475 \right) \right] \right\} = 3{,}301$. The same group of 3,301 households is scored at follow-up as well.

9. Targeting

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

There is a distinction between *targeting status* (scoring at or below a targeting cut-off) and *poverty status* (having 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 13 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 14 shows the distribution of households by targeting outcome. For an example cut-off of 30–34 and the 2005 scorecard applied to the validation sample, outcomes for the national line are:

- Inclusion: 29.3 percent are below the line and correctly targeted
- Undercoverage: 18.2 percent are below the line and mistakenly not targeted
- Leakage: 6.3 percent are above the line and mistakenly targeted
- Exclusion: 46.2 percent are above the line and correctly not targeted

Increasing the cut-off to 35–39 improves inclusion and undercoverage but worsens leakage and exclusion:

- Inclusion: 35.5 percent are below the line and correctly targeted
- Undercoverage: 12.0 percent are below the line and mistakenly not targeted
- Leakage: 11.4 percent are above the line and mistakenly targeted
- Exclusion: 41.0 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 14 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 "Total Accuracy", total net benefit is the number of households correctly included or correctly excluded:

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

Figure 14 shows "Total Accuracy" for all cut-offs for Bangladesh's scorecard. For the \$1.25/day 2005 PPP line in the validation sample, total net benefit is greatest (76.5) for a cut-off of 35–39, with about three in four Bangladeshi 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).

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 15 ("% targeted who are poor") shows the expected poverty rate among Bangladeshi

households who score at or below a given cut-off. For the example of the $1.25/day 2005 PPP line and the validation sample, targeting households who score 35–39 or less would target 47.0 percent of all households (second column) and produce a poverty rate among those targeted of 75.6 percent (third column).

Figure 15 also reports two other measures of targeting accuracy. The first is a version of inclusion ("% of poor who are targeted"). For the example of the $1.25/day 2005 PPP line and the validation sample with a cut-off of 35–39, 74.7 percent of all poor households are covered.

The final targeting measure in Figure 15 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For the $1.25/day 2005 PPP line, the validation sample, and a cut-off of 35–39, covering 3.1 poor households means leaking to 1 non-poor household.

10. Conclusion

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

The scorecard is inexpensive to use and can be understood by non-specialists. It is designed to be practical for local pro-poor organizations 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 HIES, tested on a different sub-sample from the 2005 HIES and on the 2000 HIES, and calibrated to six poverty lines (upper national, lower national, USAID "extreme", $1.25/day 2005 PPP, $1.75/day 2005 PPP, and $2.50/day 2005 PPP).

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

When the scorecard is applied to the validation sample with n = 16,384, the absolute difference between estimates and true poverty rates at a point in time is

always less than 1.8 percentage points and averages—across the six poverty lines—about 0.7 percentage points. With 90-percent confidence, the precision of these differences is +/–0.5 percentage points or less. The scorecard is usually more precise than direct measurement.

When used to measure change across independent samples of $n = 16{,}384$ in the 2005 and 2000 HIES, the average absolute difference between estimates and true changes is 1.9 percentage points, with a 90-percent confidence interval of +/–0.8 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 poverty scorecard is kept simple, using ten indicators that are inexpensive to collect and that are straightforward to verify. Points are all zeros or positive integers, and scores range from 0 (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 poverty scorecard is a practical, objective way for pro-poor programs in Bangladesh 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.

References

Adams, Niall M.; and David J. Hand. (2000) "Improving the Practice of Classifier Performance Assessment", *Neural Computation*, Vol. 12, pp. 305–311.

Baesens, Bart; Van Gestel, Tony; Viaene, Stijn; Stepanova, Maria; Suykens, Johan A. K.; and Jan Vanthienen. (2003) "Benchmarking State-of-the-Art Classification Algorithms for Credit Scoring", *Journal of the Operational Research Society*, Vol. 54, pp. 627–635.

Bollen, Kenneth A.; Glanville, Jennifer L.; and Guy Stecklov. (2007) "Socio-Economic Status, Permanent Income, and Fertility: A Latent-Variable Approach", *Population Studies*, Vol. 61, No. 1, pp. 15–34.

Caire, Dean. (2004) "Building Credit Scorecards for Small Business Lending in Developing Markets", Bannock Consulting, `http://www.microfinance.com/English/Papers/Scoring_SMEs_Hybrid.pdf`, accessed 17 April 2009.

Coady, David; Grosh, Margaret; and John Hoddinott. (2002) "The Targeting of Transfers in Developing Countries: Review of Experience and Lessons", `http://info.worldbank.org/etools/docs/library/79646/Dc%202003/courses/dc2003/readings/targeting.pdf`, accessed 17 April 2009.

Cochran, William G. (1977) *Sampling Techniques, Third Edition*, New York: Wiley, ISBN 0–471–16250–X.

Cortez, Rafeal; Mahmud, Farial; Rabbani, Ghulam; Hossain, Najmul; Faiz, Naushad; Huq, Nazmul; Sultana, Sharmin; and Tarana Tasnim. (2005) "Targeting Resources for the Poor in Bangladesh", Bangladesh Development Studies Paper No. 5, Washington, D.C.: World Bank, `http://siteresources.worldbank.org/BANGLADESHEXTN/Resources/FINAL-printversion_Paper-5.pdf`, accessed 17 April 2009.

Dawes, Robyn M. (1979) "The Robust Beauty of Improper Linear Models in Decision Making", *American Psychologist*, Vol. 34, No. 7, pp. 571–582.

Dowla, Asif; and Barua, Dipal. (2006) *The Poor Always Pay Back: The Grameen II Story*, Bloomfield, CT: Kumarian Press, ISBN 1565492315.

Efron, Bradley; and Robert J. Tibshirani. (1993) *An Introduction to the Bootstrap*, New York: Chapman and Hall, ISBN 0–412–04241–2.

Elbers, Chris; Lanjouw, Jean O; and Peter Lanjouw. (2003) "Micro-Level Estimation of Poverty and Inequality", *Econometrica*, Vol. 71, No. 1, pp. 355–364, http://siteresources.worldbank.org/DEC/Resources/micestpovineq.pdf, accessed 17 April 2009.

Filmer, Deon; and Lant Pritchett. (2001) "Estimating Wealth Effects without Expenditure Data—or Tears: An Application to Educational Enrollments in States of India", *Demography*, Vol. 38, No. 1, pp. 115–132.

_____; and Kinnon Scott. (2008) "Assessing Asset Indices", World Bank Policy Research Working Paper No. 4605, Washington, D.C., http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1149108, accessed 17 April 2009.

Friedman, Jerome H. (2001) "Greedy Function Approximation: A Gradient Boosting Machine", *Annals of Statistics*, Vol. 29, No. 5, pp. 1189–1232.

_____. (1997) "On Bias, Variance, 0–1 Loss, and the Curse-of-Dimensionality", *Data Mining and Knowledge Discovery*, Vol. 1, pp. 55–77.

Fuller, Rob. (2006) "Measuring the Poverty of Microfinance Clients in Haiti", http://www.microfinance.com/English/Papers/Scoring_Poverty_Haiti_Fuller.pdf, accessed 17 April 2009.

Goodman, L.A.; and Kruskal, W.H. (1979) *Measures of Association for Cross Classification*, New York, NY: Springer-Verlag, ISBN 0–38–790443–3.

Grootaert, Christiaan; and Jeanine Braithwaite. (1998) "Poverty Correlates and Indicator-Based Targeting in Eastern Europe and the Former Soviet Union", World Bank Policy Research Working Paper No. 1942, Washington, D.C., http://www.worldbank.org/html/dec/Publications/Workpapers/WPS1900series/wps1942/wps1942.pdf, accessed 17 April 2009.

Grosh, Margaret; and Judy L. Baker. (1995) "Proxy Means Tests for Targeting Social Programs: Simulations and Speculation", LSMS Working Paper No. 118, Washington, D.C.: World Bank, http://poverty2.forumone.com/library/view/5496/, accessed 17 April 2009.

Gwatkin, Davidson R.; Rutstein, Shea; Johnson, Kiersten; Suliman, Eldaw; Wagstaff, Adam; and Agbessi Amouzou. (n.d.) "Socio-Economic Differences in Health, Nutrition, and Population: Bangladesh", Country Reports on HNP and Poverty, Washington, D.C.: World Bank, http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2007/04/12/000020953_20070412090427/Rendered/PDF/394650banglade1io0economic01public1.pdf, accessed 17 April 2009.

Hand, David J. (2006) "Classifier Technology and the Illusion of Progress", *Statistical Science*, Vol. 22, No. 1, pp. 1–15.

_____; and Veronica Vinciotti. (2003) "Local Versus Global Models for Classification Problems: Fitting Models Where It Matters", *American Statistician*, Vol. 57, No. 2, pp. 124–131.

Haslett, Stephen; and Geoffery Jones. (2004) "Local Estimation of Poverty and Malnutrition in Bangladesh", Bangladesh Bureau of Statistics and the United Nations World Food Program, http://www.povertymap.net/publications/doc/SAE%20-%20Final%20Report%20-%20May%202004.pdf, accessed 17 April 2009.

Hoadley, Bruce; and Robert M. Oliver. (1998) "Business Measures of Scorecard Benefit", *IMA Journal of Mathematics Applied in Business and Industry*, Vol. 9, pp. 55–64.

International Comparison Project. (2008) "Tables of Results", Washington, D.C.: World Bank, http://siteresources.worldbank.org/ICPINT/Resources/icp-final-tables.pdf, accessed 17 April 2009.

IRIS Center. (2007a) "Client Assessment Survey—Bangladesh", http://www.povertytools.org/USAID_documents/Tools/Current_Tools/USAID_PAT_Bangl_7-2007.xls, accessed 17 April 2009.

_____. (2007b) "Manual for the Implementation of USAID Poverty Assessment Tools", http://www.povertytools.org/training_documents/Manuals/USAID_PAT_Manual_Eng.pdf, accessed 17 April 2009.

_____. (2007c) "Introduction to Sampling for the Implementation of PATs", http://www.povertytools.org/training_documents/Sampling/Introduction_Sampling.ppt, accessed 17 April 2009.

_____. (2005) "Notes on Assessment and Improvement of Tool Accuracy", http://www.povertytools.org/other_documents/AssessingImproving_Accuracy.pdf, accessed 17 April 2009.

Johnson, Glenn. (2007) "Lesson 3: Two-Way Tables—Dependent Samples", http://www.stat.psu.edu/online/development/stat504/03_2way/53_2way_compare.htm, accessed 17 April 2009.

Kam, S.P.; Hossain, M.; Bose, M.L.; and L. Villano. (2004) "Mapping Rural Poverty in Bangladesh: How Census Data Systems Can Help", International Rice Research Institute, http://www.nscb.gov.ph/poverty/conference/papers/11_Kam%20Suan%20Pheng.pdf, accessed 17 April 2009.

Kolesar, Peter; and Janet L. Showers. (1985) "A Robust Credit Screening Model Using Categorical Data", *Management Science*, Vol. 31, No. 2, pp. 124–133.

Lindelow, Magnus. (2006) "Sometimes More Equal Than Others: How Health Inequalities Depend on the Choice of Welfare Indicator", *Health Economics*, Vol. 15, pp. 263–279.

Lovie, Alexander D.; and Patricia Lovie. (1986) "The Flat Maximum Effect and Linear Scoring Models for Prediction", *Journal of Forecasting*, Vol. 5, pp. 159–168.

Martinelli, César; and Susan W. Parker. (2007) "Deception and Misreporting in a Social Program", Centro de Investigación Económica and Instituto Tecnológico Autónomo de México, http://ciep.itam.mx/~martinel/lies4.pdf, accessed 17 April 2009.

Mathiassen, Astrid. (2008) "The Predictive Ability of Poverty Models: Empirical Evidence from Uganda", Discussion Paper No. 560, Statistics Norway, Division for Development Cooperation, http://www.ssb.no/publikasjoner/DP/pdf/dp560.pdf.

Matul, Michal; and Sean Kline. (2003) "Scoring Change: Prizma's Approach to Assessing Poverty", MFC Spotlight Note No. 4, Warsaw, Poland: Microfinance Centre for Central and Eastern Europe and the New Independent States, http://www.mfc.org.pl/doc/Research/ImpAct/SN/MFC_SN04_eng.pdf, accessed 17 April 2009.

McNemar, Quinn. (1947) "Note on the Sampling Error of the Difference between Correlated Proportions or Percentages", *Psychometrika*, Vol. 17, pp. 153–157.

Microfinance Risk Management, L.L.C. (2009) "Data-Entry Software for a Simple Poverty Scorecard for Bangladesh", http://www.microfinance.com/#Bangladesh, accessed January 28, 2009.

Moffitt, Robert. (1991) "Program Evaluation with Non-Experimental Data", *Evaluation Review*, Vol. 15, No. 3, pp. 291–314.

Montgomery, Mark; Gragnolati, Michele; Burke, Kathleen A.; and Edmundo Paredes. (2000) "Measuring Living Standards with Proxy Variables", *Demography*, Vol. 37, No. 2, pp. 155–174.

Myers, James H.; and Edward W. Forgy. (1963) "The Development of Numerical Credit Evaluation Systems", *Journal of the American Statistical Association*, Vol. 58, No. 303, pp. 779–806.

Narayan, Ambar; and Nobuo Yoshida. (2005) "Proxy Means Tests for Targeting Welfare Benefits in Sri Lanka", Report No. SASPR–7, Washington, D.C.: World Bank, http://siteresources.worldbank.org/EXTSAREGTOPPOVRED/Resources/493440-1102216396155/572861-1102221461685/Proxy+Means+Test+for+Targeting+Welfare+Benefits.pdf, accessed 17 April 2009.

Onwujekwe, Obinna; Hanson, Kara; and Julia Fox-Rushby. (2006) "Some Indicators of Socio-Economic Status May Not Be Reliable and Use of Indices with These Data Could Worsen Equity", *Health Economics*, Vol. 15, pp. 639–644.

Rutherford, Stuart. (2009) *The Pledge: ASA, Peasant Politics, and Microfinance in the Development of Bangladesh*, New York: Oxford University Press, ISBN 0195380657.

_____. (2006) "Grameen II: The First Five Years 2001–2005: A 'Grounded View' of Grameen's New Initiative".

Rutstein, Shea Oscar; and Kiersten Johnson. (2004) "The DHS Wealth Index", DHS Comparative Reports No. 6, Calverton, MD: ORC Macro, http://www.measuredhs.com/pubs/pdf/CR6/CR6.pdf, accessed 19 April 2009.

Sahn, David E.; and David C. Stifel. (2003) "Exploring Alternative Measures of Welfare in the Absence of Expenditure Data", *Review of Income and Wealth*, Series 49, No. 4, pp. 463–489.

_____. (2000) "Poverty Comparisons Over Time and Across Countries in Africa", *World Development*, Vol. 28, No. 12, pp. 2123–2155.

SAS Institute Inc. (2004) "The LOGISTIC Procedure: Rank Correlation of Observed Responses and Predicted Probabilities", in *SAS/STAT User's Guide, Version 9*, Cary, NC, http://support.sas.com/documentation/cdl/en/statug/59654/HTML/default/statug_logistic_sect035.htm, accessed 17 April 2009.

Schapire, Robert E. (2001) "The Boosting Approach to Machine Learning: An Overview", AT&T Labs, http://www.cs.princeton.edu/~schapire/boost.html, accessed 17 April 2009

Schreiner, Mark. (2009a) "A Simple Poverty Scorecard for Peru", http://www.microfinance.com/English/Papers/Scoring_Poverty_Peru.pdf, accessed 17 April 2009.

_____. (2009b) "A Simple Poverty Scorecard for the Philippines", http://www.microfinance.com/English/Papers/Scoring_Poverty_Philippines.pdf, accessed 17 April 2009.

_____. (2008a) "A Simple Poverty Scorecard for Ecuador", http://www.microfinance.com/English/Papers/Scoring_Poverty_Ecuador.pdf, accessed 17 April 2009.

_____. (2008b) "A Simple Poverty Scorecard for Peru", http://www.microfinance.com/English/Papers/Scoring_Poverty_Peru_May_2008.pdf, accessed 17 April 2009.

_____. (2008c) "A Simple Poverty Scorecard for India", http://www.microfinance.com/English/Papers/Scoring_Poverty_India.pdf, accessed 17 April 2009.

_____. (2006a) "A Simple Poverty Scorecard for Bangladesh", http://www.microfinance.com/English/Papers/Scoring_Poverty_Bangladesh_2006.pdf, accessed 17 April 2009.

_____. (2006b) "Is One Simple Poverty Scorecard Enough for India?", memo for Grameen Foundation, http://www.microfinance.com/English/Papers/Scoring_Poverty_India_Segments.pdf, accessed 17 April 2009.

_____. (2005a) "Un Índice de Pobreza para México", memo for Grameen Foundation, http://www.microfinance.com/Castellano/Documentos/Scoring_Pobreza_Mexico.pdf, accessed 17 April 2009.

_____. (2005b) "IRIS Questions on Poverty Scorecards", memo for Grameen Foundation, http://www.microfinance.com/English/Papers/Scoring_Poverty_Response_to_IRIS.pdf, accessed 17 April 2009.

_____. (2002) *Scoring: The Next Breakthrough in Microfinance?* Occasional Paper No. 7, Consultative Group to Assist the Poor, Washington, D.C., http://pdf.usaid.gov/pdf_docs/PNACQ633.pdf, accessed 17 April 2009.

_____; Matul, Michal; Pawlak, Ewa; and Sean Kline. (2004) "Poverty Scorecards: Lessons from a Microlender in Bosnia-Herzegovina", Microfinance Risk Management, http://www.microfinance.com/English/Papers/Scoring_Poverty_in_BiH_Short.pdf, accessed 17 April 2009.

Sillers, Don. (2006) "National and International Poverty Lines: An Overview", Washington, D.C.: United States Agency for International Development, http://www.microlinks.org/file_download.php/Poverty_lines___An_Overview_1_4_06.pdf?URL_ID=12247&filename=11549869641Poverty_lines___An_Overview_1_4_06.pdf&filetype=application%2Fpdf&filesize=108185&name=Poverty_lines___An_Overview_1_4_06.pdf&location=user-S/, accessed 17 April 2009.

Smillie, Ian. (2009) *Freedom from Want: The Remarkable Success Story of BRAC, the Global Grassroots Organization That's Winning the Fight Against Poverty*, Sterling, VA: Kumarian Press, ISBN 1565492943.

Stifel, David; and Luc Christiaensen. (2007) "Tracking Poverty over Time in the Absence of Comparable Consumption Data", *World Bank Economic Review*, Vol. 21, No. 2, pp. 317–341.

Stillwell, William G.; Barron, F. Hutton; and Ward Edwards. (1983) "Evaluating Credit Applications: A Validation of Multi-Attribute Utility Weight Elicitation Techniques", *Organizational Behavior and Human Performance*, Vol. 32, pp. 87–108.

Tarozzi, Alesandro. (2008) "Can Census Data Alone Signal Heterogeneity in the Estimation of Poverty Maps?", http://www.econ.duke.edu/~taroz/TarozziHet2008.pdf, accessed 17 April 2009.

Tarozzi, Alessandro; and Angus Deaton. (2007) "Using Census and Survey Data to Estimate Poverty and Inequality for Small Areas", http://www.princeton.edu/~deaton/downloads/20080301SmallAreas_FINAL.pdf, accessed 17 April 2009.

Toohig, Jeff. (2008) "PPI Pilot Training Guide", Grameen Foundation, http://www.progressoutofpoverty.org/toolkit, accessed 17 April 2009.

United States Congress. (2002) "Amendments to the Microenterprise for Self-Reliance Act of 2000 (Public Law 106–309)", October 8, http://www.microlinks.org/file_download.php/AmendMicroenterpriseAct2000.pdf?URL_ID=7744&filename=11205460851AmendMicroenterpriseAct2000.pdf&filetype=application%2Fpdf&filesize=95834&name=AmendMicroenterpriseAct2000.pdf&location=user-S/, accessed 17 April 2009.

Wagstaff, Adam; and Naoko Watanabe. (2003) "What Difference Does the Choice of SES Make in Health Inequality Measurement?", *Health Economics*, Vol. 12, No. 10, pp. 885–890.

Wainer, Howard. (1976) "Estimating Coefficients in Linear Models: It Don't Make No Nevermind", *Psychological Bulletin*, Vol. 83, pp. 223–227.

Wodon, Quentin T. (1997) "Targeting the Poor Using ROC Curves", *World Development*, Vol. 25, No. 12, pp. 2083–2092.

Zeller, Manfred. (2004) "Review of Poverty Assessment Tools", Accelerated Microenterprise Advancement Project, http://www.microlinks.org/file_download.php/Review.pdf?URL_ID=7761&filename=11205482561Review.pdf&filetype=application%2Fpdf&filesize=443998&name=Review.pdf&location=user-S/, accessed 17 April 2009.

_____; Alcaraz V., Gabriela; and Julia Johannsen. (2004) "Developing and Testing Poverty-Assessment Tools: Results from Accuracy Tests in Bangladesh", Accelerated Microenterprise Advancement Project, http://www.microfinancegateway.org/files/22550_Bangladesh_PAT.pdf, accessed 17 April 2009.

_____; Sharma, Manohar; Henry, Carla; and Cécile Lapenu. (2006) "An Operational Method for Assessing the Poverty Outreach Performance of Development Policies and Projects: Results of Case Studies in Africa, Asia, and Latin America", *World Development*, Vol. 34, No. 3, pp. 446–464.

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

			% with expenditure below a poverty line					
			National	National	USAID	International (2005 PPP)		
Sub-sample	**Year**	**Households**	**Upper**	**Lower**	**'Extreme'**	**$1.25/day**	**$1.75/day**	**$2.50/day**
All Bangladesh	2005	10,080	37.2	23.1	17.9	47.5	72.9	87.5
	2000	7,440	46.6	32.2	22.4	54.3	76.3	90.1
Construction								
Selecting indicators and points	2005	3,334	36.8	23.2	17.9	47.7	72.2	87.2
Calibration								
Associating scores with likelihoods	2005	3,421	38.0	23.4	18.2	47.4	74.0	88.7
Validation								
Measuring accuracy	2005	3,325	36.9	22.7	17.7	47.5	72.3	86.4
Measuring accuracy	2000	7,440	46.6	32.2	22.4	54.3	76.3	90.1
Change between construction and calibration to validation (percentage points)								
2005 to 2005		6,755 and 3,325	+0.5	+0.6	+0.3	0.0	+0.8	+1.5
2005 to 2000		6,755 and 7,440	–9.2	–8.9	–4.4	–6.8	–3.2	–2.2

Source: 2000 and 2005 HIES

Figure 3: Average poverty lines and poverty rates by 2005 stratum (household level)

Stratum of 2005	Line or rate	Poverty line (nominal taka of 2000 or 2005/person/day) and poverty rate (%)											
		National Upper		National Lower		USAID 'Extreme'		International (2005 PPP) $1.25/day		$1.75/day		$2.50/day	
		2000	2005	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
Barisal Rural	Line	23.47	30.45	19.08	24.76	17.55	20.91	25.66	34.25	35.93	47.95	51.32	68.50
	Rate	50.4	50.0	31.3	34.5	23.7	24.6	59.6	59.6	81.5	82.5	93.1	92.0
Barisal Municipality	Line	25.12	31.26	21.14	26.31	18.81	24.82	27.46	35.16	38.45	49.22	54.93	70.31
	Rate	31.5	37.7	20.0	25.0	15.5	19.2	40.0	45.0	63.0	63.5	79.5	80.0
Chittagong Rural	Line	24.10	29.30	20.35	24.74	18.79	24.59	26.36	32.96	36.90	46.14	52.71	65.91
	Rate	41.6	31.3	26.9	15.4	19.8	14.7	49.7	44.4	74.8	76.1	91.5	92.4
Chittagong Municipality	Line	27.21	31.67	21.16	24.63	18.93	25.62	29.76	35.62	41.66	49.87	59.52	71.24
	Rate	38.1	27.4	23.1	11.3	17.5	13.5	45.0	36.5	60.6	61.1	83.1	81.7
Chittagong SMA	Line	32.18	38.50	21.03	25.17	25.22	32.17	35.18	43.31	49.26	60.63	70.37	86.62
	Rate	39.1	23.9	9.1	3.9	18.1	11.1	46.6	36.7	71.9	61.1	86.9	77.2
Dhaka Rural	Line	21.39	27.68	18.50	23.95	15.44	22.03	23.39	31.14	32.75	43.59	46.78	62.28
	Rate	52.8	36.0	40.6	23.3	25.7	17.2	60.2	45.9	81.7	70.8	92.5	87.2
Dhaka Municipality	Line	24.39	29.25	20.53	24.63	18.02	22.62	26.67	32.90	37.34	46.06	53.34	65.80
	Rate	33.0	28.5	24.0	17.2	15.5	13.2	37.0	36.1	56.0	56.1	79.5	75.5
Dhaka SMA	Line	28.13	33.45	22.28	26.50	22.34	27.46	30.76	37.63	43.06	52.68	61.51	75.25
	Rate	24.1	15.2	11.6	5.8	11.9	7.1	28.6	21.7	45.9	50.0	71.0	69.2

Source: 2000 and 2005 HIES

Figure 3 (cont.): Average poverty lines and poverty rates by 2005 stratum (household level)

Stratum of 2005	Line or rate	Poverty line (nominal taka of 2000 or 2005/person/day) and poverty rate (%)											
		National Upper		National Lower		USAID 'Extreme'		International (2005 PPP) $1.25/day		$1.75/day		$2.50/day	
		2000	2005	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
Khulna Rural	Line	19.14	24.42	16.80	21.43	15.20	19.12	20.93	27.46	29.30	38.44	41.85	54.92
	Rate	45.9	43.9	32.6	30.6	23.1	21.1	54.3	54.5	80.2	79.2	94.3	92.0
Khulna Municipality	Line	22.70	27.13	18.44	22.04	17.62	20.96	24.82	30.52	34.75	42.72	49.65	61.03
	Rate	31.9	31.1	20.0	17.5	16.9	15.2	41.3	40.0	59.4	62.0	71.3	77.0
Khulna SMA	Line	25.41	30.83	19.12	23.20	18.06	21.37	27.78	34.67	38.90	48.54	55.57	69.34
	Rate	45.0	53.6	24.5	35.7	21.4	26.4	50.5	62.9	70.5	83.6	85.9	92.9
Rajshahi Rural	Line	19.65	25.20	16.81	21.56	14.24	19.81	21.48	28.34	30.08	39.68	42.97	56.68
	Rate	57.6	49.6	42.4	33.6	27.6	24.4	65.8	60.8	86.3	84.4	95.7	94.5
Rajshahi Municipality	Line	23.26	28.16	18.90	22.89	16.34	21.22	25.43	31.68	35.61	44.35	50.87	63.35
	Rate	42.1	48.5	32.9	29.2	20.8	22.5	49.6	60.1	66.7	78.5	81.2	88.2
Rajshahi SMA	Line	22.44	28.14	18.94	23.75	16.26	22.91	24.53	31.65	34.35	44.31	49.07	63.30
	Rate	42.5	19.0	30.0	12.0	19.4	11.0	51.9	28.0	77.5	59.0	90.6	80.0
Sylhet Rural	Line	21.72	27.03	18.42	22.93	17.43	21.31	23.75	30.41	33.25	42.57	47.49	60.81
	Rate	37.9	33.2	22.4	19.5	17.6	15.5	49.4	43.9	76.5	70.0	90.3	89.7
Sylhet Municipality	Line	27.71	33.54	21.90	26.51	20.85	24.50	30.30	37.73	42.42	52.82	60.60	75.46
	Rate	47.5	16.3	32.5	10.0	20.0	8.1	55.0	20.0	77.5	48.8	85.0	65.6
All Bangladesh:	Line	22.41	28.27	18.75	23.58	16.88	22.41	24.51	31.80	34.31	44.52	49.02	63.59
	Rate	46.6	37.2	32.2	23.1	22.4	17.9	54.3	47.5	76.3	72.9	90.1	87.5

Source: 2000 and 2005 HIES

Figure 3 (cont.): Average poverty lines and poverty rates by 2005 stratum (person level)

Stratum of 2005	Line or rate	Poverty line (nominal taka of 2000 or 2005/person/day) and poverty rate (%)											
		National Upper		National Lower		USAID 'Extreme'		International (2005 PPP) $1.25/day		$1.75/day		$2.50/day	
		2000	2005	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
Barisal Rural	Line	23.47	30.45	19.08	24.76	17.55	20.91	25.66	34.25	35.93	47.95	51.32	68.50
	Rate	55.1	54.1	36.0	37.2	27.6	27.1	64.9	63.1	85.4	85.1	94.5	93.6
Barisal Municipality	Line	25.12	31.26	21.14	26.31	18.81	24.82	27.46	35.16	38.45	49.22	54.93	70.31
	Rate	32.0	40.4	21.7	26.4	16.2	19.3	40.4	47.9	63.2	65.4	81.7	82.2
Chittagong Rural	Line	24.10	29.30	20.35	24.74	18.79	24.59	26.36	32.96	36.90	46.14	52.71	65.91
	Rate	46.2	36.0	30.2	18.7	23.0	18.0	53.9	49.0	77.2	80.6	92.6	94.4
Chittagong Municipality	Line	27.21	31.67	21.16	24.63	18.93	25.62	29.76	35.62	41.66	49.87	59.52	71.24
	Rate	40.4	29.8	25.5	12.8	19.7	15.1	47.2	38.8	61.8	64.0	85.6	84.2
Chittagong SMA	Line	32.18	38.50	21.03	25.17	25.22	32.17	35.18	43.31	49.26	60.63	70.37	86.62
	Rate	46.1	26.6	11.5	5.3	23.0	12.9	53.9	39.3	77.8	63.1	89.6	77.5
Dhaka Rural	Line	21.39	27.68	18.50	23.95	15.44	22.03	23.39	31.14	32.75	43.59	46.78	62.28
	Rate	55.9	39.0	43.7	26.1	28.0	19.5	62.9	48.7	83.5	72.3	93.4	88.2
Dhaka Municipality	Line	24.39	29.25	20.53	24.63	18.02	22.62	26.67	32.90	37.34	46.06	53.34	65.80
	Rate	34.2	29.9	26.3	18.9	17.1	14.7	38.4	37.7	56.4	56.5	81.6	75.8
Dhaka SMA	Line	28.13	33.45	22.28	26.50	22.34	27.46	30.76	37.63	43.06	52.68	61.51	75.25
	Rate	26.5	17.5	13.0	7.0	13.3	8.5	30.8	23.9	48.6	51.2	72.9	70.8

Source: 2000 and 2005 HIES

Figure 3 (cont.): Average poverty lines and poverty rates by 2005 stratum (person level)

		Poverty line (nominal taka of 2000 or 2005/person/day) and poverty rate (%)											
		National Upper		National Lower		USAID 'Extreme'		International (2005 PPP) $1.25/day		$1.75/day		$2.50/day	
Stratum of 2005	**Line or rate**	**2000**	**2005**	**2000**	**2005**	**2000**	**2005**	**2000**	**2005**	**2000**	**2005**	**2000**	**2005**
Khulna Rural	Line	19.14	24.42	16.80	21.43	15.20	19.12	20.93	27.46	29.30	38.44	41.85	54.92
	Rate	46.4	46.4	34.0	32.7	23.1	23.2	54.1	56.5	79.7	79.9	95.0	93.0
Khulna Municipality	Line	22.70	27.13	18.44	22.04	17.62	20.96	24.82	30.52	34.75	42.72	49.65	61.03
	Rate	32.0	32.9	19.8	19.1	16.1	16.5	40.2	41.7	59.4	62.3	70.0	77.3
Khulna SMA	Line	25.41	30.83	19.12	23.20	18.06	21.37	27.78	34.67	38.90	48.54	55.57	69.34
	Rate	46.1	55.4	26.7	38.1	22.8	27.7	50.4	65.0	69.6	84.1	86.3	94.2
Rajshahi Rural	Line	19.65	25.20	16.81	21.56	14.24	19.81	21.48	28.34	30.08	39.68	42.97	56.68
	Rate	58.5	52.3	44.0	35.6	29.3	26.2	66.4	63.0	87.3	85.1	95.8	94.3
Rajshahi Municipality	Line	23.26	28.16	18.90	22.89	16.34	21.22	25.43	31.68	35.61	44.35	50.87	63.35
	Rate	44.7	49.6	35.1	31.5	22.6	24.9	51.2	60.7	65.6	78.8	79.8	88.2
Rajshahi SMA	Line	22.44	28.14	18.94	23.75	16.26	22.91	24.53	31.65	34.35	44.31	49.07	63.30
	Rate	43.4	20.8	31.6	11.7	22.1	10.3	54.7	29.7	78.7	61.6	92.5	81.5
Sylhet Rural	Line	21.72	27.03	18.42	22.93	17.43	21.31	23.75	30.41	33.25	42.57	47.49	60.81
	Rate	41.9	36.1	26.1	22.3	20.9	17.8	53.9	47.4	78.6	72.4	89.8	91.3
Sylhet Municipality	Line	27.71	33.54	21.90	26.51	20.85	24.50	30.30	37.73	42.42	52.82	60.60	75.46
	Rate	49.6	18.6	35.2	11.0	24.2	9.3	55.1	21.8	78.4	51.2	86.9	69.4
All Bangladesh:	Line	22.51	28.33	18.82	23.62	16.99	22.48	24.62	31.86	34.47	44.61	49.24	63.72
	Rate	48.9	40.0	34.3	25.1	24.4	19.9	56.5	50.1	77.9	74.6	90.9	88.6

Source: 2000 and 2005 HIES

Figure 4: Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly indicative of poverty)
114	What is the main construction material of the walls? (Mud brick, hemp/hay/bamboo, or other; C.I. sheet/wood; Brick/cement)
113	Does the household own any fans? (No; Yes)
110	Does any household member work for a daily wage? (Yes; No)
99	Does the household have an electricity connection? (No; Yes)
98	What is the highest educational attainment by any household member? (Class 4 or lower; Class 5 or higher, but lower or equal to SSC/equivalent; HSC/equivalent or higher)
94	Does the household own a television? (No; Yes)
86	Does the household own a clock? (No; Yes)
79	Does the household own a wristwatch? (No; Yes)
71	How many household members are 11-years-old or younger? (Four or more; Three; Two; One; None)
70	What is the main construction material of the roof? (Tile/wood, hemp/hay/bamboo, or other; C.I. sheet/wood; Cement)
60	What type of latrine does the household use? (Open field; *Kacha* latrine (temporary or permanent), *pacca* latrine (pit or water seal), or sanitary)
55	How many rooms does the household occupy (excluding rooms used for business)? (One, two, or three; Four; Five or more)
51	Does the household own a two-in-one cassette player? (No; Yes)
46	What is the total cultivable agricultural land owned by the household? (None, or less than 0.5 acres; More than 0.5 acres, but less than 1 acre; More than 1 acre)
45	How many household members aged 6 to 11 are currently attending school? (Not all; All; No children aged 6 to 11)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly associated with poverty)
43	Does the household own a refrigerator or freezer? (No; Yes)
29	Does the household own a camera or camcorder? (No; Yes)
23	Does the household own a VCR/VCP? (No; Yes)
22	What is the main source of drinking water? (Tube well, pond/river, well, waterfall/spring, or other; Supply water)
22	What is the main source of water for other use? (Waterfall/spring, or other; Well; Pond/river; Tube well; Supply water)
19	Does the household have any telephone connection or own any mobile phone? (No; Yes)
19	Does your dwelling possess a separate kitchen? (No; Yes)
17	Does the household own a sewing machine? (No; Yes)
15	Does the household own a motorcycle or scooter? (No; Yes)
13	What was the total operating land of the household? (No land, or less than 1.5 acres; 1.5 acres or more) (Total operating land = Total cultivable agricultural land owned + Total dwelling-house/Homestead land owned + Total cultivable agricultural land rented/share-cropped/mortgaged in − Total cultivable agricultural land rented/share-cropped/mortgaged out)
11	What is your present occupancy status? (Government residence, or other; Provided free by relative/employer; Squatter; Renter; Owner; Other status)
11	Does the household own a carpet? (No; Yes)
7	Does the household presently own a plough and yoke? (No; Yes)
6	Does the household own any chickens? (No; Yes)
6	Does the household presently own a fishing net? (No; Yes)

Source: 2005 HIES and the USD1.25/day 2005 PPP poverty line.

Upper National Poverty Line Tables

2005 Scorecard Applied to Validation Sample

(and tables pertaining to all six poverty lines)

Figure 5 (Upper 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	85.7
10–14	88.7
15–19	86.9
20–24	73.1
25–29	63.2
30–34	49.7
35–39	35.7
40–44	27.2
45–49	21.6
50–54	12.4
55–59	8.7
60–64	7.3
65–69	2.2
70–74	1.4
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (Upper 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	272	÷	272	=	100.0
5–9	967	÷	1,128	=	85.7
10–14	2,771	÷	3,124	=	88.7
15–19	5,694	÷	6,550	=	86.9
20–24	5,038	÷	6,892	=	73.1
25–29	5,699	÷	9,014	=	63.2
30–34	4,270	÷	8,597	=	49.7
35–39	4,076	÷	11,411	=	35.7
40–44	3,081	÷	11,333	=	27.2
45–49	2,230	÷	10,318	=	21.6
50–54	967	÷	7,781	=	12.4
55–59	603	÷	6,927	=	8.7
60–64	324	÷	4,414	=	7.3
65–69	79	÷	3,677	=	2.2
70–74	51	÷	3,773	=	1.4
75–79	0	÷	2,104	=	0.0
80–84	0	÷	1,090	=	0.0
85–89	0	÷	840	=	0.0
90–94	0	÷	442	=	0.0
95–100	0	÷	313	=	0.0

Number of households normalized to add up to 100,000.
Based on the 2005 HIES.

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						
	<USAID	≥USAID and <Lower	≥Lower and <Upper	≥Upper and <$1.25/day	≥$1.25/day and <$1.75/day	≥$1.75/day and <$2.50/day	≥$2.50/day
Score	<Taka 22.48	≥Taka 22.48 and <Taka 23.62	≥Taka 23.62 and <Taka 28.33	≥Taka 28.33 and <Taka 31.86	≥Taka 31.86 and <Taka 44.61	≥Taka 44.61 and <Taka 63.72	≥Taka 63.72
0–4	100.0	0.0	0.0	0.0	0.0	0.0	0.0
5–9	71.6	0.0	14.1	8.9	5.4	0.0	0.0
10–14	57.2	17.4	14.2	3.0	8.3	0.0	0.0
15–19	53.8	10.5	22.6	5.8	5.7	1.6	0.0
20–24	36.7	12.8	23.6	11.9	13.6	1.4	0.0
25–29	27.5	10.1	25.7	11.5	22.4	2.5	0.4
30–34	23.3	6.4	20.0	17.6	27.5	4.5	0.7
35–39	15.7	3.2	16.9	14.1	36.1	10.7	3.4
40–44	6.8	3.1	17.3	12.7	37.4	17.8	4.9
45–49	5.9	3.7	12.0	9.7	35.5	26.0	7.3
50–54	2.9	1.8	7.7	7.5	39.8	25.4	14.9
55–59	2.9	1.1	4.8	5.2	31.6	31.1	23.4
60–64	0.3	2.5	4.5	2.1	26.1	28.0	36.4
65–69	0.0	0.4	1.7	2.0	27.8	33.0	35.1
70–74	0.0	0.0	1.4	0.0	22.1	26.5	50.0
75–79	0.0	0.0	0.0	1.6	15.0	30.9	52.5
80–84	0.0	0.0	0.0	0.0	5.2	25.5	69.3
85–89	0.0	0.0	0.0	0.0	1.8	25.3	72.9
90–94	0.0	0.0	0.0	0.0	0.0	4.6	95.4
95–100	0.0	0.0	0.0	0.0	0.0	26.1	73.9

All poverty likelihoods are in percentage units. All US dollar lines are in 2005 PPP.

Figure 8 (Upper national poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value (2005)			
		Confidence interval (+/– percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	–7.9	5.5	5.7	6.2
10–14	–6.3	4.0	4.1	4.5
15–19	+8.8	2.1	2.6	3.4
20–24	–0.8	2.3	2.7	3.6
25–29	+0.2	2.2	2.6	3.2
30–34	–6.0	4.1	4.4	4.6
35–39	+1.0	1.9	2.2	3.1
40–44	–2.9	2.4	2.7	3.0
45–49	+2.7	1.7	2.0	2.5
50–54	+1.0	1.5	1.8	2.4
55–59	+0.6	1.4	1.6	2.1
60–64	+2.0	1.4	1.6	2.0
65–69	+1.3	0.5	0.6	0.8
70–74	+0.9	0.3	0.4	0.5
75–79	–0.6	0.6	0.6	0.8
80–84	–8.8	6.6	7.0	8.3
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 9 (All poverty lines): Differences, precision of differences, and the α factor for bootstrapped estimates of poverty rates for groups of households at a point in time, 2005 scorecard applied to 2005 validation sample and to the 2000 HIES

	Poverty line					
	National Upper	National Lower	USAID 'Extreme'	International (2005 PPP)		
				$1.25/day	$1.75/day	$2.50/day
Estimate minus true value						
2005	0.0	–0.1	–0.5	–1.7	0.0	+1.8
2000	–1.3	–3.2	+0.9	+0.5	+2.7	+0.9
Precision of difference						
2005	0.5	0.5	0.5	0.5	0.5	0.4
2000	0.5	0.5	0.5	0.5	0.4	0.3
α factor						
2005	0.81	0.84	0.88	0.82	0.89	1.03
2000	0.88	0.95	0.95	0.82	0.79	0.81

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 (Upper 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, 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	+0.2	47.6	56.0	72.1
4	–0.1	32.9	39.8	52.0
8	+0.0	23.1	27.0	36.2
16	+0.4	16.4	19.5	26.0
32	+0.3	11.4	13.9	17.3
64	+0.3	8.5	10.0	12.7
128	+0.1	5.7	6.9	8.9
256	+0.0	4.1	4.8	6.6
512	–0.0	2.9	3.6	4.6
1,024	+0.0	2.0	2.3	3.0
2,048	+0.0	1.4	1.7	2.2
4,096	–0.0	1.0	1.2	1.6
8,192	–0.1	0.7	0.9	1.1
16,384	–0.0	0.5	0.6	0.8

Figure 11 (All poverty lines): Differences, precision of differences, and the α factor for bootstrapped estimates of changes in group's poverty rates between two points in time, 2005 scorecard applied to the 2005 validation sample and to the 2000 HIES

	Poverty line					
	National Upper	National Lower	USAID 'Extreme'	International (2005 PPP)		
				$1.25/day	$1.75/day	$2.50/day
Estimate minus true value						
2005 to 2000	–1.3	–3.1	+1.5	+2.2	+2.7	–0.8
Precision of difference						
2005 to 2000	0.8	0.7	0.7	0.8	0.7	0.5
α factor						
2005 to 2000	0.84	0.88	0.92	0.81	0.84	0.88

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 12 (Upper national poverty line): Differences and precision of differences for bootstrapped estimates of changes in group's poverty rates between two points in time, 2005 scorecard applied to the 2005 validation sample and the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	–1.3	73.3	82.7	102.9
4	–1.6	46.1	58.6	69.1
8	–2.1	32.3	38.0	50.6
16	–1.8	24.3	28.7	38.4
32	–1.9	16.7	20.4	27.1
64	–1.6	11.8	14.1	20.1
128	–1.5	8.7	10.6	14.6
256	–1.4	6.3	7.3	9.9
512	–1.3	4.2	5.1	6.7
1,024	–1.4	2.9	3.4	4.5
2,048	–1.3	2.0	2.4	3.2
4,096	–1.3	1.4	1.7	2.3
8,192	–1.3	1.0	1.2	1.7
16,384	–1.3	0.8	0.9	1.2

Figure 13 (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 14 (Upper national poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2005 validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.3	36.6	0.0	63.1	63.4	–98.5
5–9	1.3	35.5	0.1	63.1	64.4	–92.6
10–14	4.3	32.6	0.2	62.9	67.2	–76.1
15–19	9.4	27.5	1.7	61.5	70.9	–44.5
20–24	14.5	22.4	3.5	59.6	74.1	–12.0
25–29	20.3	16.6	6.7	56.4	76.7	+28.2
30–34	25.1	11.8	10.5	52.6	77.7	+64.4
35–39	29.2	7.7	17.8	45.3	74.5	+51.7
40–44	32.6	4.2	25.7	37.4	70.1	+30.3
45–49	34.8	2.1	33.9	29.2	64.0	+8.1
50–54	35.8	1.1	40.7	22.5	58.2	–10.2
55–59	36.4	0.5	46.9	16.2	52.6	–27.3
60–64	36.7	0.2	51.1	12.0	48.7	–38.5
65–69	36.7	0.1	54.7	8.4	45.2	–48.3
70–74	36.8	0.1	58.4	4.7	41.5	–58.5
75–79	36.8	0.1	60.5	2.6	39.4	–64.1
80–84	36.9	0.0	61.5	1.6	38.5	–66.9
85–89	36.9	0.0	62.4	0.8	37.6	–69.1
90–94	36.9	0.0	62.8	0.3	37.2	–70.3
95–100	36.9	0.0	63.1	0.0	36.9	–71.2

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

Figure 15 (Upper national poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2005 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	0.3	100.0	0.7	Only poor targeted
5–9	1.4	95.0	3.6	19.2:1
10–14	4.5	94.5	11.6	17.3:1
15–19	11.1	85.0	25.5	5.6:1
20–24	18.0	80.6	39.3	4.2:1
25–29	27.0	75.2	55.0	3.0:1
30–34	35.6	70.4	67.9	2.4:1
35–39	47.0	62.1	79.2	1.6:1
40–44	58.3	56.0	88.5	1.3:1
45–49	68.6	50.6	94.3	1.0:1
50–54	76.4	46.8	97.0	0.9:1
55–59	83.3	43.7	98.7	0.8:1
60–64	87.8	41.8	99.5	0.7:1
65–69	91.4	40.2	99.6	0.7:1
70–74	95.2	38.6	99.7	0.6:1
75–79	97.3	37.8	99.8	0.6:1
80–84	98.4	37.5	100.0	0.6:1
85–89	99.2	37.2	100.0	0.6:1
90–94	99.7	37.0	100.0	0.6:1
95–100	100.0	36.9	100.0	0.6:1

Figure 16: Upper and lower national poverty lines by 2005 stratum

Stratum of 2005	Poverty line (taka/person/month)			
	2000		2005	
	Upper	Lower	Upper	Lower
Barisal Rural	713.78	580.39	926.21	753.13
Barisal Municipality	763.92	642.92	950.74	800.15
Chittagong Rural	733.08	618.99	891.28	752.57
Chittagong Municipality	827.76	643.62	963.33	749.04
Chittagong SMA	978.67	639.73	1,171.19	765.57
Dhaka Rural	650.66	562.85	842.08	728.43
Dhaka Municipality	741.83	624.58	889.75	749.12
Dhaka SMA	855.49	677.71	1,017.52	806.06
Khulna Rural	582.10	510.88	742.63	651.77
Khulna Municipality	690.48	560.88	825.29	670.39
Khulna SMA	772.83	581.69	937.60	705.71
Rajshahi Rural	597.59	511.38	766.48	655.90
Rajshahi Municipality	707.46	574.95	856.61	696.16
Rajshahi SMA	682.45	576.00	855.97	722.46
Sylhet Rural	660.53	560.22	822.31	697.43
Sylhet Municipality	842.80	666.11	1,020.31	806.41

Source: Nobuo Yoshida of the World Bank provides the data.

Lower National Poverty Line Tables

2005 Scorecard Applied to Validation Sample

Figure 5 (Lower 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	71.6
10–14	74.5
15–19	64.3
20–24	49.5
25–29	37.6
30–34	29.7
35–39	18.8
40–44	9.9
45–49	9.6
50–54	4.7
55–59	4.0
60–64	2.8
65–69	0.4
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 (Lower 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	272	÷	272	=	100.0
5–9	808	÷	1,128	=	71.6
10–14	2,328	÷	3,124	=	74.5
15–19	4,212	÷	6,550	=	64.3
20–24	3,409	÷	6,892	=	49.5
25–29	3,387	÷	9,014	=	37.6
30–34	2,552	÷	8,597	=	29.7
35–39	2,149	÷	11,411	=	18.8
40–44	1,122	÷	11,333	=	9.9
45–49	988	÷	10,318	=	9.6
50–54	365	÷	7,781	=	4.7
55–59	274	÷	6,927	=	4.0
60–64	125	÷	4,414	=	2.8
65–69	16	÷	3,677	=	0.4
70–74	0	÷	3,773	=	0.0
75–79	0	÷	2,104	=	0.0
80–84	0	÷	1,090	=	0.0
85–89	0	÷	840	=	0.0
90–94	0	÷	442	=	0.0
95–100	0	÷	313	=	0.0

Number of households normalized to add up to 100,000.
Based on the 2005 HIES.

Figure 8 (Lower national poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value (2005)			
		Confidence interval (+/– percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+40.1	12.4	14.6	19.2
5–9	–18.3	11.0	11.3	11.9
10–14	–5.5	4.3	4.6	5.1
15–19	+7.8	2.6	3.2	4.4
20–24	+2.8	2.4	2.9	4.2
25–29	–3.3	2.7	2.9	3.4
30–34	–3.6	2.8	3.0	3.4
35–39	+3.1	1.4	1.7	2.2
40–44	–2.7	2.1	2.2	2.5
45–49	–0.6	1.3	1.6	2.0
50–54	–1.6	1.4	1.5	1.9
55–59	+1.9	0.6	0.8	1.0
60–64	+1.4	0.7	0.8	1.0
65–69	–0.2	0.5	0.5	0.7
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 (Lower 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, 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	+0.2	43.9	53.0	68.6
4	–0.2	31.1	36.1	49.0
8	–0.5	21.1	24.3	32.7
16	+0.1	14.9	18.2	23.0
32	+0.0	10.1	12.1	15.6
64	+0.1	7.2	8.2	10.4
128	–0.0	5.0	6.0	7.9
256	–0.0	3.6	4.4	5.9
512	–0.0	2.6	3.1	4.3
1,024	–0.1	1.8	2.1	2.8
2,048	–0.1	1.3	1.6	2.0
4,096	–0.1	0.9	1.2	1.5
8,192	–0.1	0.7	0.8	1.0
16,384	–0.1	0.5	0.6	0.7

Figure 12 (Lower national poverty line): Differences and precision of differences for bootstrapped estimates of changes in group's poverty rates between two points in time, 2005 scorecard applied to the 2005 validation sample and the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	–2.0	60.5	76.9	102.2
4	–2.6	43.2	53.7	69.6
8	–3.0	30.3	37.0	51.1
16	–3.3	22.9	26.6	34.7
32	–3.4	15.7	18.7	24.4
64	–3.4	11.0	13.2	17.8
128	–3.2	8.0	9.6	12.2
256	–3.3	5.5	6.6	8.6
512	–3.2	3.9	4.5	6.1
1,024	–3.2	2.6	3.0	4.1
2,048	–3.2	1.8	2.3	2.8
4,096	–3.1	1.4	1.6	2.1
8,192	–3.1	0.9	1.1	1.5
16,384	–3.1	0.7	0.9	1.1

Figure 14 (Lower national poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2005 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	0.2	22.5	0.1	77.2	77.4	–98.1
5–9	1.2	21.5	0.2	77.1	78.3	–88.7
10–14	3.6	19.0	0.9	76.5	80.1	–64.0
15–19	7.4	15.2	3.6	73.7	81.1	–18.4
20–24	10.7	11.9	7.2	70.1	80.8	+26.6
25–29	14.5	8.1	12.5	64.9	79.4	+45.0
30–34	17.4	5.2	18.1	59.2	76.7	+20.0
35–39	19.3	3.4	27.7	49.7	69.0	–22.2
40–44	20.7	1.9	37.6	39.8	60.5	–65.9
45–49	21.8	0.8	46.8	30.5	52.4	–106.6
50–54	22.4	0.3	54.1	23.3	45.6	–138.6
55–59	22.5	0.1	60.8	16.5	39.1	–168.4
60–64	22.6	0.0	65.1	12.2	34.8	–187.4
65–69	22.7	0.0	68.8	8.6	31.2	–203.5
70–74	22.7	0.0	72.6	4.8	27.4	–220.2
75–79	22.7	0.0	74.7	2.7	25.3	–229.5
80–84	22.7	0.0	75.7	1.6	24.3	–234.3
85–89	22.7	0.0	76.6	0.8	23.4	–238.0
90–94	22.7	0.0	77.0	0.3	23.0	–240.0
95–100	22.7	0.0	77.3	0.0	22.7	–241.3

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

Figure 15 (Lower national poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2005 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	0.3	60.2	0.7	1.5:1
5–9	1.4	82.7	5.1	4.8:1
10–14	4.5	80.3	16.0	4.1:1
15–19	11.1	67.1	32.8	2.0:1
20–24	18.0	59.7	47.4	1.5:1
25–29	27.0	53.8	64.1	1.2:1
30–34	35.6	49.0	77.0	1.0:1
35–39	47.0	41.1	85.2	0.7:1
40–44	58.3	35.6	91.5	0.6:1
45–49	68.6	31.8	96.3	0.5:1
50–54	76.4	29.3	98.7	0.4:1
55–59	83.3	27.0	99.5	0.4:1
60–64	87.8	25.8	99.9	0.3:1
65–69	91.4	24.8	100.0	0.3:1
70–74	95.2	23.8	100.0	0.3:1
75–79	97.3	23.3	100.0	0.3:1
80–84	98.4	23.0	100.0	0.3:1
85–89	99.2	22.8	100.0	0.3:1
90–94	99.7	22.7	100.0	0.3:1
95–100	100.0	22.7	100.0	0.3:1

USAID "Extreme" Poverty Line Tables

2005 Scorecard Applied to Validation Sample

Figure 5 (USAID "extreme" 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	71.6
10–14	57.2
15–19	53.8
20–24	36.7
25–29	27.5
30–34	23.3
35–39	15.7
40–44	6.8
45–49	5.9
50–54	2.9
55–59	2.9
60–64	0.3
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

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

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	272	÷	272	=	100.0
5–9	808	÷	1,128	=	71.6
10–14	1,785	÷	3,124	=	57.2
15–19	3,523	÷	6,550	=	53.8
20–24	2,527	÷	6,892	=	36.7
25–29	2,478	÷	9,014	=	27.5
30–34	2,003	÷	8,597	=	23.3
35–39	1,789	÷	11,411	=	15.7
40–44	772	÷	11,333	=	6.8
45–49	605	÷	10,318	=	5.9
50–54	225	÷	7,781	=	2.9
55–59	201	÷	6,927	=	2.9
60–64	14	÷	4,414	=	0.3
65–69	0	÷	3,677	=	0.0
70–74	0	÷	3,773	=	0.0
75–79	0	÷	2,104	=	0.0
80–84	0	÷	1,090	=	0.0
85–89	0	÷	840	=	0.0
90–94	0	÷	442	=	0.0
95–100	0	÷	313	=	0.0

Number of households normalized to add up to 100,000.
Based on the 2005 HIES.

Figure 8 (USAID "extreme" poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value (2005)			
		Confidence interval (+/– percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+55.9	12.5	15.2	19.1
5–9	–14.4	9.4	9.7	10.5
10–14	–6.7	5.2	5.7	6.2
15–19	+4.9	2.8	3.3	4.1
20–24	–6.6	4.5	4.7	5.3
25–29	–2.1	2.1	2.3	3.1
30–34	–0.6	1.9	2.1	3.2
35–39	+2.2	1.4	1.6	2.0
40–44	–2.7	2.0	2.1	2.3
45–49	–0.5	1.1	1.3	1.7
50–54	–1.1	1.1	1.3	1.6
55–59	+0.8	0.6	0.8	1.0
60–64	–1.1	0.9	1.0	1.1
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 (USAID "extreme" 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, 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	–0.5	41.4	49.5	64.2
4	–0.8	27.8	32.6	41.3
8	–0.7	18.4	22.4	29.4
16	–0.2	14.2	16.3	21.7
32	–0.5	9.3	11.1	15.3
64	–0.4	6.7	7.9	9.8
128	–0.5	4.8	5.7	7.6
256	–0.5	3.3	3.8	6.0
512	–0.5	2.4	2.8	3.9
1,024	–0.5	1.7	2.1	2.7
2,048	–0.5	1.2	1.5	1.9
4,096	–0.5	0.9	1.1	1.3
8,192	–0.6	0.6	0.8	1.0
16,384	–0.5	0.5	0.5	0.7

Figure 12 (USAID "extreme" poverty line): Differences and precision of differences for bootstrapped estimates of changes in group's poverty rates between two points in time, 2005 scorecard applied to the 2005 validation sample and the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	+2.5	57.2	65.9	100.0
4	+2.4	40.3	50.8	65.8
8	+1.4	27.6	32.7	47.1
16	+1.0	20.8	24.3	33.3
32	+1.2	14.6	17.3	22.7
64	+1.3	10.5	12.6	16.2
128	+1.5	7.4	8.7	11.3
256	+1.3	5.1	6.0	8.2
512	+1.4	3.6	4.4	5.5
1,024	+1.3	2.5	3.0	3.8
2,048	+1.4	1.8	2.1	2.8
4,096	+1.4	1.3	1.6	2.0
8,192	+1.5	0.9	1.2	1.4
16,384	+1.5	0.7	0.8	1.1

Figure 14 (USAID "extreme" poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2005 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	0.1	17.6	0.1	82.2	82.3	–97.8
5–9	1.0	16.7	0.4	81.9	83.0	–86.2
10–14	3.0	14.7	1.6	80.7	83.7	–57.7
15–19	6.3	11.4	4.8	77.5	83.8	–1.9
20–24	9.2	8.5	8.7	73.5	82.8	+50.6
25–29	11.8	5.9	15.1	67.2	79.0	+14.5
30–34	14.0	3.7	21.6	60.7	74.7	–22.0
35–39	15.5	2.2	31.5	50.8	66.4	–77.7
40–44	16.5	1.2	41.8	40.5	56.9	–136.4
45–49	17.1	0.6	51.5	30.8	47.9	–191.0
50–54	17.5	0.2	59.0	23.3	40.8	–233.1
55–59	17.6	0.1	65.7	16.6	34.2	–271.3
60–64	17.7	0.0	70.1	12.2	29.9	–295.8
65–69	17.7	0.0	73.7	8.6	26.3	–316.5
70–74	17.7	0.0	77.5	4.8	22.5	–337.8
75–79	17.7	0.0	79.6	2.7	20.4	–349.7
80–84	17.7	0.0	80.7	1.6	19.3	–355.9
85–89	17.7	0.0	81.5	0.8	18.5	–360.6
90–94	17.7	0.0	82.0	0.3	18.0	–363.1
95–100	17.7	0.0	82.3	0.0	17.7	–364.9

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

Figure 15 (USAID "extreme" poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2005 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	0.3	45.9	0.7	0.8:1
5–9	1.4	74.6	5.9	2.9:1
10–14	4.5	65.7	16.8	1.9:1
15–19	11.1	56.9	35.6	1.3:1
20–24	18.0	51.3	52.1	1.1:1
25–29	27.0	43.9	66.9	0.8:1
30–34	35.6	39.3	79.0	0.6:1
35–39	47.0	33.1	87.8	0.5:1
40–44	58.3	28.3	93.1	0.4:1
45–49	68.6	25.0	96.7	0.3:1
50–54	76.4	22.8	98.6	0.3:1
55–59	83.3	21.1	99.5	0.3:1
60–64	87.8	20.2	100.0	0.3:1
65–69	91.4	19.4	100.0	0.2:1
70–74	95.2	18.6	100.0	0.2:1
75–79	97.3	18.2	100.0	0.2:1
80–84	98.4	18.0	100.0	0.2:1
85–89	99.2	17.8	100.0	0.2:1
90–94	99.7	17.8	100.0	0.2:1
95–100	100.0	17.7	100.0	0.2:1

$1.25/Day 2005 PPP Poverty Line Tables

2005 Scorecard Applied to Validation Sample

Figure 5 ($1.25/Day 2005 PPP 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	94.6
10–14	91.7
15–19	92.8
20–24	85.0
25–29	74.7
30–34	67.3
35–39	49.8
40–44	39.9
45–49	31.3
50–54	19.9
55–59	13.9
60–64	9.4
65–69	4.2
70–74	1.4
75–79	1.6
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Figure 6 ($1.25/Day 2005 PPP poverty line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	272	÷	272	=	100.0
5–9	1,067	÷	1,128	=	94.6
10–14	2,865	÷	3,124	=	91.7
15–19	6,075	÷	6,550	=	92.8
20–24	5,856	÷	6,892	=	85.0
25–29	6,733	÷	9,014	=	74.7
30–34	5,785	÷	8,597	=	67.3
35–39	5,687	÷	11,411	=	49.8
40–44	4,522	÷	11,333	=	39.9
45–49	3,225	÷	10,318	=	31.3
50–54	1,549	÷	7,781	=	19.9
55–59	964	÷	6,927	=	13.9
60–64	415	÷	4,414	=	9.4
65–69	154	÷	3,677	=	4.2
70–74	51	÷	3,773	=	1.4
75–79	34	÷	2,104	=	1.6
80–84	0	÷	1,090	=	0.0
85–89	0	÷	840	=	0.0
90–94	0	÷	442	=	0.0
95–100	0	÷	313	=	0.0

Number of households normalized to add up to 100,000.
Based on the 2005 HIES.

Figure 8 ($1.25/Day 2005 PPP poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value (2005)			
		Confidence interval (+/– percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	–2.0	2.3	2.9	3.6
10–14	–5.9	3.5	3.6	3.7
15–19	+2.9	1.4	1.7	2.3
20–24	+0.9	1.9	2.2	3.1
25–29	–4.4	3.1	3.2	3.5
30–34	–3.7	2.9	3.1	3.6
35–39	–3.7	2.9	3.0	3.3
40–44	–2.4	2.2	2.5	3.3
45–49	–2.0	2.1	2.4	3.1
50–54	–1.1	2.2	2.6	3.4
55–59	+1.3	1.6	1.9	2.7
60–64	+1.1	1.7	2.1	2.6
65–69	–1.8	1.6	1.8	2.2
70–74	–0.8	0.8	0.9	1.2
75–79	+1.0	0.5	0.6	0.8
80–84	–8.8	6.6	7.0	8.3
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 10 ($1.25/Day 2005 PPP 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, 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	–0.5	49.9	58.5	73.5
4	–1.8	32.9	39.3	50.6
8	–1.6	24.0	27.5	37.7
16	–1.4	17.6	20.6	25.7
32	–1.4	11.7	13.7	18.8
64	–1.5	8.6	9.7	13.0
128	–1.6	6.0	6.8	8.3
256	–1.6	4.2	4.9	6.4
512	–1.7	2.9	3.5	4.8
1,024	–1.7	2.1	2.4	3.3
2,048	–1.7	1.4	1.7	2.3
4,096	–1.7	1.1	1.3	1.6
8,192	–1.7	0.7	0.9	1.1
16,384	–1.7	0.5	0.6	0.8

Figure 12 ($1.25/Day 2005 PPP poverty line): Differences and precision of differences for bootstrapped estimates of changes in group's poverty rates between two points in time, 2005 scorecard applied to the 2005 validation sample and the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	+0.6	74.8	83.9	106.9
4	+1.6	47.1	58.1	69.4
8	+1.3	34.0	39.1	50.1
16	+1.7	25.5	29.9	38.8
32	+1.8	17.0	20.9	28.4
64	+2.0	11.9	14.6	19.3
128	+2.1	8.4	10.0	13.0
256	+2.1	5.9	7.2	9.4
512	+2.2	4.1	5.1	6.6
1,024	+2.2	2.9	3.4	4.3
2,048	+2.2	2.0	2.4	3.0
4,096	+2.2	1.4	1.7	2.2
8,192	+2.2	1.1	1.2	1.7
16,384	+2.2	0.8	0.9	1.2

Figure 14 ($1.25/Day 2005 PPP poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2005 validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.3	47.3	0.0	52.5	52.7	–98.9
5–9	1.4	46.2	0.0	52.4	53.8	–94.2
10–14	4.4	43.1	0.1	52.3	56.8	–81.2
15–19	10.3	37.3	0.8	51.7	61.9	–55.1
20–24	16.1	31.5	1.9	50.5	66.6	–28.4
25–29	23.2	24.3	3.8	48.7	71.9	+5.6
30–34	29.3	18.2	6.3	46.2	75.5	+36.5
35–39	35.5	12.0	11.4	41.0	76.5	+73.6
40–44	40.4	7.2	18.0	34.5	74.9	+62.2
45–49	44.0	3.6	24.7	27.8	71.7	+48.1
50–54	45.6	2.0	30.8	21.6	67.2	+35.2
55–59	46.6	0.9	36.8	15.7	62.3	+22.7
60–64	47.0	0.5	40.7	11.7	58.8	+14.4
65–69	47.3	0.2	44.1	8.3	55.6	+7.2
70–74	47.4	0.1	47.8	4.7	52.1	–0.5
75–79	47.5	0.1	49.8	2.6	50.1	–4.8
80–84	47.5	0.0	50.9	1.6	49.1	–7.0
85–89	47.5	0.0	51.7	0.8	48.3	–8.7
90–94	47.5	0.0	52.1	0.3	47.9	–9.7
95–100	47.5	0.0	52.5	0.0	47.5	–10.3

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

Figure 15 ($1.25/Day 2005 PPP poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2005 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	0.3	100.0	0.6	Only poor targeted
5–9	1.4	97.4	2.9	37.9:1
10–14	4.5	97.6	9.3	40.3:1
15–19	11.1	92.8	21.6	12.9:1
20–24	18.0	89.3	33.8	8.4:1
25–29	27.0	86.0	48.8	6.2:1
30–34	35.6	82.4	61.7	4.7:1
35–39	47.0	75.6	74.7	3.1:1
40–44	58.3	69.2	84.9	2.2:1
45–49	68.6	64.0	92.5	1.8:1
50–54	76.4	59.7	95.9	1.5:1
55–59	83.3	55.9	98.0	1.3:1
60–64	87.8	53.6	98.9	1.2:1
65–69	91.4	51.7	99.5	1.1:1
70–74	95.2	49.8	99.8	1.0:1
75–79	97.3	48.8	99.8	1.0:1
80–84	98.4	48.3	100.0	0.9:1
85–89	99.2	47.9	100.0	0.9:1
90–94	99.7	47.7	100.0	0.9:1
95–100	100.0	47.5	100.0	0.9:1

$1.75/Day 2005 PPP Poverty Line Tables

2005 Scorecard Applied to Validation Sample

Figure 5 ($1.75/Day 2005 PPP 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	100.0
10–14	100.0
15–19	98.4
20–24	98.6
25–29	97.1
30–34	94.8
35–39	85.9
40–44	77.3
45–49	66.8
50–54	59.7
55–59	45.5
60–64	35.5
65–69	32.0
70–74	23.5
75–79	16.6
80–84	5.2
85–89	1.8
90–94	0.0
95–100	0.0

Figure 6 ($1.75/Day 2005 PPP poverty line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	272	÷	272	=	100.0
5–9	1,128	÷	1,128	=	100.0
10–14	3,124	÷	3,124	=	100.0
15–19	6,446	÷	6,550	=	98.4
20–24	6,794	÷	6,892	=	98.6
25–29	8,752	÷	9,014	=	97.1
30–34	8,147	÷	8,597	=	94.8
35–39	9,803	÷	11,411	=	85.9
40–44	8,760	÷	11,333	=	77.3
45–49	6,887	÷	10,318	=	66.8
50–54	4,648	÷	7,781	=	59.7
55–59	3,152	÷	6,927	=	45.5
60–64	1,568	÷	4,414	=	35.5
65–69	1,175	÷	3,677	=	32.0
70–74	886	÷	3,773	=	23.5
75–79	350	÷	2,104	=	16.6
80–84	57	÷	1,090	=	5.2
85–89	15	÷	840	=	1.8
90–94	0	÷	442	=	0.0
95–100	0	÷	313	=	0.0

Number of households normalized to add up to 100,000.
Based on the 2005 HIES.

Figure 8 ($1.75/Day 2005 PPP poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value (2005)			
		Confidence interval (+/– percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+0.0	0.0	0.0	0.0
15–19	–1.1	0.7	0.8	0.8
20–24	+1.6	0.9	1.0	1.3
25–29	+2.1	1.1	1.3	1.6
30–34	+2.1	1.2	1.4	1.9
35–39	–1.4	1.3	1.5	2.0
40–44	+0.1	1.8	2.1	2.7
45–49	–4.9	3.4	3.6	3.9
50–54	–0.0	2.5	3.0	4.0
55–59	–3.7	3.2	3.5	4.1
60–64	–4.5	3.9	4.2	5.0
65–69	+8.7	3.1	3.5	4.6
70–74	+6.4	2.5	3.1	4.1
75–79	+11.4	2.1	2.5	3.6
80–84	–4.6	4.5	5.1	7.0
85–89	–10.3	7.9	8.5	9.5
90–94	–4.2	3.7	4.1	4.6
95–100	+0.0	0.0	0.0	0.0

Figure 10 ($1.75/Day 2005 PPP 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, 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	+0.9	45.2	56.3	72.1
4	–0.1	29.8	37.6	48.9
8	–0.3	22.5	26.7	35.4
16	–0.0	17.0	19.6	24.8
32	+0.1	12.0	13.6	16.5
64	+0.1	8.1	9.5	12.0
128	–0.0	5.6	6.6	8.7
256	+0.0	4.0	4.7	5.9
512	–0.1	2.9	3.4	4.3
1,024	–0.1	2.0	2.4	3.2
2,048	–0.1	1.4	1.7	2.2
4,096	–0.1	1.0	1.2	1.5
8,192	–0.1	0.7	0.8	1.1
16,384	–0.0	0.5	0.6	0.8

Figure 12 ($1.75/Day 2005 PPP poverty line): Differences and precision of differences for bootstrapped estimates of changes in group's poverty rates between two points in time, 2005 scorecard applied to the 2005 validation sample and the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	+1.0	57.5	72.7	100.8
4	+2.2	41.4	52.0	67.3
8	+2.5	29.8	37.8	48.2
16	+2.4	22.6	26.3	34.9
32	+2.4	16.4	19.0	24.8
64	+2.5	10.7	13.2	16.6
128	+2.5	7.5	9.3	11.8
256	+2.6	5.3	6.3	8.1
512	+2.7	3.8	4.5	5.9
1,024	+2.8	2.7	3.2	4.2
2,048	+2.7	1.9	2.2	2.9
4,096	+2.7	1.3	1.6	2.1
8,192	+2.7	1.0	1.1	1.4
16,384	+2.7	0.7	0.8	1.1

Figure 14 ($1.75/Day 2005 PPP poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2005 validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.3	72.1	0.0	27.7	27.9	–99.2
5–9	1.4	70.9	0.0	27.7	29.1	–96.1
10–14	4.5	67.8	0.0	27.7	32.2	–87.5
15–19	11.0	61.3	0.0	27.6	38.7	–69.4
20–24	17.7	54.6	0.3	27.4	45.1	–50.7
25–29	26.3	46.0	0.7	27.0	53.3	–26.3
30–34	34.3	38.0	1.3	26.4	60.7	–3.4
35–39	44.2	28.1	2.8	24.9	69.1	+26.1
40–44	53.0	19.3	5.3	22.4	75.4	+53.9
45–49	60.4	11.9	8.2	19.4	79.9	+78.4
50–54	65.1	7.3	11.3	16.3	81.4	+84.3
55–59	68.5	3.8	14.8	12.8	81.4	+79.5
60–64	70.4	1.9	17.3	10.3	80.8	+76.0
65–69	71.3	1.1	20.2	7.5	78.8	+72.1
70–74	72.0	0.3	23.2	4.4	76.4	+67.9
75–79	72.1	0.2	25.2	2.4	74.6	+65.2
80–84	72.2	0.1	26.2	1.5	73.7	+63.8
85–89	72.3	0.0	26.9	0.7	73.0	+62.8
90–94	72.3	0.0	27.3	0.3	72.7	+62.2
95–100	72.3	0.0	27.7	0.0	72.3	+61.8

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

Figure 15 ($1.75/Day 2005 PPP poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2005 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	0.3	100.0	0.4	Only poor targeted
5–9	1.4	100.0	1.9	Only poor targeted
10–14	4.5	100.0	6.3	Only poor targeted
15–19	11.1	99.7	15.3	338.5:1
20–24	18.0	98.6	24.5	70.6:1
25–29	27.0	97.5	36.4	39.5:1
30–34	35.6	96.4	47.4	27.0:1
35–39	47.0	94.1	61.1	16.0:1
40–44	58.3	90.9	73.3	10.0:1
45–49	68.6	88.0	83.5	7.4:1
50–54	76.4	85.2	90.0	5.7:1
55–59	83.3	82.2	94.7	4.6:1
60–64	87.8	80.2	97.4	4.1:1
65–69	91.4	78.0	98.5	3.5:1
70–74	95.2	75.6	99.5	3.1:1
75–79	97.3	74.1	99.7	2.9:1
80–84	98.4	73.4	99.8	2.8:1
85–89	99.2	72.9	100.0	2.7:1
90–94	99.7	72.6	100.0	2.6:1
95–100	100.0	72.3	100.0	2.6:1

$2.50/Day 2005 PPP Poverty Line Tables

2005 Scorecard Applied to Validation Sample

Figure 5 ($2.50/Day 2005 PPP 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	100.0
10–14	100.0
15–19	100.0
20–24	100.0
25–29	99.6
30–34	99.3
35–39	96.6
40–44	95.1
45–49	92.7
50–54	85.1
55–59	76.6
60–64	63.6
65–69	64.9
70–74	50.0
75–79	47.5
80–84	30.7
85–89	27.1
90–94	4.6
95–100	26.1

Figure 6 ($2.50/Day 2005 PPP poverty line): Derivation of estimated poverty likelihoods associated with scores

Score	Households below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	272	÷	272	=	100.0
5–9	1,128	÷	1,128	=	100.0
10–14	3,124	÷	3,124	=	100.0
15–19	6,550	÷	6,550	=	100.0
20–24	6,892	÷	6,892	=	100.0
25–29	8,981	÷	9,014	=	99.6
30–34	8,532	÷	8,597	=	99.3
35–39	11,018	÷	11,411	=	96.6
40–44	10,778	÷	11,333	=	95.1
45–49	9,565	÷	10,318	=	92.7
50–54	6,622	÷	7,781	=	85.1
55–59	5,304	÷	6,927	=	76.6
60–64	2,806	÷	4,414	=	63.6
65–69	2,387	÷	3,677	=	64.9
70–74	1,887	÷	3,773	=	50.0
75–79	999	÷	2,104	=	47.5
80–84	335	÷	1,090	=	30.7
85–89	227	÷	840	=	27.1
90–94	20	÷	442	=	4.6
95–100	82	÷	313	=	26.1

Number of households normalized to add up to 100,000.
Based on the 2005 HIES.

Figure 8 ($2.50/Day 2005 PPP poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value (2005)			
		Confidence interval (+/– percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+0.0	0.0	0.0	0.0
15–19	+0.0	0.0	0.0	0.0
20–24	+0.5	0.4	0.4	0.5
25–29	+0.1	0.3	0.3	0.4
30–34	+0.6	0.5	0.6	0.8
35–39	–0.9	0.7	0.8	0.9
40–44	+3.5	1.2	1.6	2.0
45–49	+0.4	1.1	1.2	1.7
50–54	+1.0	1.8	2.2	2.8
55–59	–1.8	2.2	2.5	3.5
60–64	–1.1	3.5	4.2	5.3
65–69	+14.3	3.8	4.5	5.6
70–74	–2.0	3.3	4.0	5.7
75–79	+30.8	3.6	4.2	5.6
80–84	+10.1	5.1	6.0	8.5
85–89	–1.8	6.8	8.4	10.7
90–94	–0.3	3.0	3.8	4.8
95–100	+26.1	0.0	0.0	0.0

Figure 10 ($2.50/Day 2005 PPP 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, 2005 scorecard applied to the 2005 validation sample

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	+0.7	34.7	45.0	66.2
4	+1.0	26.4	31.6	37.5
8	+1.6	18.8	22.9	28.5
16	+1.7	13.2	15.7	20.7
32	+1.9	9.6	11.3	14.3
64	+1.9	6.3	7.6	9.6
128	+1.8	4.6	5.5	7.1
256	+1.9	3.4	4.0	5.1
512	+1.8	2.4	2.8	3.8
1,024	+1.7	1.6	2.0	2.7
2,048	+1.8	1.2	1.4	1.9
4,096	+1.7	0.8	1.0	1.2
8,192	+1.8	0.6	0.7	0.9
16,384	+1.8	0.4	0.5	0.6

Figure 12 ($2.50/Day 2005 PPP poverty line): Differences and precision of differences for bootstrapped estimates of changes in group's poverty rates between two points in time, 2005 scorecard applied to the 2005 validation sample and the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	+0.7	51.9	59.3	81.7
4	+0.3	34.0	40.7	53.3
8	–0.6	23.3	28.8	36.5
16	–0.9	16.4	19.5	25.0
32	–0.9	11.3	14.1	17.1
64	–1.0	7.7	9.3	12.4
128	–0.9	5.9	7.1	8.8
256	–0.9	3.9	4.6	6.4
512	–0.8	2.8	3.5	4.5
1,024	–0.8	2.0	2.4	3.3
2,048	–0.8	1.5	1.7	2.3
4,096	–0.8	1.0	1.2	1.6
8,192	–0.8	0.7	0.8	1.2
16,384	–0.8	0.5	0.6	0.8

Figure 14 ($2.50/Day 2005 PPP poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2005 validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.3	86.1	0.0	13.6	13.9	–99.4
5–9	1.4	85.0	0.0	13.6	15.0	–96.8
10–14	4.5	81.9	0.0	13.6	18.1	–89.5
15–19	11.1	75.3	0.0	13.6	24.7	–74.4
20–24	17.9	68.5	0.0	13.5	31.5	–58.5
25–29	26.9	59.5	0.1	13.5	40.4	–37.7
30–34	35.4	51.0	0.2	13.4	48.7	–17.9
35–39	46.5	39.9	0.5	13.1	59.5	+8.2
40–44	57.0	29.4	1.3	12.3	69.3	+33.4
45–49	66.5	20.0	2.2	11.4	77.9	+56.3
50–54	73.0	13.4	3.4	10.2	83.2	+72.9
55–59	78.5	7.9	4.9	8.7	87.2	+87.3
60–64	81.5	4.9	6.3	7.3	88.8	+92.8
65–69	83.4	3.0	8.0	5.5	88.9	+90.7
70–74	85.4	1.0	9.8	3.8	89.1	+88.6
75–79	85.8	0.6	11.5	2.1	87.9	+86.7
80–84	86.1	0.3	12.3	1.3	87.4	+85.8
85–89	86.4	0.0	12.9	0.7	87.1	+85.1
90–94	86.4	0.0	13.3	0.3	86.7	+84.6
95–100	86.4	0.0	13.6	0.0	86.4	+84.3

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

Figure 15 ($2.50/Day 2005 PPP poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2005 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	0.3	100.0	0.3	Only poor targeted
5–9	1.4	100.0	1.6	Only poor targeted
10–14	4.5	100.0	5.2	Only poor targeted
15–19	11.1	100.0	12.8	Only poor targeted
20–24	18.0	99.8	20.7	498.3:1
25–29	27.0	99.7	31.1	304.7:1
30–34	35.6	99.4	40.9	171.5:1
35–39	47.0	98.9	53.8	90.8:1
40–44	58.3	97.7	66.0	43.0:1
45–49	68.6	96.8	76.9	30.6:1
50–54	76.4	95.5	84.5	21.3:1
55–59	83.3	94.2	90.8	16.1:1
60–64	87.8	92.9	94.3	13.0:1
65–69	91.4	91.2	96.5	10.4:1
70–74	95.2	89.7	98.8	8.7:1
75–79	97.3	88.2	99.3	7.5:1
80–84	98.4	87.5	99.6	7.0:1
85–89	99.2	87.0	99.9	6.7:1
90–94	99.7	86.7	100.0	6.5:1
95–100	100.0	86.4	100.0	6.4:1

Upper National Poverty Line Tables

2005 Scorecard Applied to 2000 HIES

Figure 8 (Upper national poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value (2000)			
		Confidence interval (+/− percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+2.8	2.9	3.2	4.1
5–9	–7.6	4.8	5.0	5.3
10–14	–2.4	1.9	2.1	2.5
15–19	+5.1	1.6	1.9	2.6
20–24	+2.1	2.1	2.5	3.2
25–29	–1.1	1.9	2.3	2.9
30–34	–2.9	2.4	2.6	3.2
35–39	–7.4	4.7	4.8	5.2
40–44	–2.0	2.0	2.2	2.8
45–49	–1.3	1.9	2.4	3.1
50–54	–0.5	1.7	2.1	2.7
55–59	–0.6	1.8	2.1	2.7
60–64	+2.9	1.4	1.6	2.2
65–69	–2.8	2.4	2.6	2.8
70–74	–1.0	1.3	1.6	1.9
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 (Upper 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, 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	-1.1	48.7	56.3	73.8
4	-1.7	34.5	41.3	51.9
8	-2.1	24.5	29.1	37.7
16	-1.4	17.6	21.4	29.0
32	-1.5	12.2	14.3	20.3
64	-1.3	8.6	10.5	14.4
128	-1.4	6.3	7.7	10.3
256	-1.4	4.4	5.1	6.8
512	-1.4	3.1	3.6	4.7
1,024	-1.3	2.1	2.5	3.3
2,048	-1.3	1.5	1.9	2.5
4,096	-1.3	1.1	1.3	1.8
8,192	-1.3	0.8	0.9	1.3
16,384	-1.3	0.5	0.7	0.9

Figure 14 (Upper national poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2000 HIES

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	0.6	45.9	0.0	53.4	54.0	-97.3
5–9	3.3	43.3	0.2	53.2	56.5	-85.5
10–14	8.7	37.9	0.7	52.7	61.4	-61.2
15–19	16.6	29.9	2.4	51.0	67.6	-23.5
20–24	22.7	23.9	4.8	48.6	71.3	7.8
25–29	29.5	17.0	8.5	45.0	74.5	45.0
30–34	35.1	11.5	13.4	40.0	75.1	71.2
35–39	40.2	6.3	20.0	33.4	73.7	57.0
40–44	43.1	3.4	27.1	26.4	69.5	41.8
45–49	44.9	1.6	32.9	20.5	65.5	29.3
50–54	45.8	0.8	38.2	15.3	61.0	18.0
55–59	46.2	0.3	42.3	11.1	57.3	9.1
60–64	46.4	0.2	46.0	7.5	53.9	1.3
65–69	46.5	0.1	48.3	5.1	51.6	-3.7
70–74	46.6	0.0	50.4	3.1	49.6	-8.2
75–79	46.6	0.0	51.6	1.9	48.4	-10.8
80–84	46.6	0.0	52.6	0.8	47.4	-13.0
85–89	46.6	0.0	52.9	0.5	47.1	-13.6
90–94	46.6	0.0	53.3	0.1	46.7	-14.5
95–100	46.6	0.0	53.4	0.0	46.6	-14.8

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

Figure 15 (Upper national poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2000 HIES

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	0.6	97.4	1.3	37.5:1
5–9	3.5	94.4	7.0	16.9:1
10–14	9.4	92.2	18.6	11.9:1
15–19	19.0	87.3	35.7	6.9:1
20–24	27.5	82.4	48.7	4.7:1
25–29	38.0	77.7	63.4	3.5:1
30–34	48.5	72.3	75.3	2.6:1
35–39	60.2	66.8	86.4	2.0:1
40–44	70.2	61.4	92.7	1.6:1
45–49	77.9	57.7	96.5	1.4:1
50–54	84.0	54.5	98.3	1.2:1
55–59	88.6	52.2	99.2	1.1:1
60–64	92.3	50.2	99.6	1.0:1
65–69	94.8	49.1	99.9	1.0:1
70–74	96.9	48.0	100.0	0.9:1
75–79	98.1	47.4	100.0	0.9:1
80–84	99.2	46.9	100.0	0.9:1
85–89	99.5	46.8	100.0	0.9:1
90–94	99.9	46.6	100.0	0.9:1
95–100	100.0	46.6	100.0	0.9:1

Lower National Poverty Line Tables

2005 Scorecard Applied to 2000 HIES

Figure 8 (Lower national poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value (2005)			
		Confidence interval (+/− percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+2.8	2.9	3.2	4.1
5–9	−9.0	6.1	6.4	7.1
10–14	−3.3	2.8	3.0	3.5
15–19	−2.4	2.2	2.5	3.2
20–24	−3.1	2.6	2.9	3.5
25–29	−7.7	4.9	5.0	5.3
30–34	−1.9	1.9	2.3	3.0
35–39	−6.4	4.0	4.2	4.5
40–44	−5.7	3.6	3.8	4.1
45–49	−1.0	1.5	1.7	2.3
50–54	+0.5	1.1	1.3	1.7
55–59	+2.7	0.6	0.8	1.0
60–64	+2.0	0.5	0.6	0.8
65–69	−0.8	1.0	1.1	1.4
70–74	−0.2	0.3	0.3	0.4
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 (Lower 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, 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	-1.8	46.4	54.3	67.7
4	-2.8	32.5	37.6	51.2
8	-3.5	23.0	28.3	37.4
16	-3.2	17.2	20.3	26.7
32	-3.4	12.1	14.3	18.9
64	-3.3	8.7	10.3	13.6
128	-3.3	5.8	7.2	9.5
256	-3.3	4.2	5.0	6.7
512	-3.2	3.0	3.4	4.3
1,024	-3.3	2.0	2.4	3.0
2,048	-3.2	1.4	1.7	2.3
4,096	-3.2	1.0	1.2	1.6
8,192	-3.2	0.7	0.9	1.1
16,384	-3.2	0.5	0.6	0.9

Figure 14 (Lower national poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2000 HIES

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	0.6	31.6	0.0	67.8	68.4	-96.1
5–9	2.9	29.3	0.6	67.3	70.2	-80.2
10–14	7.5	24.7	1.9	65.9	73.4	-47.5
15–19	14.0	18.2	5.0	62.8	76.8	2.6
20–24	18.4	13.8	9.1	58.7	77.1	42.7
25–29	23.2	9.0	14.8	53.0	76.2	54.0
30–34	26.5	5.7	22.0	45.8	72.3	31.6
35–39	29.4	2.8	30.8	37.0	66.4	4.3
40–44	31.0	1.2	39.3	28.6	59.5	-22.0
45–49	31.8	0.4	46.1	21.7	53.5	-43.2
50–54	32.0	0.1	51.9	15.9	47.9	-61.4
55–59	32.1	0.1	56.5	11.4	43.5	-75.5
60–64	32.1	0.0	60.2	7.6	39.8	-87.1
65–69	32.2	0.0	62.6	5.2	37.4	-94.7
70–74	32.2	0.0	64.8	3.1	35.2	-101.3
75–79	32.2	0.0	66.0	1.9	34.0	-105.0
80–84	32.2	0.0	67.0	0.8	33.0	-108.2
85–89	32.2	0.0	67.3	0.5	32.7	-109.2
90–94	32.2	0.0	67.7	0.1	32.3	-110.5
95–100	32.2	0.0	67.8	0.0	32.2	-110.8

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

Figure 15 (Lower national poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2000 HIES

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	0.6	97.4	1.9	37.5:1
5–9	3.5	84.0	9.1	5.3:1
10–14	9.4	79.9	23.3	4.0:1
15–19	19.0	73.5	43.5	2.8:1
20–24	27.5	66.9	57.2	2.0:1
25–29	38.0	61.0	72.1	1.6:1
30–34	48.5	54.6	82.3	1.2:1
35–39	60.2	48.9	91.4	1.0:1
40–44	70.2	44.1	96.3	0.8:1
45–49	77.9	40.8	98.8	0.7:1
50–54	84.0	38.2	99.6	0.6:1
55–59	88.6	36.2	99.8	0.6:1
60–64	92.3	34.8	99.9	0.5:1
65–69	94.8	33.9	100.0	0.5:1
70–74	96.9	33.2	100.0	0.5:1
75–79	98.1	32.8	100.0	0.5:1
80–84	99.2	32.4	100.0	0.5:1
85–89	99.5	32.3	100.0	0.5:1
90–94	99.9	32.2	100.0	0.5:1
95–100	100.0	32.2	100.0	0.5:1

USAID "Extreme" Poverty Line Tables

2005 Scorecard Applied to 2000 HIES

Figure 8 (USAID "extreme" poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value (2005)			
		Confidence interval (+/− percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+5.4	3.6	4.3	6.1
5–9	−0.4	3.5	4.4	6.1
10–14	−3.5	3.0	3.3	4.3
15–19	+6.3	2.1	2.4	3.3
20–24	+2.7	2.2	2.5	3.2
25–29	−3.4	2.6	2.9	3.2
30–34	+3.7	1.6	1.9	2.4
35–39	+1.9	1.4	1.6	2.2
40–44	−1.5	1.3	1.4	1.8
45–49	+0.4	1.1	1.3	1.7
50–54	+0.4	0.9	1.0	1.3
55–59	+2.3	0.4	0.5	0.6
60–64	−0.3	0.5	0.5	0.7
65–69	−0.3	0.4	0.4	0.5
70–74	−0.2	0.2	0.2	0.3
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" 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, 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	2.0	43.0	51.1	65.8
4	1.7	30.1	35.9	45.2
8	0.7	21.1	24.8	32.0
16	0.7	15.2	18.3	24.8
32	0.7	11.3	13.3	17.4
64	0.9	8.0	9.6	11.8
128	1.0	5.5	6.6	8.0
256	0.9	3.9	4.7	6.4
512	0.9	2.6	3.3	4.1
1,024	0.8	2.0	2.2	2.7
2,048	0.9	1.4	1.7	2.1
4,096	0.9	0.9	1.1	1.5
8,192	0.9	0.7	0.8	1.1
16,384	0.9	0.5	0.6	0.8

Figure 14 (USAID "extreme" poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2000 HIES

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	0.6	21.8	0.0	77.5	78.1	-94.5
5–9	2.7	19.8	0.8	76.8	79.4	-72.6
10–14	6.3	16.2	3.1	74.5	80.7	-30.1
15–19	10.9	11.5	8.1	69.5	80.4	33.6
20–24	13.8	8.6	13.7	63.9	77.7	39.0
25–29	17.2	5.3	20.8	56.7	73.9	7.1
30–34	19.3	3.2	29.2	48.3	67.6	-30.4
35–39	20.9	1.5	39.3	38.3	59.2	-75.2
40–44	21.8	0.7	48.5	29.1	50.9	-116.0
45–49	22.2	0.2	55.7	21.9	44.1	-148.2
50–54	22.4	0.1	61.6	16.0	38.3	-174.7
55–59	22.4	0.0	66.2	11.4	33.8	-195.0
60–64	22.4	0.0	69.9	7.7	30.1	-211.7
65–69	22.4	0.0	72.4	5.2	27.6	-222.7
70–74	22.4	0.0	74.5	3.1	25.5	-232.2
75–79	22.4	0.0	75.7	1.9	24.3	-237.6
80–84	22.4	0.0	76.7	0.8	23.3	-242.2
85–89	22.4	0.0	77.0	0.5	23.0	-243.5
90–94	22.4	0.0	77.5	0.1	22.5	-245.4
95–100	22.4	0.0	77.6	0.0	22.4	-245.9

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

Figure 15 (USAID "extreme" poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2000 HIES

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	0.6	94.8	2.7	18.3:1
5–9	3.5	76.9	11.9	3.3:1
10–14	9.4	66.8	28.0	2.0:1
15–19	19.0	57.4	48.7	1.3:1
20–24	27.5	50.3	61.7	1.0:1
25–29	38.0	45.2	76.5	0.8:1
30–34	48.5	39.7	85.9	0.7:1
35–39	60.2	34.8	93.3	0.5:1
40–44	70.2	31.0	97.1	0.4:1
45–49	77.9	28.5	99.0	0.4:1
50–54	84.0	26.6	99.6	0.4:1
55–59	88.6	25.3	99.8	0.3:1
60–64	92.3	24.3	99.9	0.3:1
65–69	94.8	23.7	100.0	0.3:1
70–74	96.9	23.1	100.0	0.3:1
75–79	98.1	22.9	100.0	0.3:1
80–84	99.2	22.6	100.0	0.3:1
85–89	99.5	22.5	100.0	0.3:1
90–94	99.9	22.5	100.0	0.3:1
95–100	100.0	22.4	100.0	0.3:1

$1.25/Day 2005 PPP Poverty Line Tables

2005 Scorecard Applied to 2000 HIES

Figure 8 ($1.25/Day 2005 PPP poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value (2005)			
		Confidence interval (+/− percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+2.8	2.9	3.2	4.1
5–9	+0.0	1.8	2.2	2.8
10–14	−2.2	1.8	1.9	2.1
15–19	+4.0	1.4	1.6	2.2
20–24	+4.0	1.9	2.1	3.0
25–29	+0.3	1.8	2.1	2.9
30–34	+3.4	1.9	2.2	3.2
35–39	−3.3	2.6	2.8	3.2
40–44	+1.2	2.0	2.4	3.2
45–49	−1.4	2.3	2.6	3.5
50–54	−1.3	2.2	2.6	3.3
55–59	+0.3	2.1	2.4	3.1
60–64	+1.5	1.9	2.2	3.1
65–69	−2.4	2.3	2.5	3.2
70–74	−4.1	3.1	3.4	4.1
75–79	+0.1	1.4	1.5	1.8
80–84	−1.2	1.4	1.5	1.9
85–89	−1.2	1.6	2.0	2.7
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 10 ($1.25/Day 2005 PPP 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, 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	0.1	49.9	57.4	75.7
4	-0.2	35.4	41.8	52.8
8	-0.3	24.1	28.9	39.4
16	0.3	17.5	21.1	27.2
32	0.4	12.1	14.8	20.1
64	0.5	8.2	10.1	13.1
128	0.5	6.1	7.4	9.8
256	0.5	4.3	5.1	6.7
512	0.5	3.0	3.5	4.5
1,024	0.5	2.1	2.5	3.1
2,048	0.5	1.5	1.8	2.2
4,096	0.5	1.0	1.3	1.6
8,192	0.5	0.7	0.9	1.2
16,384	0.5	0.5	0.6	0.9

Figure 14 ($1.25/Day 2005 PPP poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2000 HIES

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	0.6	53.7	0.0	45.6	46.3	-97.7
5–9	3.3	51.0	0.2	45.5	48.8	-87.5
10–14	8.9	45.5	0.5	45.1	54.0	-66.4
15–19	17.5	36.9	1.6	44.1	61.6	-32.8
20–24	24.4	30.0	3.1	42.5	66.9	-4.5
25–29	32.3	22.1	5.7	39.9	72.2	29.3
30–34	39.0	15.3	9.5	36.2	75.2	61.0
35–39	45.3	9.0	14.9	30.7	76.0	72.6
40–44	49.2	5.1	21.0	24.7	73.9	61.4
45–49	51.8	2.6	26.1	19.6	71.4	52.0
50–54	53.1	1.2	30.8	14.8	67.9	43.3
55–59	53.7	0.6	34.8	10.8	64.6	35.9
60–64	54.0	0.3	38.3	7.4	61.4	29.5
65–69	54.2	0.2	40.6	5.1	59.2	25.3
70–74	54.3	0.0	42.6	3.0	57.3	21.6
75–79	54.3	0.0	43.8	1.8	56.2	19.4
80–84	54.3	0.0	44.8	0.8	55.2	17.5
85–89	54.3	0.0	45.1	0.5	54.9	17.0
90–94	54.3	0.0	45.5	0.1	54.5	16.2
95–100	54.3	0.0	45.7	0.0	54.3	16.0

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

Figure 15 ($1.25/Day 2005 PPP poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2000 HIES

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	0.6	97.4	1.1	37.5:1
5–9	3.5	95.3	6.1	20.5:1
10–14	9.4	94.5	16.3	17.1:1
15–19	19.0	91.8	32.1	11.2:1
20–24	27.5	88.6	44.9	7.8:1
25–29	38.0	84.9	59.4	5.6:1
30–34	48.5	80.4	71.8	4.1:1
35–39	60.2	75.2	83.4	3.0:1
40–44	70.2	70.1	90.6	2.3:1
45–49	77.9	66.5	95.3	2.0:1
50–54	84.0	63.3	97.7	1.7:1
55–59	88.6	60.7	98.9	1.5:1
60–64	92.3	58.5	99.4	1.4:1
65–69	94.8	57.2	99.7	1.3:1
70–74	96.9	56.0	99.9	1.3:1
75–79	98.1	55.4	100.0	1.2:1
80–84	99.2	54.8	100.0	1.2:1
85–89	99.5	54.6	100.0	1.2:1
90–94	99.9	54.4	100.0	1.2:1
95–100	100.0	54.3	100.0	1.2:1

$1.75/Day 2005 PPP Poverty Line Tables

2005 Scorecard Applied to 2000 HIES

Figure 8 ($1.75/Day 2005 PPP poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value (2005)			
		Confidence interval (+/− percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+1.1	0.6	0.7	0.9
15–19	+0.0	0.5	0.6	0.9
20–24	+0.8	0.7	0.7	1.0
25–29	+2.8	1.0	1.1	1.4
30–34	+6.6	1.3	1.5	2.1
35–39	+0.3	1.4	1.7	2.2
40–44	+3.9	1.9	2.2	3.0
45–49	+0.9	2.3	2.7	3.3
50–54	+6.4	2.6	3.1	4.4
55–59	+2.3	3.1	3.5	4.6
60–64	+5.4	3.2	3.9	4.8
65–69	+8.6	3.6	4.2	5.6
70–74	+3.4	3.5	4.3	5.4
75–79	+7.2	3.5	4.1	5.0
80–84	+2.4	2.0	2.4	3.3
85–89	+0.6	1.6	2.0	2.7
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 10 ($1.75/Day 2005 PPP 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, 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	1.9	38.7	46.9	63.3
4	2.1	27.2	32.5	42.7
8	2.3	19.9	23.0	30.5
16	2.3	14.4	16.8	21.1
32	2.5	10.2	12.6	16.1
64	2.5	7.2	8.7	11.0
128	2.5	5.0	5.8	7.6
256	2.6	3.6	4.2	5.4
512	2.7	2.5	3.1	3.9
1,024	2.7	1.8	2.1	2.9
2,048	2.7	1.3	1.5	1.9
4,096	2.7	0.9	1.1	1.4
8,192	2.7	0.6	0.8	1.0
16,384	2.7	0.4	0.6	0.7

Figure 14 ($1.75/Day 2005 PPP poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2000 HIES

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	0.6	75.7	0.0	23.7	24.3	-98.3
5–9	3.5	72.9	0.0	23.7	27.1	-90.9
10–14	9.3	67.0	0.1	23.6	32.9	-75.5
15–19	18.8	57.5	0.2	23.4	42.2	-50.4
20–24	27.1	49.2	0.4	23.2	50.3	-28.5
25–29	37.0	39.3	1.0	22.7	59.7	-1.7
30–34	46.3	30.1	2.2	21.4	67.7	24.2
35–39	56.3	20.0	3.9	19.8	76.1	52.7
40–44	63.7	12.6	6.5	17.2	80.9	75.5
45–49	68.8	7.5	9.0	14.6	83.4	88.1
50–54	72.1	4.3	11.9	11.8	83.9	84.5
55–59	74.1	2.3	14.5	9.2	83.2	81.0
60–64	75.2	1.2	17.2	6.5	81.7	77.5
65–69	75.8	0.6	19.0	4.6	80.4	75.1
70–74	76.2	0.2	20.8	2.9	79.1	72.8
75–79	76.3	0.0	21.8	1.8	78.1	71.4
80–84	76.3	0.0	22.8	0.8	77.2	70.1
85–89	76.3	0.0	23.1	0.5	76.9	69.7
90–94	76.3	0.0	23.6	0.1	76.4	69.1
95–100	76.3	0.0	23.7	0.0	76.3	69.0

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

Figure 15 ($1.75/Day 2005 PPP poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2000 HIES

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	0.6	100.0	0.8	Only poor targeted
5–9	3.5	100.0	4.5	Only poor targeted
10–14	9.4	99.3	12.2	145.9:1
15–19	19.0	98.8	24.6	85.2:1
20–24	27.5	98.5	35.5	65.6:1
25–29	38.0	97.4	48.5	37.0:1
30–34	48.5	95.4	60.6	20.9:1
35–39	60.2	93.6	73.8	14.5:1
40–44	70.2	90.8	83.5	9.8:1
45–49	77.9	88.4	90.1	7.6:1
50–54	84.0	85.9	94.4	6.1:1
55–59	88.6	83.6	97.0	5.1:1
60–64	92.3	81.4	98.5	4.4:1
65–69	94.8	79.9	99.2	4.0:1
70–74	96.9	78.6	99.8	3.7:1
75–79	98.1	77.7	99.9	3.5:1
80–84	99.2	77.0	100.0	3.3:1
85–89	99.5	76.7	100.0	3.3:1
90–94	99.9	76.4	100.0	3.2:1
95–100	100.0	76.3	100.0	3.2:1

$2.50/Day 2005 PPP Poverty Line Tables

2005 Scorecard Applied to 2000 HIES

Figure 8 ($2.50/Day 2005 PPP poverty line): Bootstrapped differences between estimated and true household poverty likelihoods with confidence intervals in a large sample (n = 16,384), 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value (2005)			
		Confidence interval (+/− percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.0	0.0	0.0	0.0
5–9	+0.0	0.0	0.0	0.0
10–14	+0.0	0.4	0.5	0.6
15–19	+0.0	0.2	0.3	0.3
20–24	+0.5	0.4	0.4	0.6
25–29	+0.1	0.4	0.5	0.7
30–34	+0.6	0.6	0.7	0.9
35–39	−0.9	0.7	0.8	1.0
40–44	+3.5	1.1	1.3	1.9
45–49	+0.4	1.3	1.6	2.1
50–54	+1.0	2.1	2.4	3.3
55–59	−1.8	2.5	3.2	4.0
60–64	−1.1	4.2	4.5	5.0
65–69	+14.3	3.9	4.8	6.0
70–74	−2.0	4.5	5.4	6.8
75–79	+30.8	5.7	6.7	9.0
80–84	+10.1	6.0	7.2	9.4
85–89	−1.8	5.8	6.8	9.4
90–94	−0.3	4.1	5.0	6.4
95–100	+26.1	9.7	11.3	14.3

Figure 10 ($2.50/Day 2005 PPP 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, 2005 scorecard applied to the 2000 HIES

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Sample size (n)	Diff.	90-percent	95-percent	99-percent
2	1.4	30.7	36.1	48.3
4	1.2	19.3	23.5	31.7
8	1.0	13.1	16.2	22.0
16	0.8	9.3	11.9	16.2
32	0.9	6.9	8.2	11.5
64	0.9	4.9	5.9	7.4
128	0.9	3.6	4.1	5.6
256	0.9	2.5	3.1	3.9
512	0.9	1.9	2.2	2.8
1,024	0.9	1.4	1.6	2.0
2,048	0.9	0.9	1.1	1.4
4,096	0.9	0.6	0.8	1.0
8,192	0.9	0.5	0.5	0.7
16,384	0.9	0.3	0.4	0.5

Figure 14 ($2.50/Day 2005 PPP poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, 2005 scorecard applied to the 2000 HIES

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	0.6	89.5	0.0	9.9	10.5	-98.6
5–9	3.5	86.7	0.0	9.9	13.3	-92.3
10–14	9.4	80.8	0.0	9.8	19.2	-79.2
15–19	19.0	71.2	0.1	9.8	28.8	-57.8
20–24	27.4	62.7	0.1	9.8	37.2	-39.1
25–29	37.8	52.3	0.2	9.7	47.5	-15.9
30–34	48.1	42.1	0.4	9.4	57.5	7.1
35–39	59.4	30.7	0.8	9.1	68.6	32.8
40–44	68.6	21.5	1.6	8.2	76.8	54.0
45–49	75.6	14.5	2.3	7.6	83.2	70.2
50–54	80.6	9.5	3.4	6.5	87.1	82.6
55–59	84.1	6.0	4.4	5.5	89.6	91.6
60–64	86.7	3.4	5.6	4.3	91.0	93.8
65–69	88.3	1.8	6.5	3.4	91.7	92.8
70–74	89.4	0.8	7.6	2.3	91.7	91.6
75–79	89.8	0.4	8.4	1.5	91.2	90.7
80–84	90.1	0.1	9.1	0.8	90.8	89.9
85–89	90.1	0.0	9.4	0.5	90.6	89.6
90–94	90.1	0.0	9.8	0.1	90.2	89.2
95–100	90.1	0.0	9.9	0.0	90.1	89.0

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

Figure 15 ($2.50/Day 2005 PPP poverty line): Households below the poverty line and all households at a given score or at or below a given score cut-off, 2005 scorecard applied to the 2000 HIES

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	0.6	100.0	0.7	Only poor targeted
5–9	3.5	100.0	3.8	Only poor targeted
10–14	9.4	99.7	10.4	291.9:1
15–19	19.0	99.7	21.0	314.6:1
20–24	27.5	99.6	30.4	247.7:1
25–29	38.0	99.5	41.9	181.0:1
30–34	48.5	99.1	53.3	109.5:1
35–39	60.2	98.7	66.0	77.9:1
40–44	70.2	97.7	76.1	41.9:1
45–49	77.9	97.1	83.9	33.0:1
50–54	84.0	96.0	89.4	23.9:1
55–59	88.6	95.0	93.4	19.1:1
60–64	92.3	93.9	96.2	15.5:1
65–69	94.8	93.2	98.0	13.6:1
70–74	96.9	92.2	99.1	11.8:1
75–79	98.1	91.5	99.6	10.7:1
80–84	99.2	90.8	99.9	9.9:1
85–89	99.5	90.6	100.0	9.6:1
90–94	99.9	90.2	100.0	9.2:1
95–100	100.0	90.1	100.0	9.1:1