Simple Poverty Scorecard® Poverty-Assessment Tool South Africa

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Abstract

The Simple Poverty Scorecard-brand poverty-assessment tool uses 10 low-cost indicators from South Africa's 2005/6 Income and Expenditure Survey to estimate the likelihood that a household has consumption below a given poverty line. Field workers can collect responses in about ten minutes. The scorecard's accuracy is reported for a range of poverty lines. The scorecard is a practical way for pro-poor programs in South Africa to measure poverty rates, to track changes in poverty rates over time, and to segment clients for differentiated treatment.

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Simple Poverty Scorecard® Poverty-Assessment Tool

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

Indicator	Response	Points	Score
1. How many members does the household have?	A. Seven or more	0	
	B. Six	7	
	C. Five	10	
	D. Four	14	
	E. Three	19	
	F. Two	27	
	G. One	37	
2. How many household members' main income is from salaries and wages, net profit from business or professional practice/ activities, or commercial farming?	A. None	0	
	B. One	5	
	C. Two or more	10	
3. How many rooms are in the dwelling unit, including bedrooms, living rooms, dining rooms, kitchens, and bathrooms, etc.?	A. Four or less	0	
	B. Five or six	4	
	C. Seven or more	8	
4. What is the main material used for the roof of the main dwelling?	A. Bricks, cement block/concrete, corrugated iron/zinc, wood, plastic, cardboard, mixture of mud and cement, wattle and daub, mud, thatching, asbestos, or other	0	
	B. Tile	7	
5. What type of toilet facility is available for this household?	A. Pit latrine off-site with or without ventilation pipe, bucket toilet off-site, none, or other	0	
	B. Pit latrine on-site with or without ventilation pipe, or bucket toilet on-site	4	
	C. Flush toilet in dwelling/on-site/off-site with off-site/on-site disposal (septic tank), or chemical toilet on-site or off-site	7	
6. What is the main source of cooking energy/fuel for this household?	A. Paraffin, coal, wood, animal dung, none, or other	0	
	B. Electricity from mains/generator/solar, or gas	5	
7. Does the household own a washing machine?	A. No	0	
	B. Yes	9	
8. Does the household own a videocassette recorder/DVD?	A. No	0	
	B. Yes	7	
9. Does the household own a microwave?	A. No	0	
	B. Yes	6	
10. Does the household own a refrigerator or freezer?	A. No	0	
	B. Yes	4	

Score:

Simple Poverty Scorecard® Poverty-Assessment Tool South Africa

1. Introduction

Pro-poor programs in South Africa can use the Simple Poverty Scorecard poverty-assessment tool to estimate the likelihood that a household has consumption below a given poverty line, to estimate a population's poverty rate at a point in time, to track changes in a population's poverty rate over time, and to segment participants for differentiated treatment.

The direct approach to poverty measurement via surveys is difficult and costly, asking households about a lengthy list of consumption items (such as "Did you purchase white bread on December 1st 2005? Was this for the household's own consumption? What is the value? What else did you purchase on December 1st 2005? . . .")

In contrast, the indirect approach via the scorecard is simple, quick, and inexpensive. It uses ten verifiable indicators (such as "What is the main source of cooking energy/fuel for this household?" or "Does the household own a refrigerator or freezer?") to get a score that is highly correlated with poverty status as measured by the exhaustive survey.

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

for 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). Measurements from these approaches are not comparable across organizations nor across countries, they may be costly, and their accuracy and precision are unknown.

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

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

cryptic indicator names such as "LGHHSZ_2", negative values, and many decimal places). Thanks to the predictive-modeling phenomenon known as the "flat max", simple, transparent scorecards are usually about accurate as complex, opaque 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, they have rarely or never been applied to poverty-assessment tools.

The scorecard is based on the 2005/6 Income and Expenditure Survey (IES) by Statistics South Africa. Indicators are selected to be:

- Inexpensive to collect, easy to answer quickly, and simple to verify
- Strongly correlated with poverty
- Liable to change over time as poverty status changes

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

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

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

Third, the scorecard can be used to estimate changes in the poverty rate for a 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.

The scorecard can also be used for targeting. To help managers choose the most appropriate targeting cut-off for their purposes, this paper reports several measures of targeting accuracy for a range of possible cut-offs.

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

The scorecard is constructed and calibrated using sub-samples of the data from the 2005/6 IES. Its accuracy is validated on another sub-sample from the 2005/6 IES.

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.[1]

Thus, while the indirect scoring approach is less costly than the direct survey approach, it is also biased. (The survey approach is unbiased by assumption.) There is bias because scoring must assume that the future relationship between indicators and

[1] In the context of the scorecard, examples of "different populations" include a nationally representative sample at a different point in time or a non-nationally representative sub-group (Tarozzi and Deaton, 2007).

poverty will be the same as in the data used to build the scorecard.[2] Of course, this assumption—ubiquitous and inevitable in predictive modeling—holds only partly.

When applied to the validation sample with bootstrap samples of $n = 16{,}384$, the difference between scorecard estimates of groups' poverty rates and the true rates at a point in time is –2.2 percentage points for the national line, and the average absolute difference is 2.0 percentage points across all seven lines. These differences are due to sampling variation and not bias; the average of each difference would be zero if the whole 2005/6 IES were to be repeatedly redrawn and divided into sub-samples before repeating the entire process of building and calibrating scorecards.

The 90-percent confidence intervals for these estimates are +/–0.9 percentage points or less for estimates of a poverty rate at a point in time. For $n = 1{,}024$, the 90-percent intervals are +/–3.6 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 South Africa. Sections 4 and 5 describe scorecard construction and offer guidelines for use in practice. 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 through time. Section 9 covers targeting. The final section is a summary.

[2] Bias may also result from changes in the quality of data collection, from changes over time to 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 consumption surveys.

2. Data and poverty lines

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

2.1 Data

The scorecard is based on data from the 18,801 African/Black and Coloured households in the 2005/6 IES conducted from September 2005 to August 2006. This is South Africa's most recent available national consumption survey.

Unsurprisingly, poverty in South Africa varies sharply across population groups. African/Black and Coloured[3] households—comprising 89 percent of all households—are about 26 times more likely to have consumption below the national poverty line than are White, Indian/Asian, and other households (42.3 percent versus 1.6 percent, Figure 2). Thus, the scorecard and other figures reported here pertain only to African/Black and Coloured households. These households in the 2005/6 IES 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

[3] The terms for population groups in this paper are those used in the 2005/6 IES.

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 consumption (divided by the number of household members) is below a given poverty line.

Beyond this general definition, there two special cases, *household-level poverty rates* and *person-level poverty rates*. With household-level rates, each household is counted as if it had only one person, regardless of true household size, so all households are counted equally. With person-level rates (the "head-count index"), each household is weighted by the number of people in it, so larger households count more.

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 consumption above a poverty line (it is "non-poor") and that the second household has per-capita consumption below a poverty line (it is "poor"). The household-level rate counts both households as if they had only one person and so gives a poverty rate of $1 \div (1 + 1) = 50$ percent. In contrast, the person-level rate weighs each household by the number of people in it and so gives a poverty rate 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 prefer to report household-level poverty rates.

This paper reports poverty rates and poverty lines for South Africa at both the household-level and the person-level, by urban/rural by province (Figures A1 and A2). The scorecard is constructed using the 2005/6 IES 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 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, calibrate scores to person-level likelihoods, and measure accuracy for person-level rates, but it is not done here.

2.2.2 Poverty lines

Statistics South Africa (2007a) estimates a food poverty line based on the 2000 IES and a per-person, per-day standard of 2261 kilocalories (ZAR9.10 at March 2006 prices). The national line of ZAR13.89 is defined as the food line plus "essential" non-food consumption for "non-food items typically purchased by households" with observed food consumption in the 2000 IES close to the food line.

Statistics South Africa (2007a) also calculates "lower" and "upper" poverty thresholds. The upper line of ZAR25.58 is defined as the food poverty line plus "average spending on non-food items" by households in the 2000 IES with food consumption in the area of the food line.[4] The lower threshold is not used in this paper because it is very similar to the USD1.25/day 2005 PPP 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 seven lines:

- National
- Food
- USAID "extreme"
- National upper
- USD1.25/day 2005 PPP
- USD2.50/day 2005 PPP
- USD4.00/day 2005 PPP

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

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

- 2005 PPP exchange rate for "individual consumption expenditure by households" (International Comparison Project, 2008): ZAR4.57 per USD1.00
- National Consumer Price Index (CPI, Statistics South Africa 2007b). The average CPIs in 2005 is 129.7, and the monthly CPI in March 2006 is 133.1.

[4] The upper line is much higher than the national line, but Statistics South Africa (2007a) does not explain the precise distinction between the two concepts of non-food consumption that drive the difference.

Given this, the USD1.25/day 2005 PPP line for South Africa as a whole at March 2006 prices are (Sillers, 2006):

$$(\text{2005 PPP exchange rate}) \cdot \text{USD1.25} \cdot \left(\frac{\text{CPI}_{\text{Mar. 2006}}}{\text{CPI}_{\text{2005 average}}} \right) =$$

$$\left(\frac{\text{ZAR4.57}}{\text{USD1.00}} \right) \cdot \text{USD1.25} \cdot \left(\frac{133.1}{129.7} \right) = \text{ZAR5.86}.$$

The USD2.50/day and USD4.00/day 2005 PPP lines are multiples of the USD1.25/day line.

The lines just discussed apply to South Africa as a whole. They are adjusted for urban/rural and provincial differences in cost-of-living using:

- L, a given all-South Africa poverty line
- π_i, a price index by urban/rural in each province
- π, a price index for South Africa as a whole (Figure 13)

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

$$L_i = \frac{L \cdot \pi_i}{\pi}.$$

The all-South Africa lines shown in Figure A1 and A2 are the weighted average of local lines L_i. The differences in local lines reflect the differences in local prices. This paper uses the national line to construct the scorecard.

3. Context of poverty-assessment tools for South Africa

This section discusses three existing poverty-assessment tools for South Africa in terms of goals, methods, poverty lines, indicators, accuracy, precision, and cost. Compared with these three tools, the new scorecard here has two strengths. First, its estimates are tested out-of-sample, and accuracy and formulas for standard errors are reported. Second, it is based on the latest nationally representative data.

3.1 Alderman *et al.*

Alderman *et al.* (2002) first test how well a poverty-assessment tool can estimate consumption and how well two simple questions in a census can estimate income. They find that the tool's proxy for consumption beats the census's proxy for income.

Alderman *et al.* use the tool to construct a "poverty map" (Elbers, Lanjouw, and Lanjouw, 2003) to estimate poverty rates for South Africa at the level of Transitional Local Councils. They construct nine poverty-assessment tools (one per province) using generalized least squares, estimating the logarithm of consumption for the 28,710 households in both the 1995 IES and the 1995 October Housing Survey, considering only indicators also found in the 1996 census.

The resulting tools are then applied to the 8.3 million households in the 1996 census to estimate poverty rates for a poverty line of ZAR800/household/month (in 1996 prices) for smaller areas than would be possible with only the IES. Finally,

Alderman *et al.* make "poverty maps" that quickly show how estimated poverty rates vary across areas in a way that makes sense to lay people.

Poverty mapping and the scorecard are similar in that they both:

- Build poverty-assessment tools with nationally representative survey data and then apply them to other data on sub-groups that may not be nationally representative
- Use simple, verifiable indicators that are quick and inexpensive to collect
- Provide unbiased estimates
- 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 the scorecard 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

The basic difference between the two approaches is that poverty mapping seeks to help governments design pro-poor policies, while the scorecard seeks to help small, local pro-poor organizations to manage their outreach when implementing policies.[5]

[5] 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).

The following 15 indicators (at both the household level and as district-level averages) appear in the tool by Alderman *et al.* for South Africa:

- Demographics:
    - Household size (logarithm)
    - Population group
    - Whether the head is female
- Number of household members with a primary education
- Employment:
    - Number of professionals
    - Number of skilled workers
- Characteristics of the residence:
    - Whether the structure is a formal dwelling
    - Rooms per person
    - Type of toilet arrangement
    - Presence of electric lighting
    - Type of refuse collection
- Ownership of a telephone
- Location:
    - Tribal area
    - Farm
    - Urban area

Because the census does not measure consumption, Alderman *et al.* cannot test accuracy out-of-sample (that is, using data that was not already used to construct the tool). In-sample, they find that their overall estimated poverty rate is within 0.1 percentage points of the IES 1995 estimate. They discuss (but do not report) standard errors, so a comparison of precision with the new scorecard here is not possible.

Demombynes *et al.* (2002) use the same approach and data as Alderman *et al.* They test the accuracy and precision of estimated poverty rates, concluding that "poverty estimates produced from census data are both *plausible* (in that they match well stratum-level estimates calculated directly from the household surveys) and

satisfactorily *precise* (at a level of disaggregation far below that allowed by household surveys)". As in this paper (Section 7), Demombynes *et al.* find standard errors for their tool that are smaller than for direct measurement.

3.2 Gwatkin *et al.*

Gwatkin *et al.* (2007) apply to South Africa 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 12,247 households in South Africa's 1998 DHS. The index is like the 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-term wealth/economic status.[6] Other examples of the PCA-index approach are Stifel and Christiaensen (2007), Zeller *et al.* (2006), Sahn and Stifle (2000), and Filmer and Pritchett (2001).

[6] Still, because the indicators are similar and because the "flat max" is important, carefully built PCA indices and consumption-based poverty-assessment tools 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 consumption include Filmer and Scott (2008), Lindelow (2006), Wagstaff and Watanabe (2003), and Montgomery *et al.* (2000).

The 18 indicators in Gwatkin *et al.* are similar in their simplicity, inexpensiveness, and verifiability to those in the new 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 walls
- Number of people per sleeping room
- Ownership of consumer durables:
  - — Radios
  - — Televisions
  - — Refrigerators
  - — Bicycles
  - — Motorcycles
  - — Cars or trucks
  - — Telephones
  - — Personal computers
  - — Washing machines
  - — Donkeys or horses
  - — Sheep or cattle

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, consumption-based poverty line. Thus, while both approaches can rank households, only the scorecard can estimate quantitative, consumption-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 Sahn and Stifel

Like this paper and like Gwatkin *et al.*, Sahn and Stifel (2003) seek a low-cost, practical way to measure poverty. They build an asset index using factor analysis (like PCA) and the 8,848 households in the South Africa Integrated Household Survey. Sahn and Stifel seek "to see if there exist simpler and less demanding alternatives to collecting data on consumption for purposes of measuring economic welfare and ranking households" (p. 484). Their motivation is similar to that of the new scorecard here: they want tools that are affordable and feasible given constraints on budgets and users' technical savvy, and they want to make comparisons over time and space without the complications and assumptions required for direct measurement via consumption surveys. Like this paper, they also seek a tool for targeting.

Sahn and Stifle's 9 indicators are simple, inexpensive, and verifiable:

- Ownership of consumer durables:
  - — Radio
  - — Television
  - — Refrigerator
  - — Bicycle
  - — Motorized transport
- Residence quality:
  - — Source of drinking water
  - — Type of toilet arrangement
  - — Quality of construction material of floor
- Human capital (education of the household head)

To check coherency between the asset index and reported consumption in the SAIHS[7] and between the asset index and child nutrition, Sahn and Stifel rank South African households based on the index, on consumption, and on height-for-age. For each pair of proxies, they judge the coherence of the two rankings by the distance between a given household's decile ranks. They conclude that the asset index predicts long-term nutritional status no worse than does current consumption. They also report that the asset index predicts consumption worse than does a least-squares regression that predicts consumption based on household demographics, education, residence quality, and access to public services.

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

4. Scorecard construction

For South Africa, about 100 potential indicators are initially prepared in the areas of:

- Family composition (such as household size)
- Education (such as the highest educational level of household members)
- Housing (such as the main source of cooking energy/fuel)
- Ownership of durable goods (such as microwaves and washing machines)

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 3 lists the best candidate indicators, ranked by uncertainty coefficient. Responses for each indicator in Figure 3 are ordered starting with those most strongly linked with higher poverty likelihoods.

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 videocassette recorder/DVD 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 national 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 scorecard here applies to all of South Africa. Evidence from India and Mexico (Schreiner, 2006a and 2005a), Sri Lanka (Narayan and Yoshida, 2005), and Jamaica (Grosh and Baker, 1995) suggests that segmenting poverty-assessment tools by urban/rural does not improve accuracy much in terms of targeting.

5. Practical guidelines for scorecard use

The main challenge of scorecard design is not to maximize statistical accuracy but rather to improve the chances that scoring is actually used in practice (Schreiner, 2005b). When scoring projects fail, the reason is not usually statistical inaccuracy but rather the failure of an organization to decide to do what is needed to integrate scoring in its processes and to 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. 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 is ready to be photocopied. A field worker using the paper scorecard would:

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

Of course, field workers must be trained. Quality outputs depend on quality inputs. If organizations or field workers gather their own data and have an incentive to exaggerate poverty rates (for example, if funders reward them for higher poverty rates), then it is wise to do on-going quality control via data review and random audits (Matul and Kline, 2003).[8] IRIS Center (2007a) and Toohig (2008) are useful nuts-and-bolts guides for budgeting, training field workers and supervisors, logistics, sampling, interviewing, piloting, recording data, and controlling quality.

In particular, while collecting scorecard indicators is relatively easier than alternatives, it is still absolutely difficult. Training and explicit definitions of terms and concepts in the scorecard is essential. For the case of Nigeria, there is 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, however, Martinelli and Parker (2007) find that errors by interviewers

[8] 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.

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

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

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

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

- Employees of the organization
- Third-party contractors

Responses, scores, and poverty likelihoods can be recorded:

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

The subjects to be scored can be:

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

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

Frequency of application can be:

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

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

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

An example set of choices were made by BRAC and ASA, two microlenders in Bangladesh (each with 7 million participants) who are applying the Simple Poverty Scorecard tool for Bangladesh (Schreiner, 2013). Their design is that loan officers in a random sample of branches will score all participants each time they visit a homestead (about once a year) as part of their standard due diligence prior to loan disbursement. Responses are recorded on paper in the field before being sent to a central office to be entered into a database. ASA's and BRAC's sampling plans cover 50,000–100,000 participants each.

6. Estimates of household poverty likelihoods

The sum of scorecard points for a household is called the *score*. For South Africa, 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 necessarily double the likelihood of being above a poverty line.

To get absolute units, scores must be converted to *poverty likelihoods*, that is, probabilities of being below a poverty line. This is done via simple look-up tables. For the example of the national line, scores of 10–14 have a poverty likelihood of 96.3 percent, and scores of 40–44 have a poverty likelihood of 29.6 percent (Figure 4).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 40–44 are associated with a poverty likelihood of 29.6 percent for the national line but 10.3 percent for the food line.[9]

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.

[9] Starting with Figure 4, most figures have seven versions, one for each of seven poverty lines. To keep them straight, they are grouped by poverty line. Single tables that pertain to all poverty lines are placed with the first group of tables for the national line.

For the example of the national line (Figure 5), there are 7,152 (normalized) households in the calibration sub-sample with a score of 20–24, of whom 5,854 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 20–24 is then 81.9 percent, because 5,854 ÷ 7,152 = 81.9 percent.

To illustrate with the national line and a score of 40–44, there are 10,227 (normalized) households in the calibration sample, of whom 3,024 (normalized) are below the line (Figure 5). Thus, the poverty likelihood for this score is 3,024 ÷ 10,227 = 29.6 percent.

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

Figure 6 shows, for all scores, the likelihood that consumption falls in a range demarcated by two adjacent poverty lines. For example, the daily consumption of someone with a score of 35–39 falls in the following ranges with probability:

- 4.4 percent below the USD1.25/day 2005 PPP line
- 8.2 percent between the USD1.25/day 2005 PPP and USAID lines
- 2.9 percent between the USAID and food lines
- 13.0 percent between the food and USD2.50/day 2005 PPP lines
- 10.8 percent between the USD2.50/day and national lines
- 19.0 percent between the national and USD4.00/day 2005 PPP lines
- 18.9 percent between the USD4.00/day 2005 PPP and upper national lines
- 22.8 percent above the upper national 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 consumption and quantitative poverty lines. The poverty likelihoods would be objective even if indicators and/or points were selected without any data at

all. In fact, objective scorecards of proven accuracy are often based only on judgment (Fuller, 2006; Caire, 2004; Schreiner *et al.*, 2004). Of course, the scorecard here is constructed with both data and judgment. The fact that this paper acknowledges that some choices in scorecard construction—as in any statistical analysis—are informed by judgment in no way impugns the objectivity of the poverty likelihoods, as this depends on using data in score calibration, not on using data (and nothing else) in scorecard construction.

Although the points in the South Africa scorecard are transformed coefficients from a Logit regression, scores are not converted to poverty likelihoods via the Logit formula of $2.718281828^{\text{score}}$ x $(1+ 2.718281828^{\text{score}})^{-1}$. 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 samples.

6.2 Accuracy of estimates of households' poverty likelihoods

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

average estimate matches the true 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.[10]

Of course, the relationship between indicators and poverty does change to some unknown extent with time and also across sub-groups in South Africa's population, so the scorecard will generally be biased when applied after August 2006 (the end date of fieldwork for the 2005/6 IES) or when applied with non-nationally representative groups.

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 consumption below a poverty line
- For each score, record the difference between the estimated poverty likelihood (Figure 4) and the true poverty likelihood in the bootstrap sample
- Repeat the previous three steps 1,000 times
- For each score, report the average difference between estimated and true poverty likelihoods across the 1,000 bootstrap samples
- For each score, report the two-sided interval containing the central 900, 950, or 990 differences between estimated and true poverty likelihoods

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

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

For the national line, the average poverty likelihood across bootstrap samples for scores of 20–24 in the validation sample is too low by 1.6 percentage points (Figure 7). For scores of 5–9, the estimate is too high by 4.0 percentage points.[11]

The 90-percent confidence interval for the differences for scores of 20–24 is +/– 2.2 percentage points (Figure 7). This means that in 900 of 1,000 bootstraps, the difference between the estimate and the true value is between –3.8 and 0.6 percentage points (because –1.6 – 2.2 = –3.8, and –1.6 + 2.2 = 0.6). In 950 of 1,000 bootstraps (95 percent), the difference is –1.6 +/–2.5 percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is –1.6 +/–3.3 percentage points.

For almost all scores below 64, Figure 7 shows differences—sometimes large ones—between estimated poverty likelihoods and true values. This is because the validation sub-sample is a single sample that—thanks to sampling variation—differs in distribution from the construction/calibration sub-samples and from South Africa's population. For targeting, however, what matters is less the difference in all score ranges and more the difference in score ranges just above and below the targeting cut-

[11] 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 process of scorecard building and calibration.

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 out. This is generally the case, as discussed in the next section.

Another possible source of differences between estimates and true values is overfitting. By construction, the scorecard here is unbiased, but it may still be *overfit* when applied after the end of the IES fieldwork in August 2006. That is, it may fit the 2005/6 IES data so closely that it captures not only some timeless patterns but also some random patterns that, due to sampling variation, show up only in the 2005/6 IES. Or the scorecard may be overfit in the sense that it is not robust to changes in the relationships between indicators and poverty or when it is applied to non-nationally representative samples.

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

Most errors in individual households' likelihoods, however, cancel out in the estimates of groups' poverty rates (see later sections). Furthermore, at least some of the differences 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 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 81.9, 64.2, and 29.6 percent (national line, Figure 4). The group's estimated poverty rate is the households' average poverty likelihood of $(81.9 + 64.2 + 29.6) \div 3 = 58.6$ percent.[12]

7.1 Accuracy of estimated poverty rates at a point in time

For the South Africa scorecard applied to the validation sample with $n = 16{,}384$, the absolute differences between the estimated poverty rate at a point in time and the true rate are 3.6 percentage points or less (Figure 8, summarizing Figure 9 across poverty lines). The average absolute difference across the seven poverty lines is 2.0 percentage points. At least part of these differences is due to sampling variation in the validation sample and in the random division of the 2005/6 IES into three sub-samples.

In terms of precision, the 90-percent confidence interval for a group's estimated poverty rate at a point in time with $n = 16{,}384$ is +/–0.9 percentage points or less (Figure 8). This means that in 900 of 1,000 bootstraps of this size, the difference

[12] The group's poverty rate is *not* the poverty likelihood associated with the average score. Here, the average score is $(20 + 30 + 40) \div 3 = 30$, and the poverty likelihood associated with the average score is 64.2 percent. This is not the 58.6 percent found as the average of the three poverty likelihoods associated with each of the three scores.

between the estimate and the true value is within 0.9 percentage points of the average difference. In the specific case of the national line and the validation sample, 90 percent of all samples of $n = 16{,}384$ produce estimates that differ from the true value in the range of –2.2 – 0.6 = –2.8 to –2.2 + 0.6 = –1.6 percentage points. This is because –2.2 is the average difference, and +/–0.6 is its 90-percent confidence interval. The average difference is –2.2 because the average scorecard estimate is too low by 2.2 percentage points; it estimates a poverty rate of 40.8 percent for the validation sample, but the true value is 43.0 percent (Figure 2).

7.2 Formula for standard errors for estimates of poverty rates

How precise are the point-in-time estimates? Because they are averages of binary (0/1, or poor/non-poor) variables, the estimates have a Normal distribution and can be characterized by their average difference vis-à-vis true values together with the standard error of the average difference.

To derive a formula for the standard errors of estimated poverty rates at a point in time from indirect measurement via poverty-assessment tools (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
(for example, 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, this implies that for a sample n of 16,384 with 90-percent confidence ($z = 1.64$) and a poverty rate p of 42.0 percent (the average poverty rate in the construction and calibration samples in Figure 2 for the national line), the confidence interval c is $+/- z \cdot \sqrt{\frac{p \cdot (1-p)}{n}} = +/- 1.64 \cdot \sqrt{\frac{0.420 \cdot (1-0.420)}{16{,}384}} = 0.00632$, or 0.632 percentage points.

The scorecard, however, does not measure poverty directly, so this formula is not immediately applicable. To derive a formula for the South Africa scorecard, consider Figure 9, 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 national line, the 90-percent confidence interval is 0.635 percentage points.[13]

Thus, the 90-percent confidence interval with $n = 16{,}384$ is 0.635 percentage points for South Africa's scorecard and 0.632 percentage points for direct measurement. The ratio of the two intervals is $0.635 \div 0.632 = 1.00$.

Now consider the same case, but with $n = 8{,}192$. The confidence interval under direct measurement is $+/-1.64 \cdot \sqrt{\frac{0.420 \cdot (1-0.420)}{8{,}192}} = 0.00894$, or about 0.894 percentage points. The empirical confidence interval with the South Africa scorecard (Figure 9) is 0.00885, or about 0.885 percentage points. Thus for $n = 8{,}192$, the ratio of the two intervals is $0.885 \div 0.894 = 0.99$.

This ratio of 0.99 for $n = 8{,}182$ is not far from the ratio of 1.00 for $n = 16{,}384$. Across all sample sizes of 256 or more in Figure 9, the average ratio turns out to be 1.01, implying that confidence intervals for indirect estimates of poverty rates via the South Africa scorecard and this poverty line are about the same as confidence intervals for direct estimates via the 2005/6 IES. This 1.01 appears in Figure 8 as the "α factor" because if $\alpha = 1.01$, then the formula relating confidence intervals c and standard errors σ for the South Africa scorecard is $c = +/- z \cdot \alpha \cdot \sigma$. That is, formula for the standard error σ for point-in-time estimates of poverty rates via scoring is $\alpha \cdot \sqrt{\frac{p \cdot (1-p)}{n}}$.

[13] Due to rounding, Figure 9 displays 0.6, not 0.635.

In general, α can be more or less than 1.00. When α is less than 1.00, it means that the scorecard is more precise than direct measurement. This occurs for three of of seven poverty lines in Figure 8.

The formula relating confidence intervals to standard errors for the scorecard can be rearranged to give a formula for determining sample size before measurement.[14] If $\hat{p}$ is the expected poverty rate before measurement, then the formula for sample size n based on the desired confidence level that corresponds to z and the desired confidence interval $+/-c$ is $n = \left(\frac{\alpha \cdot z}{c}\right)^2 \cdot \hat{p} \cdot (1 - \hat{p})$.

To illustrate how to use this, suppose $c = 0.0526$ and $z = 1.64$ (90-percent confidence). Then the formula gives $n = \left(\frac{1.01 \cdot 1.64}{0.0526}\right)^2 \cdot 0.420 \cdot (1 - 0.420) = 242$, close to the sample size of 256 observed for these parameters in Figure 9.

Of course, the α factors in Figure 8 are specific to South Africa, its poverty lines, its poverty rates, and this scorecard. The derivation of the formulas, however, is valid for any scorecard following the approach in this paper.

In practice after the end of fieldwork for the IES in August 2006, an organization would select a poverty line (say, the national line), select a desired confidence level

[14] IRIS Center (2007a and 2007b) says that a sample size of $n = 300$ is sufficient for USAID reporting. If a poverty-assessment tool 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 poverty-assessment tool could be more or less precise than direct measurement.

(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 42.3 percent national average among African/Black and Coloured households in the 2005/6 IES in Figure 2), look up α (here, 1.01), assume that the scorecard will still work in the future and/or for non-nationally representative sub-groups,[15] and then compute the required sample size. In this illustration,

$$n = \left(\frac{1.01 \cdot 1.64}{0.02}\right)^2 \cdot 0.423 \cdot (1 - 0.423) = 1{,}675.$$

[15] This paper reports accuracy for the scorecard applied to the validation sample, but it cannot test accuracy for later years or for other groups. Still, performance after March 2006 will probably resemble that in the 2005/6 IES, with some deterioration over time.

8. Estimates of changes in group poverty rates over time

The change in a group's poverty rate between two points in time is estimated as the change in the average poverty likelihood of the households in the group. With data for 2005/6 IES only, this paper cannot estimate changes over time, nor can it present formula for standard errors. Nevertheless, the relevant concepts are presented here because, in practice, pro-poor organizations can apply the scorecard to collect their own data and measure change through time.

8.1 Warning: Change is not impact

Scoring can estimate change. Of course, poverty could get better or worse, and scoring does not indicate what caused change. This point is often forgotten or confused, so it bears repeating: the scorecard simply estimates change, and it does not, in and of itself, indicate the reason for the change. In particular, estimating the impact of program participation requires knowing what would have happened to participants if they had not been participants (Moffitt, 1991). Knowing this requires either strong assumptions or a control group that resembles participants in all ways except participation. To belabor the point, the scorecard can help estimate program impact only if there is some way to know what would have happened in the absence of the program. And that information must come from somewhere beyond the scorecard. Even measuring simple change usually requires assuming that the population is constant over time and that program drop-outs do not differ from non-drop-outs.

8.2 Calculating estimated changes in poverty rates over time

Consider the illustration begun in the previous section. On Jan. 1, 2009, a program samples three households who score 20, 30, and 40 and so have poverty likelihoods of 81.9, 64.2, and 29.6 percent (national line, Figure 4). The group's baseline estimated poverty rate is the households' average poverty likelihood of (81.9 + 64.2 + 29.6) ÷ 3 = 58.6 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 25, 35, and 45 (poverty likelihoods of 72.9, 39.3, and 18.0 percent, national line, Figure 4). Their average poverty likelihood at follow-up is now (72.9 + 39.3 + 18.0) ÷ 3 = 43.4 percent, an improvement of 58.6 – 43.4 = 15.2 percentage points.

This suggests that about one of seven participants in this hypothetical example crossed the poverty line in 2009.[16] Among those who started below the line, one in four (15.2 ÷ 58.6 = 25.9 percent) on net ended up above the line.[17]

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

8.3 Accuracy for estimated change in two independent samples

With only the 2005/6 IES, it is not possible to measure the accuracy of scorecard estimates of changes in groups' poverty rates over time. In practice, of course, local pro-poor organizations can still apply South Africa's scorecard to estimate change. The rest of this section suggests approximate formulas for standard errors and sample sizes that may be used until there is additional data.

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 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,[18] and α is the average (across a range of bootstrapped sample sizes) of the ratio of the observed confidence interval from a scorecard and the theoretical confidence interval under direct measurement.

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

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

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

For the countries for which this α has been measured (Peru, the Philippines, India, Vietnam, and Bangladesh, see Schreiner, 2009a, 2009b, and 2008c and Chen and Schreiner, 2009a and 2009b), the average α across poverty lines is 0.77, 0.77, 1.40, 0.68, and 1.03. The average across countries (0.93) may be reasonable for South Africa.

To illustrate the use of the formula above to determine sample size for estimating changes in poverty rates across two independent samples, suppose the desired confidence level is 90 percent ($z = 1.64$), the desired confidence interval is 2 percentage points ($c = 0.02$), the poverty line is the national line, $\alpha = 0.93$, and $\hat{p} = 0.423$ (from Figure 2). Then the baseline sample size is $n = 2 \cdot \left(\frac{0.93 \cdot 1.64}{0.02} \right)^2 \cdot 0.423 \cdot (1 - 0.423) =$ 2,839, and the follow-up sample size is also 2,839.

8.4 Accuracy for estimated change for one sample, scored twice

Analogous to previous derivations, the general formula relating the confidence interval c to the standard error σ when using a scorecard to estimate change for a single group of households, all of whom are scored at two points in time, is:[19]

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

where 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.

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

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

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

Because $\hat{p}_*$ could be anything between 0–1, more information is needed to apply 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:

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

Given this, a sample-size formula for a group of households to whom the South Africa scorecard is applied twice (once after August 2006 and then again later) is:

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

In Peru (the only other country for which there is 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 the national line, and the sample will first be scored in 2009 and then again in 2012 ($y = 3$). The before-baseline poverty rate is 42.3 percent ($p_{2006} = 0.423$, Figure 2), and suppose $\alpha = 1.3$. Then the baseline sample size is $n = 2 \cdot \left(\frac{1.3 \cdot 1.64}{0.02} \right)^2 \cdot \{-0.02 + 0.016 \cdot 3 + 0.47 \cdot [0.423 \cdot (1 - 0.423)]\} = 3{,}244$. The same group of 3,244 households is scored at follow-up as well.

9. Targeting

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

There is a distinction between *targeting status* (scoring at or below a targeting cut-off) and *poverty status* (consumption below a poverty line). Poverty status is a fact that depends on whether consumption 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 10 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 11 shows the distribution of households by targeting outcome. For an example cut-off of 35–39, outcomes for the national line in the validation sample are:

- Inclusion: 36.9 percent are below the line and correctly targeted
- Undercoverage: 6.1 percent are below the line and mistakenly not targeted
- Leakage: 13.9 percent are above the line and mistakenly targeted
- Exclusion: 43.1 percent are above the line and correctly not targeted

Increasing the cut-off to 40–44 improves inclusion and undercoverage but worsens leakage and exclusion:

- Inclusion: 40.2 percent are below the line and correctly targeted
- Undercoverage: 2.8 percent are below the line and mistakenly not targeted
- Leakage: 20.8 percent are above the line and mistakenly targeted
- Exclusion: 36.2 percent are above the line and correctly not targeted

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

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

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

- Assign benefits and costs to possible outcomes, based on its values and mission
- Tally total net benefits for each cut-off using Figure 11 for a given poverty line
- Select the cut-off with the highest total net benefit

The most difficult step is assigning benefits and costs to targeting outcomes. 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 11 shows "Total Accuracy" for all cut-offs for the South Africa scorecard. For the national line in the validation sample, total net benefit is greatest (80.1) for a cut-off of 30–34, with about eight in ten South African 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 12 ("% targeted who are poor") shows, for the South Africa scorecard applied to the validation sample, the expected poverty rate among households who score at or below a given cut-off. For the example of the national line in the validation sample, targeting

households who score 35–39 or less would target 50.8 percent of all households and produce a poverty rate among those targeted of 72.5 percent.

Figure 12 also reports two other measures of targeting accuracy. The first is a version of coverage ("% of poor who are targeted"). For the example of the national line in the validation sample and a cut-off of 35–39, 85.7 percent of all poor households are covered.

The final targeting measure in Figure 12 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For the national line in the validation sample and a cut-off of 35–39, covering 2.6 poor households means leaking to 1 non-poor household.

10. Conclusion

Pro-poor programs in South Africa can use the scorecard to segment clients for differentiated treatment as well as to estimate:

- The likelihood that a household has consumption below a given poverty line
- The poverty rate of a population at a point in time
- The change in the poverty rate of a population over time

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

The scorecard is built with a sub-sample of data from the 2005/6 IES, tested on a different sub-sample from the 2005/6 IES, and calibrated to seven poverty lines (national, food, USAID "extreme", national upper, USD1.25/day 2005 PPP, USD2.50/day 2005 PPP, and USD4.00/day 2005 PPP).

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

When the scorecard is applied to the validation sample with $n = 16{,}384$, the absolute difference between estimates versus true poverty rates for groups of households at a point in time is always less than 3.6 percentage points and averages—across the seven poverty lines—about 2.0 percentage points. For $n = 16{,}384$ and 90-percent confidence, the precision of these differences is +/–0.9 percentage points or better, and

for $n = 1{,}024$, precision is +/–3.6 percentage points or less. For some poverty lines, the scorecard is more precise than direct measurement.

If a program wants to use the scorecard for targeting, then the results here provide the information needed to select a cut-off that fits their values and mission.

Although the statistical technique is innovative, and although technical accuracy is important, the design of the scorecard here focuses on transparency and ease-of-use. After all, a perfectly accurate scorecard is worthless if programs feel so daunted by its complexity or its cost that they do not even try to use it. For this reason, the scorecard is kept simple, using 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 scorecard is a practical, objective way for pro-poor programs in South Africa 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 consumption survey.

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

		% with expenditure below a poverty line						
			National	USAID	National	International (2005 PPP)		
Sub-sample	**Households**	**National**	**Food**	**'Extreme'**	**Upper**	**$1.25/day**	**$2.50/day**	**$4.00/day**
South Africa: African/Black and Coloured	18,801	42.3	24.6	18.7	65.7	10.5	34.4	54.6
Construction								
Selecting indicators and weights	6,261	41.0	23.9	17.8	66.3	10.2	33.2	54.1
Calibration								
Associating scores with likelihoods	6,303	42.9	24.5	18.6	65.9	10.3	34.9	54.8
Validation								
Measuring accuracy	6,237	43.0	25.4	19.6	65.0	11.0	35.0	55.0
Change in poverty rate (percentage points)								
From construction/calibration to validation for African/Black and Coloured		-1.0	-1.2	-1.4	1.1	-0.7	-1.0	-0.6
South Africa: White, Indian/Asian, or other	2,343	1.6	0.3	0.2	4.7	0.1	0.7	3.4
South Africa: All	21,144	36.0	20.8	15.8	56.3	8.9	29.2	46.7

Source: 2005/06 IES. Population group is determined by the household head.

Figure 3: Poverty indicators by uncertainty coefficient

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
148	How many members does the household have? (Seven or more; Six; Five; Four; Three; Two; One)
116	What is the main source of heating energy/fuel for this household? (Wood, candle, animal dung, or other; Paraffin, coal, or none; Electricity from mains/generator/solar, or gas)
113	What is the main source of cooking energy/fuel for this household? (Paraffin, coal, wood, animal dung, none, or other; Electricity from mains/generator/solar, or gas)
87	What type of toilet facility is available for this household? (Pit latrine off-site with or without ventilation pipe, bucket toilet off-site, none, or other; Pit latrine on-site with or without ventilation pipe, or bucket toilet on-site; Flush toilet in dwelling/on-site/off-site with off-site/on-site disposal (septic tank), or chemical toilet on-site/off-site)
75	What is the type of main dwelling that the household occupies on this piece of land? (Traditional dwelling/hut/structure made of traditional material; Dwelling or brick structure on a separate stand or yard or on-farm, informal dwelling/shack in backyard or not in backyard *e.g.* in an informal/squatter settlement or on-farm; Flat or apartment in a block of flats, town/cluster/semi-detached house (simplex, duplex or triplex), unit in retirement village, dwelling/flat/room in backyard, room/flatlet or a larger dwelling/servants' quarters/granny flat, caravan/tent, workers' hostel, family unit (formerly workers' hostel), or other)
72	How is the refuse or rubbish of this household taken care of? (Own refuse dump, or no rubbish removal; Removed by local authority at least once a week/less than once a week, removed by community members at least once a week/less than once a week, communal refuse dump/communal container, or other)
68	Does the household own a microwave? (No; Yes)
68	What is the highest level of education successfully completed by any household member? (Grade 11/Standard 9/Form 4, or lower; Grade 12/Standard 10/Form 5/MATRIC, or higher)
67	Does the household own a videocassette recorder/DVD? (No; Yes)
66	Do you have any street lighting where you live? (No; Yes)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
60	What is the main material used for the walls of the main dwelling? (Mixture of mud and cement, wattle and daub, mud, thatching, or other; Cement block/concrete, corrugated iron/zinc, wood, plastic, cardboard or tile; Bricks or asbestos)
54	How many household members' main income is from salaries and wages, net profit from business or professional practice/activities, or commercial farming? (None; One; Two or more)
54	How many household members have income from salaries and wages, or net profit from business or professional practice/activities or commercial farming? (None; One; Two or more)
52	How many bathrooms does this household occupy? (None; One; Two or more)
49	Does the household own a washing machine? (No; Yes)
42	What is the main material used for the roof of the main dwelling? (Bricks, cement block/concrete, corrugated iron/zinc, wood, plastic, cardboard, mixture of mud and cement, wattle and daub, mud, thatching, asbestos, or other; Tile)
41	What is the main source of lighting energy/fuel for this household? (Candle, or other; Paraffin; Electricity from mains/generator/solar, or gas)
34	Is there any garage that belongs to the dwelling unit? (No; Yes)
34	Does the household own a motor vehicle? (No; Yes)
34	Does the household own a stereo/Hi-Fi? (No; Yes)
34	Does the household own a landline telephone? (No; Yes)
30	Does the household own a computer? (No; Yes)
29	Does the household own a refrigerator or freezer? (No; Yes)
29	Does the household own a camera? (No; Yes)
27	Does the household own a gas or electric stove? (No; Yes)

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

Uncertainty coefficient	Indicator (Answers ordered starting with those most strongly linked with higher poverty likelihoods)
27	Does the household own a television? (No; Yes)
17	Is the toilet facility shared with other households? (No; Yes)
12	Does the household own a tape recorder? (No; Yes)
8	Does the household own a wheelbarrow? (No; Yes)
8	Does the household own a satellite dish? (No; Yes)
7	How many bedrooms does this household occupy? (Two or less; Three or more)
6	How many living rooms are in the dwelling unit? (None; One or more)
4	How many kitchens does this household occupy? (None; One or more)
3	Does the household own a radio? (No; Yes)
3	Does the household own a bicycle? (No; Yes)
3	How many dining rooms does this household occupy? (None; One or more)
2	How many rooms are in the dwelling unit, including bedrooms, living rooms, dining rooms, kitchens, and bathrooms, etc.? (Four or less; Five or six; Seven or more)
1	Does the household own a motorcycle/scooter? (No; Yes)
0	Does the household own a motorboat? (No; Yes)
0	Can anybody in the household read and write in at least one language? (No; Yes)

National Poverty Line Tables

(and Tables Pertaining to All Seven Poverty Lines)

Figure 4 (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	98.0
5–9	95.1
10–14	96.3
15–19	91.8
20–24	81.9
25–29	72.9
30–34	64.2
35–39	39.3
40–44	29.6
45–49	18.0
50–54	5.4
55–59	4.2
60–64	0.9
65–69	0.1
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Surveyed cases weighted to represent African/Black and Coloured households.
Based on the 2005/06 IES.

Figure 5 (National poverty line): Derivation of estimated poverty likelihoods associated with scores

Score	Households at score and below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,555	÷	1,587	=	98.0
5–9	2,403	÷	2,526	=	95.1
10–14	4,613	÷	4,792	=	96.3
15–19	5,678	÷	6,186	=	91.8
20–24	5,854	÷	7,152	=	81.9
25–29	6,437	÷	8,833	=	72.9
30–34	5,709	÷	8,895	=	64.2
35–39	4,261	÷	10,834	=	39.3
40–44	3,024	÷	10,227	=	29.6
45–49	2,031	÷	11,279	=	18.0
50–54	486	÷	9,036	=	5.4
55–59	206	÷	4,951	=	4.2
60–64	41	÷	4,471	=	0.9
65–69	3	÷	4,274	=	0.1
70–74	0	÷	2,536	=	0.0
75–79	0	÷	1,227	=	0.0
80–84	0	÷	779	=	0.0
85–89	0	÷	335	=	0.0
90–94	0	÷	45	=	0.0
95–100	0	÷	36	=	0.0

Number of all households normalized to sum to 100,000.
Based on the 2005/06 IES.

Figure 6 (All poverty lines): Distribution of household poverty likelihoods across consumption ranges demarcated by poverty lines

	Likelihood of having expenditure in range demarcated by poverty lines per day per capita							
	<$1.25/day	=>$1.25/day and <USAID	=>USAID and <Food	=>Food and <$2.50/day	=>$2.50/day and <National	=>National and <$4.00/day	=>$4.00/day and <Upper	=>Upper
Score	<ZAR5.86	=>ZAR5.86 and <ZAR8.06	=>ZAR8.06 and <ZAR9.11	=>ZAR9.11 and <ZAR11.72	=>ZAR11.72 and <ZAR13.90	=>ZAR13.90 and <ZAR18.76	=>ZAR18.76 and <ZAR25.60	=>ZAR25.60
0–4	76.3	2.7	13.9	3.1	2.1	2.0	0.0	0.0
5–9	55.6	21.8	10.3	5.1	2.2	2.4	2.4	0.0
10–14	40.5	14.2	22.3	15.6	3.8	2.8	0.5	0.4
15–19	30.2	21.2	17.9	13.6	8.9	4.9	1.9	1.4
20–24	21.6	16.3	13.0	19.2	11.8	12.9	2.5	2.8
25–29	12.6	16.9	8.8	21.9	12.7	16.7	4.2	6.2
30–34	5.1	13.5	6.3	20.6	18.8	17.5	11.0	7.4
35–39	4.4	8.2	2.9	13.0	10.8	19.0	18.9	22.8
40–44	2.0	5.2	3.1	10.0	9.3	18.4	25.8	26.2
45–49	1.0	2.2	1.6	5.6	7.6	18.1	17.7	46.2
50–54	0.4	0.6	0.1	1.5	2.8	8.3	14.2	72.1
55–59	0.0	0.1	0.0	1.0	3.1	6.2	14.0	75.7
60–64	0.0	0.4	0.0	0.0	0.5	4.1	6.0	89.0
65–69	0.0	0.0	0.0	0.1	0.0	0.3	4.4	95.3
70–74	0.0	0.0	0.0	0.0	0.0	0.0	1.4	98.6
75–79	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
80–84	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
85–89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
90–94	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
95–100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0

All poverty likelihoods are in percentage units. All poverty lines are in March 2006 prices.

Figure 7 (National poverty line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Score	**Diff.**	**90-percent**	**95-percent**	**99-percent**
0–4	–1.6	1.0	1.0	1.0
5–9	+4.0	2.6	3.1	4.1
10–14	–0.3	1.0	1.2	1.5
15–19	–0.4	1.6	1.9	2.5
20–24	–1.6	2.2	2.5	3.3
25–29	–4.5	3.4	3.5	4.1
30–34	–9.7	6.1	6.4	6.9
35–39	–4.3	3.4	3.7	4.3
40–44	–8.0	5.6	5.9	6.3
45–49	+6.4	1.4	1.6	2.1
50–54	+0.1	1.1	1.3	1.7
55–59	–4.7	3.6	3.9	4.4
60–64	+0.5	0.3	0.3	0.4
65–69	–0.1	0.1	0.1	0.2
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 8 (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, scorecard applied to the validation sample

	Poverty line						
		National	USAID	National	International (2005 PPP)		
	National	Food	'Extreme'	Upper	$1.25/day	$2.50/day	$4.00/day
Estimate minus true value							
Scorecard applied to the validation sample	–2.2	–3.6	–3.6	+1.1	+1.0	–1.8	–1.0
Precision of difference							
Scorecard applied to the validation sample	0.6	0.9	0.9	0.5	0.3	0.7	0.6
α for sample size							
Scorecard applied to the validation sample	1.01	1.54	1.77	0.89	0.83	1.14	0.91

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

Sample Size	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–1.1	67.3	77.4	94.6
4	–0.5	33.7	40.4	57.6
8	–0.5	26.3	30.2	38.8
16	–0.9	19.2	23.9	30.0
32	–1.7	14.4	17.0	20.7
64	–2.0	10.6	12.3	15.6
128	–2.1	7.5	9.1	11.6
256	–2.1	5.3	6.3	8.3
512	–2.2	3.7	4.4	6.1
1,024	–2.2	2.6	3.0	3.9
2,048	–2.2	1.8	2.1	2.8
4,096	–2.2	1.3	1.6	2.0
8,192	–2.2	0.9	1.1	1.4
16,384	–2.2	0.6	0.8	1.0

Figure 10 (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 11 (National poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.6	41.4	0.0	57.0	58.6	–92.7
5–9	3.9	39.1	0.2	56.8	60.7	–81.4
10–14	8.4	34.6	0.5	56.5	65.0	–59.7
15–19	14.0	29.0	1.1	56.0	70.0	–32.2
20–24	20.0	23.0	2.2	54.8	74.8	–1.7
25–29	26.4	16.6	4.7	52.3	78.7	+33.6
30–34	31.5	11.5	8.4	48.6	80.1	+66.3
35–39	36.9	6.1	13.9	43.1	79.9	+67.6
40–44	40.2	2.8	20.8	36.2	76.4	+51.6
45–49	41.9	1.1	30.4	26.6	68.5	+29.3
50–54	42.6	0.4	38.8	18.2	60.8	+9.8
55–59	42.9	0.1	43.4	13.6	56.5	–1.0
60–64	43.0	0.0	47.8	9.2	52.2	–11.2
65–69	43.0	0.0	52.1	5.0	47.9	–21.1
70–74	43.0	0.0	54.6	2.4	45.4	–27.0
75–79	43.0	0.0	55.8	1.2	44.2	–29.8
80–84	43.0	0.0	56.6	0.4	43.4	–31.7
85–89	43.0	0.0	56.9	0.1	43.1	–32.4
90–94	43.0	0.0	57.0	0.0	43.0	–32.5
95–100	43.0	0.0	57.0	0.0	43.0	–32.6

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

Figure 12 (National poverty line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.6	99.0	3.7	103.9:1
5–9	4.1	94.5	9.0	17.2:1
10–14	8.9	94.6	19.6	17.5:1
15–19	15.1	93.0	32.7	13.3:1
20–24	22.2	90.1	46.6	9.1:1
25–29	31.1	84.8	61.3	5.6:1
30–34	40.0	78.9	73.3	3.7:1
35–39	50.8	72.5	85.7	2.6:1
40–44	61.0	65.9	93.6	1.9:1
45–49	72.3	57.9	97.5	1.4:1
50–54	81.3	52.3	99.1	1.1:1
55–59	86.3	49.7	99.8	1.0:1
60–64	90.8	47.3	99.9	0.9:1
65–69	95.0	45.2	100.0	0.8:1
70–74	97.6	44.1	100.0	0.8:1
75–79	98.8	43.5	100.0	0.8:1
80–84	99.6	43.2	100.0	0.8:1
85–89	99.9	43.0	100.0	0.8:1
90–94	100.0	43.0	100.0	0.8:1
95–100	100.0	43.0	100.0	0.8:1

Figure 13: Consumer price index in March 2006 by province and by urban/rural

	Consumer Price Index (March 2006)	
Province	**Urban**	**Rural**
Western Cape	132.0	139.8
Eastern Cape	135.3	135.3
Northern Cape	136.0	136.9
Free State	128.9	115.5
KwaZulu-Natal	131.9	138.9
North West	133.0	131.0
Gauteng	130.9	134.6
Mpumalanga	135.0	141.2
Limpopo	128.6	131.8

The CPI in March 2006 for South Africa as a whole is 133.1.
Source: Statistics South Africa,
`http://www.statssa.gov.za/publications/P0141/P0141March2007.pdf`.

National Food Poverty Line Tables

Figure 4 (National food 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	92.8
5–9	87.8
10–14	77.0
15–19	69.3
20–24	50.9
25–29	38.3
30–34	24.8
35–39	15.5
40–44	10.3
45–49	4.8
50–54	1.1
55–59	0.1
60–64	0.4
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Surveyed cases weighted to represent African/Black and Coloured households.
Based on the 2005/06 IES.

Figure 5 (National food poverty line): Derivation of estimated poverty likelihoods associated with scores

Score	Households at score and below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,473	÷	1,587	=	92.8
5–9	2,217	÷	2,526	=	87.8
10–14	3,688	÷	4,792	=	77.0
15–19	4,284	÷	6,186	=	69.3
20–24	3,638	÷	7,152	=	50.9
25–29	3,382	÷	8,833	=	38.3
30–34	2,208	÷	8,895	=	24.8
35–39	1,677	÷	10,834	=	15.5
40–44	1,049	÷	10,227	=	10.3
45–49	539	÷	11,279	=	4.8
50–54	99	÷	9,036	=	1.1
55–59	2	÷	4,951	=	0.1
60–64	20	÷	4,471	=	0.4
65–69	0	÷	4,274	=	0.0
70–74	0	÷	2,536	=	0.0
75–79	0	÷	1,227	=	0.0
80–84	0	÷	779	=	0.0
85–89	0	÷	335	=	0.0
90–94	0	÷	45	=	0.0
95–100	0	÷	36	=	0.0

Number of all households normalized to sum to 100,000.
Based on the 2005/06 IES.

Figure 7 (National food poverty line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Score	**Diff.**	**90-percent**	**95-percent**	**99-percent**
0–4	+6.6	4.0	4.9	6.0
5–9	+11.4	4.1	4.8	6.3
10–14	+12.9	5.1	6.4	8.5
15–19	+5.2	3.4	3.9	5.4
20–24	–0.0	2.9	3.5	4.3
25–29	–18.4	10.8	11.1	11.7
30–34	–27.0	15.6	15.9	16.7
35–39	+2.4	1.4	1.7	2.2
40–44	+0.5	1.4	1.7	2.1
45–49	+0.4	1.0	1.2	1.5
50–54	+0.4	0.3	0.3	0.5
55–59	+0.0	0.1	0.1	0.1
60–64	+0.4	0.0	0.0	0.1
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 9 (National food poverty line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–2.0	63.0	76.9	91.5
4	–0.8	32.9	42.9	58.9
8	–1.1	25.0	34.4	48.2
16	–1.5	22.6	27.8	36.0
32	–2.4	17.2	20.8	29.4
64	–3.0	12.4	15.4	20.5
128	–3.3	9.2	11.3	15.1
256	–3.4	6.6	7.8	10.7
512	–3.5	4.8	5.8	7.8
1,024	–3.6	3.4	4.0	5.1
2,048	–3.6	2.4	2.9	3.7
4,096	–3.6	1.7	2.1	2.6
8,192	–3.6	1.2	1.4	2.0
16,384	–3.6	0.9	1.0	1.3

Figure 11 (National food poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.4	24.0	0.2	74.4	75.8	–88.3
5–9	3.4	22.0	0.7	73.9	77.3	–70.4
10–14	7.1	18.3	1.8	72.8	79.9	–36.9
15–19	11.0	14.4	4.1	70.5	81.6	+2.9
20–24	15.0	10.4	7.3	67.4	82.3	+46.6
25–29	19.0	6.4	12.1	62.5	81.5	+52.3
30–34	21.6	3.8	18.4	56.3	77.9	+27.7
35–39	23.5	1.8	27.3	47.3	70.9	–7.4
40–44	24.7	0.7	36.3	38.3	63.1	–43.0
45–49	25.2	0.1	47.1	27.5	52.8	–85.5
50–54	25.4	0.0	56.0	18.6	44.0	–120.5
55–59	25.4	0.0	60.9	13.7	39.1	–140.0
60–64	25.4	0.0	65.4	9.2	34.6	–157.6
65–69	25.4	0.0	69.7	5.0	30.3	–174.4
70–74	25.4	0.0	72.2	2.4	27.8	–184.4
75–79	25.4	0.0	73.4	1.2	26.6	–189.2
80–84	25.4	0.0	74.2	0.4	25.8	–192.3
85–89	25.4	0.0	74.5	0.1	25.5	–193.6
90–94	25.4	0.0	74.6	0.0	25.4	–193.8
95–100	25.4	0.0	74.6	0.0	25.4	–193.9

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

Figure 12 (National food poverty line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.6	87.3	5.5	6.9:1
5–9	4.1	82.9	13.4	4.8:1
10–14	8.9	79.8	28.0	4.0:1
15–19	15.1	73.0	43.4	2.7:1
20–24	22.2	67.4	59.0	2.1:1
25–29	31.1	61.0	74.7	1.6:1
30–34	40.0	54.1	85.2	1.2:1
35–39	50.8	46.3	92.7	0.9:1
40–44	61.0	40.5	97.4	0.7:1
45–49	72.3	34.9	99.4	0.5:1
50–54	81.3	31.2	99.9	0.5:1
55–59	86.3	29.4	100.0	0.4:1
60–64	90.8	28.0	100.0	0.4:1
65–69	95.0	26.7	100.0	0.4:1
70–74	97.6	26.0	100.0	0.4:1
75–79	98.8	25.7	100.0	0.3:1
80–84	99.6	25.5	100.0	0.3:1
85–89	99.9	25.4	100.0	0.3:1
90–94	100.0	25.4	100.0	0.3:1
95–100	100.0	25.4	100.0	0.3:1

USAID "Extreme" Poverty Line Tables

Figure 4 (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	78.9
5–9	77.5
10–14	54.7
15–19	51.4
20–24	37.9
25–29	29.5
30–34	18.6
35–39	12.6
40–44	7.1
45–49	3.2
50–54	1.0
55–59	0.1
60–64	0.4
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Surveyed cases weighted to represent African/Black and Coloured households.
Based on the 2005/06 IES.

Figure 5 (USAID "Extreme" poverty line): Derivation of estimated poverty likelihoods associated with scores

Score	Households at score and below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,253	÷	1,587	=	78.9
5–9	1,957	÷	2,526	=	77.5
10–14	2,621	÷	4,792	=	54.7
15–19	3,178	÷	6,186	=	51.4
20–24	2,708	÷	7,152	=	37.9
25–29	2,604	÷	8,833	=	29.5
30–34	1,650	÷	8,895	=	18.6
35–39	1,366	÷	10,834	=	12.6
40–44	729	÷	10,227	=	7.1
45–49	358	÷	11,279	=	3.2
50–54	89	÷	9,036	=	1.0
55–59	2	÷	4,951	=	0.1
60–64	20	÷	4,471	=	0.4
65–69	0	÷	4,274	=	0.0
70–74	0	÷	2,536	=	0.0
75–79	0	÷	1,227	=	0.0
80–84	0	÷	779	=	0.0
85–89	0	÷	335	=	0.0
90–94	0	÷	45	=	0.0
95–100	0	÷	36	=	0.0

Number of all households normalized to sum to 100,000.
Based on the 2005/06 IES.

Figure 7 (USAID "Extreme" poverty line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+14.1	5.5	6.8	8.5
5–9	+15.0	4.7	5.6	7.0
10–14	+1.7	4.8	6.0	7.5
15–19	+9.6	3.4	4.1	5.5
20–24	–1.7	2.8	3.5	4.4
25–29	–6.6	4.7	5.1	5.6
30–34	–29.6	17.0	17.3	18.1
35–39	–0.5	1.6	1.9	2.5
40–44	+0.9	1.1	1.4	1.8
45–49	–1.1	1.0	1.2	1.5
50–54	+0.4	0.3	0.3	0.4
55–59	+0.0	0.1	0.1	0.1
60–64	+0.4	0.0	0.0	0.1
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 9 (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, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–2.2	66.4	71.0	87.2
4	–1.9	31.4	41.6	56.7
8	–1.5	25.9	33.3	48.2
16	–1.8	23.5	29.0	35.4
32	–2.5	18.2	21.9	30.7
64	–3.1	13.1	15.8	21.5
128	–3.3	9.3	10.8	15.7
256	–3.4	6.7	8.0	10.3
512	–3.6	4.9	5.9	7.6
1,024	–3.6	3.6	4.3	5.6
2,048	–3.6	2.6	3.1	4.1
4,096	–3.6	1.8	2.1	2.6
8,192	–3.6	1.3	1.5	2.1
16,384	–3.6	0.9	1.0	1.4

Figure 11 (USAID "Extreme" poverty line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.1	18.5	0.5	80.0	81.1	–86.1
5–9	2.8	16.8	1.4	79.0	81.8	–64.9
10–14	5.7	13.9	3.2	77.2	82.9	–25.5
15–19	8.7	10.9	6.4	74.0	82.8	+21.6
20–24	11.8	7.8	10.5	70.0	81.7	+46.6
25–29	14.8	4.8	16.3	64.1	78.9	+17.0
30–34	16.9	2.7	23.1	57.3	74.1	–18.0
35–39	18.3	1.2	32.5	48.0	66.3	–65.6
40–44	19.0	0.6	42.0	38.4	57.4	–114.4
45–49	19.5	0.1	52.8	27.6	47.0	–169.7
50–54	19.6	0.0	61.8	18.6	38.2	–215.2
55–59	19.6	0.0	66.7	13.7	33.3	–240.5
60–64	19.6	0.0	71.2	9.2	28.8	–263.2
65–69	19.6	0.0	75.4	5.0	24.6	–285.0
70–74	19.6	0.0	78.0	2.4	22.0	–298.0
75–79	19.6	0.0	79.2	1.2	20.8	–304.2
80–84	19.6	0.0	80.0	0.4	20.0	–308.2
85–89	19.6	0.0	80.3	0.1	19.7	–309.9
90–94	19.6	0.0	80.4	0.0	19.6	–310.2
95–100	19.6	0.0	80.4	0.0	19.6	–310.3

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

Figure 12 (USAID "Extreme" poverty line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.6	71.4	5.8	2.5:1
5–9	4.1	67.0	14.1	2.0:1
10–14	8.9	64.0	29.1	1.8:1
15–19	15.1	57.9	44.6	1.4:1
20–24	22.2	53.0	60.2	1.1:1
25–29	31.1	47.6	75.6	0.9:1
30–34	40.0	42.2	86.0	0.7:1
35–39	50.8	36.1	93.6	0.6:1
40–44	61.0	31.2	97.1	0.5:1
45–49	72.3	26.9	99.3	0.4:1
50–54	81.3	24.1	99.9	0.3:1
55–59	86.3	22.7	100.0	0.3:1
60–64	90.8	21.6	100.0	0.3:1
65–69	95.0	20.6	100.0	0.3:1
70–74	97.6	20.1	100.0	0.3:1
75–79	98.8	19.8	100.0	0.2:1
80–84	99.6	19.7	100.0	0.2:1
85–89	99.9	19.6	100.0	0.2:1
90–94	100.0	19.6	100.0	0.2:1
95–100	100.0	19.6	100.0	0.2:1

National Upper Poverty Line Tables

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

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	100.0
10–14	99.6
15–19	98.6
20–24	97.2
25–29	93.8
30–34	92.6
35–39	77.2
40–44	73.8
45–49	53.9
50–54	27.9
55–59	24.3
60–64	11.0
65–69	4.7
70–74	1.4
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Surveyed cases weighted to represent African/Black and Coloured households.
Based on the 2005/06 IES.

Figure 5 (Upper line): Derivation of estimated poverty likelihoods associated with scores

Score	Households at score and below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,587	÷	1,587	=	100.0
5–9	2,526	÷	2,526	=	100.0
10–14	4,771	÷	4,792	=	99.6
15–19	6,100	÷	6,186	=	98.6
20–24	6,948	÷	7,152	=	97.2
25–29	8,283	÷	8,833	=	93.8
30–34	8,237	÷	8,895	=	92.6
35–39	8,366	÷	10,834	=	77.2
40–44	7,544	÷	10,227	=	73.8
45–49	6,074	÷	11,279	=	53.9
50–54	2,525	÷	9,036	=	27.9
55–59	1,204	÷	4,951	=	24.3
60–64	493	÷	4,471	=	11.0
65–69	203	÷	4,274	=	4.7
70–74	35	÷	2,536	=	1.4
75–79	0	÷	1,227	=	0.0
80–84	0	÷	779	=	0.0
85–89	0	÷	335	=	0.0
90–94	0	÷	45	=	0.0
95–100	0	÷	36	=	0.0

Number of all households normalized to sum to 100,000.
Based on the 2005/06 IES.

Figure 7 (Upper line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (+/− percentage points)		
Score	**Diff.**	**90-percent**	**95-percent**	**99-percent**
0–4	+0.3	0.3	0.4	0.5
5–9	+2.1	1.3	1.5	2.0
10–14	–0.4	0.2	0.2	0.2
15–19	–0.4	0.5	0.6	0.8
20–24	–0.3	1.0	1.1	1.6
25–29	–3.6	2.1	2.1	2.3
30–34	–2.6	1.8	1.9	2.1
35–39	–3.4	2.9	3.1	3.5
40–44	–2.5	2.3	2.5	3.4
45–49	+5.1	2.6	3.3	4.1
50–54	+8.7	2.0	2.4	3.0
55–59	+7.2	2.8	3.3	4.4
60–64	+5.3	1.4	1.6	2.1
65–69	+2.7	0.6	0.7	1.0
70–74	+1.3	0.1	0.1	0.2
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 9 (Upper line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.4	60.0	72.9	92.2
4	+0.6	32.2	39.8	50.2
8	+0.6	24.2	28.3	39.2
16	+0.5	17.5	21.2	30.0
32	+1.0	12.9	15.5	20.9
64	+1.0	9.0	10.6	14.8
128	+0.9	6.0	7.0	9.2
256	+1.1	4.2	5.2	7.0
512	+1.1	3.0	3.7	4.7
1,024	+1.1	2.1	2.4	3.4
2,048	+1.1	1.6	1.8	2.3
4,096	+1.1	1.1	1.3	1.6
8,192	+1.1	0.8	0.9	1.2
16,384	+1.1	0.5	0.6	0.8

Figure 11 (Upper line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.6	63.4	0.0	35.0	36.6	–95.1
5–9	4.1	60.9	0.1	35.0	39.0	–87.4
10–14	8.8	56.1	0.1	34.9	43.8	–72.7
15–19	14.9	50.1	0.2	34.9	49.8	–53.8
20–24	21.9	43.0	0.3	34.7	56.7	–32.0
25–29	30.4	34.6	0.7	34.3	64.7	–5.4
30–34	38.6	26.4	1.3	33.7	72.3	+20.9
35–39	47.8	17.2	3.0	32.0	79.8	+51.7
40–44	55.3	9.6	5.7	29.3	84.7	+79.1
45–49	61.0	4.0	11.3	23.7	84.6	+82.6
50–54	63.4	1.6	17.9	17.1	80.5	+72.4
55–59	64.3	0.7	22.0	13.0	77.4	+66.2
60–64	64.7	0.3	26.0	9.0	73.7	+59.9
65–69	65.0	0.0	30.1	4.9	69.9	+53.7
70–74	65.0	0.0	32.6	2.4	67.4	+49.9
75–79	65.0	0.0	33.8	1.2	66.2	+48.0
80–84	65.0	0.0	34.6	0.4	65.4	+46.8
85–89	65.0	0.0	34.9	0.1	65.1	+46.3
90–94	65.0	0.0	35.0	0.0	65.0	+46.2
95–100	65.0	0.0	35.0	0.0	65.0	+46.1

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

Figure 12 (Upper line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.6	99.5	2.4	181.6:1
5–9	4.1	98.6	6.2	72.9:1
10–14	8.9	99.3	13.6	136.4:1
15–19	15.1	99.0	23.0	97.8:1
20–24	22.2	98.7	33.8	73.9:1
25–29	31.1	97.8	46.7	43.8:1
30–34	40.0	96.6	59.4	28.7:1
35–39	50.8	94.1	73.6	15.9:1
40–44	61.0	90.7	85.2	9.7:1
45–49	72.3	84.3	93.8	5.4:1
50–54	81.3	78.0	97.6	3.5:1
55–59	86.3	74.5	99.0	2.9:1
60–64	90.8	71.3	99.6	2.5:1
65–69	95.0	68.4	100.0	2.2:1
70–74	97.6	66.6	100.0	2.0:1
75–79	98.8	65.8	100.0	1.9:1
80–84	99.6	65.3	100.0	1.9:1
85–89	99.9	65.0	100.0	1.9:1
90–94	100.0	65.0	100.0	1.9:1
95–100	100.0	65.0	100.0	1.9:1

USD1.25/Day 2005 PPP Poverty Line Tables

Figure 4 (USD1.25/day 2005 PPP line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	76.3
5–9	55.6
10–14	40.5
15–19	30.2
20–24	21.6
25–29	12.6
30–34	5.1
35–39	4.4
40–44	2.0
45–49	1.0
50–54	0.4
55–59	0.0
60–64	0.0
65–69	0.0
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Surveyed cases weighted to represent African/Black and Coloured households.
Based on the 2005/06 IES.

Figure 5 (USD1.25/day 2005 PPP line): Derivation of estimated poverty likelihoods associated with scores

Score	Households at score and below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,210	÷	1,587	=	76.3
5–9	1,405	÷	2,526	=	55.6
10–14	1,942	÷	4,792	=	40.5
15–19	1,867	÷	6,186	=	30.2
20–24	1,545	÷	7,152	=	21.6
25–29	1,109	÷	8,833	=	12.6
30–34	449	÷	8,895	=	5.1
35–39	473	÷	10,834	=	4.4
40–44	199	÷	10,227	=	2.0
45–49	108	÷	11,279	=	1.0
50–54	33	÷	9,036	=	0.4
55–59	0	÷	4,951	=	0.0
60–64	0	÷	4,471	=	0.0
65–69	0	÷	4,274	=	0.0
70–74	0	÷	2,536	=	0.0
75–79	0	÷	1,227	=	0.0
80–84	0	÷	779	=	0.0
85–89	0	÷	335	=	0.0
90–94	0	÷	45	=	0.0
95–100	0	÷	36	=	0.0

Number of all households normalized to sum to 100,000.
Based on the 2005/06 IES.

Figure 7 (USD1.25/day 2005 PPP line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+23.9	5.7	6.8	8.3
5–9	+6.5	4.8	5.8	7.3
10–14	+4.5	3.9	4.7	6.2
15–19	+4.0	2.7	3.2	4.1
20–24	+1.2	2.2	2.6	3.7
25–29	–1.8	2.1	2.4	3.5
30–34	+1.2	0.7	0.9	1.1
35–39	+0.9	0.7	0.8	1.1
40–44	+0.6	0.4	0.5	0.7
45–49	+0.7	0.1	0.2	0.2
50–54	+0.3	0.1	0.1	0.1
55–59	+0.0	0.0	0.0	0.0
60–64	–0.0	0.0	0.0	0.0
65–69	+0.0	0.0	0.0	0.0
70–74	+0.0	0.0	0.0	0.0
75–79	+0.0	0.0	0.0	0.0
80–84	+0.0	0.0	0.0	0.0
85–89	+0.0	0.0	0.0	0.0
90–94	+0.0	0.0	0.0	0.0
95–100	+0.0	0.0	0.0	0.0

Figure 9 (USD1.25/day 2005 PPP line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–0.8	50.0	64.0	75.6
4	–0.1	22.2	29.3	42.7
8	+0.5	14.7	19.5	27.3
16	+0.8	10.0	12.7	17.5
32	+0.9	7.1	8.8	12.2
64	+0.8	5.2	6.4	9.1
128	+0.9	3.7	4.4	5.9
256	+0.9	2.6	3.1	4.1
512	+0.9	1.8	2.1	3.1
1,024	+1.0	1.3	1.5	2.0
2,048	+0.9	0.9	1.1	1.3
4,096	+0.9	0.6	0.7	1.0
8,192	+0.9	0.5	0.6	0.7
16,384	+1.0	0.3	0.4	0.5

Figure 11 (USD1.25/day 2005 PPP line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	0.9	10.0	0.6	88.4	89.3	–76.9
5–9	2.2	8.7	1.9	87.2	89.4	–42.1
10–14	4.4	6.5	4.5	84.6	89.0	+21.6
15–19	6.5	4.5	8.6	80.4	86.9	+21.8
20–24	8.2	2.8	14.1	75.0	83.1	–28.1
25–29	9.4	1.6	21.7	67.3	76.7	–97.5
30–34	10.2	0.8	29.8	59.2	69.4	–171.2
35–39	10.7	0.3	40.1	48.9	59.6	–265.2
40–44	10.9	0.1	50.1	38.9	49.8	–356.6
45–49	11.0	0.0	61.4	27.7	38.6	–458.7
50–54	11.0	0.0	70.4	18.6	29.6	–540.8
55–59	11.0	0.0	75.3	13.7	24.7	–585.9
60–64	11.0	0.0	79.8	9.2	20.2	–626.6
65–69	11.0	0.0	84.1	5.0	15.9	–665.5
70–74	11.0	0.0	86.6	2.4	13.4	–688.6
75–79	11.0	0.0	87.8	1.2	12.2	–699.8
80–84	11.0	0.0	88.6	0.4	11.4	–706.8
85–89	11.0	0.0	88.9	0.1	11.1	–709.9
90–94	11.0	0.0	89.0	0.0	11.0	–710.3
95–100	11.0	0.0	89.0	0.0	11.0	–710.6

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

Figure 12 (USD1.25/day 2005 PPP line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.6	59.6	8.6	1.5:1
5–9	4.1	54.6	20.5	1.2:1
10–14	8.9	49.9	40.5	1.0:1
15–19	15.1	43.1	59.3	0.8:1
20–24	22.2	36.8	74.5	0.6:1
25–29	31.1	30.2	85.5	0.4:1
30–34	40.0	25.5	92.8	0.3:1
35–39	50.8	21.1	97.4	0.3:1
40–44	61.0	17.9	99.2	0.2:1
45–49	72.3	15.2	99.8	0.2:1
50–54	81.3	13.5	99.9	0.2:1
55–59	86.3	12.7	99.9	0.1:1
60–64	90.8	12.1	100.0	0.1:1
65–69	95.0	11.6	100.0	0.1:1
70–74	97.6	11.3	100.0	0.1:1
75–79	98.8	11.1	100.0	0.1:1
80–84	99.6	11.0	100.0	0.1:1
85–89	99.9	11.0	100.0	0.1:1
90–94	100.0	11.0	100.0	0.1:1
95–100	100.0	11.0	100.0	0.1:1

USD2.50/Day 2005 PPP Poverty Line Tables

Figure 4 (USD2.50/day 2005 PPP line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	95.9
5–9	92.9
10–14	92.5
15–19	82.9
20–24	70.1
25–29	60.2
30–34	45.4
35–39	28.5
40–44	20.3
45–49	10.4
50–54	2.6
55–59	1.1
60–64	0.4
65–69	0.1
70–74	0.0
75–79	0.0
80–84	0.0
85–89	0.0
90–94	0.0
95–100	0.0

Surveyed cases weighted to represent African/Black and Coloured households.
Based on the 2005/06 IES.

Figure 5 (USD2.50/day 2005 PPP line): Derivation of estimated poverty likelihoods associated with scores

Score	Households at score and below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,522	÷	1,587	=	95.9
5–9	2,347	÷	2,526	=	92.9
10–14	4,434	÷	4,792	=	92.5
15–19	5,128	÷	6,186	=	82.9
20–24	5,012	÷	7,152	=	70.1
25–29	5,313	÷	8,833	=	60.2
30–34	4,036	÷	8,895	=	45.4
35–39	3,087	÷	10,834	=	28.5
40–44	2,075	÷	10,227	=	20.3
45–49	1,175	÷	11,279	=	10.4
50–54	230	÷	9,036	=	2.6
55–59	52	÷	4,951	=	1.1
60–64	20	÷	4,471	=	0.4
65–69	3	÷	4,274	=	0.1
70–74	0	÷	2,536	=	0.0
75–79	0	÷	1,227	=	0.0
80–84	0	÷	779	=	0.0
85–89	0	÷	335	=	0.0
90–94	0	÷	45	=	0.0
95–100	0	÷	36	=	0.0

Number of all households normalized to sum to 100,000.
Based on the 2005/06 IES.

Figure 7 (USD2.50/day 2005 PPP line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+2.7	3.1	3.6	4.7
5–9	+4.9	3.0	3.6	4.6
10–14	–0.5	1.4	1.7	2.5
15–19	–4.5	3.2	3.3	3.6
20–24	–3.9	3.2	3.5	3.9
25–29	–9.5	6.1	6.3	6.8
30–34	–12.5	8.2	8.5	9.0
35–39	–0.5	2.1	2.6	3.6
40–44	+7.0	1.5	1.9	2.6
45–49	+2.6	1.2	1.4	1.7
50–54	–0.5	0.9	1.1	1.4
55–59	–0.4	0.6	0.7	0.9
60–64	+0.3	0.1	0.2	0.2
65–69	–0.1	0.1	0.1	0.2
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 9 (USD2.50/day 2005 PPP line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–1.4	65.8	74.9	91.2
4	–0.4	33.1	40.8	52.4
8	+0.0	24.9	31.1	38.2
16	–0.3	20.3	24.1	29.8
32	–1.0	15.0	17.5	24.4
64	–1.4	10.6	13.2	17.5
128	–1.5	8.0	9.2	12.0
256	–1.6	5.5	6.6	8.5
512	–1.7	4.0	4.7	6.3
1,024	–1.7	2.8	3.4	4.1
2,048	–1.8	2.0	2.2	2.8
4,096	–1.8	1.4	1.6	2.1
8,192	–1.8	1.0	1.2	1.5
16,384	–1.8	0.7	0.9	1.1

Figure 11 (USD2.50/day 2005 PPP line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.5	33.5	0.1	64.9	66.4	–91.2
5–9	3.7	31.3	0.4	64.6	68.3	–77.6
10–14	8.0	27.0	0.9	64.1	72.1	–51.6
15–19	13.2	21.8	1.9	63.1	76.3	–19.2
20–24	18.6	16.4	3.6	61.3	79.9	+16.6
25–29	24.1	10.9	7.0	58.0	82.1	+57.5
30–34	27.9	7.1	12.0	52.9	80.9	+65.6
35–39	31.6	3.4	19.2	45.8	77.4	+45.3
40–44	33.5	1.6	27.6	37.4	70.9	+21.3
45–49	34.5	0.5	37.8	27.2	61.7	–7.8
50–54	34.9	0.2	46.5	18.5	53.4	–32.6
55–59	35.0	0.1	51.3	13.7	48.6	–46.5
60–64	35.0	0.0	55.8	9.2	44.2	–59.2
65–69	35.0	0.0	60.0	5.0	40.0	–71.3
70–74	35.0	0.0	62.5	2.4	37.5	–78.5
75–79	35.0	0.0	63.8	1.2	36.2	–82.0
80–84	35.0	0.0	64.5	0.4	35.5	–84.2
85–89	35.0	0.0	64.9	0.1	35.1	–85.2
90–94	35.0	0.0	64.9	0.0	35.1	–85.3
95–100	35.0	0.0	65.0	0.0	35.0	–85.4

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

Figure 12 (USD2.50/day 2005 PPP line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.6	94.2	4.3	16.3:1
5–9	4.1	91.0	10.7	10.1:1
10–14	8.9	90.3	22.9	9.3:1
15–19	15.1	87.6	37.7	7.1:1
20–24	22.2	83.7	53.1	5.1:1
25–29	31.1	77.5	68.8	3.5:1
30–34	40.0	69.9	79.7	2.3:1
35–39	50.8	62.3	90.3	1.7:1
40–44	61.0	54.8	95.5	1.2:1
45–49	72.3	47.8	98.6	0.9:1
50–54	81.3	42.9	99.6	0.8:1
55–59	86.3	40.5	99.9	0.7:1
60–64	90.8	38.6	99.9	0.6:1
65–69	95.0	36.9	100.0	0.6:1
70–74	97.6	35.9	100.0	0.6:1
75–79	98.8	35.5	100.0	0.5:1
80–84	99.6	35.2	100.0	0.5:1
85–89	99.9	35.1	100.0	0.5:1
90–94	100.0	35.0	100.0	0.5:1
95–100	100.0	35.0	100.0	0.5:1

USD4.00/Day 2005 PPP Poverty Line Tables

Figure 4 (USD4.00/day 2005 PPP line): Estimated poverty likelihoods associated with scores

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0–4	100.0
5–9	97.6
10–14	99.1
15–19	96.7
20–24	94.7
25–29	89.6
30–34	81.6
35–39	58.4
40–44	47.9
45–49	36.1
50–54	13.7
55–59	10.4
60–64	5.0
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

Surveyed cases weighted to represent African/Black and Coloured households.
Based on the 2005/06 IES.

Figure 5 (USD4.00/day 2005 PPP line): Derivation of estimated poverty likelihoods associated with scores

Score	Households at score and below poverty line		All households at score		Poverty likelihood (estimated, %)
0–4	1,587	÷	1,587	=	100.0
5–9	2,464	÷	2,526	=	97.6
10–14	4,749	÷	4,792	=	99.1
15–19	5,981	÷	6,186	=	96.7
20–24	6,773	÷	7,152	=	94.7
25–29	7,913	÷	8,833	=	89.6
30–34	7,261	÷	8,895	=	81.6
35–39	6,324	÷	10,834	=	58.4
40–44	4,902	÷	10,227	=	47.9
45–49	4,075	÷	11,279	=	36.1
50–54	1,238	÷	9,036	=	13.7
55–59	513	÷	4,951	=	10.4
60–64	224	÷	4,471	=	5.0
65–69	15	÷	4,274	=	0.4
70–74	0	÷	2,536	=	0.0
75–79	0	÷	1,227	=	0.0
80–84	0	÷	779	=	0.0
85–89	0	÷	335	=	0.0
90–94	0	÷	45	=	0.0
95–100	0	÷	36	=	0.0

Number of all households normalized to sum to 100,000.
Based on the 2005/06 IES.

Figure 7 (USD4.00/day 2005 PPP line): Bootstrapped differences between estimated and true poverty likelihoods for households in a large sample (n = 16,384) with confidence intervals, scorecard applied to the validation sample

	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
Score	Diff.	90-percent	95-percent	99-percent
0–4	+0.4	0.4	0.5	0.6
5–9	+0.9	1.6	1.9	2.5
10–14	+0.6	0.7	0.8	1.0
15–19	–1.0	0.8	0.9	1.0
20–24	–0.2	1.2	1.4	1.9
25–29	–3.3	2.2	2.3	2.5
30–34	–5.0	3.4	3.5	3.9
35–39	–0.8	2.7	3.2	4.3
40–44	–11.3	6.9	7.1	7.8
45–49	+4.0	2.4	2.8	3.8
50–54	+3.4	1.4	1.6	2.2
55–59	+0.3	2.4	2.8	3.9
60–64	+4.3	0.3	0.4	0.5
65–69	–0.1	0.3	0.3	0.4
70–74	–0.1	0.1	0.2	0.2
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 9 (USD4.00/day 2005 PPP line): Differences and precision of differences for bootstrapped estimates of poverty rates for groups of households at a point in time, by sample size, scorecard applied to the validation sample

Sample Size	Difference between estimate and true value			
		Confidence interval (+/– percentage points)		
n	Diff.	90-percent	95-percent	99-percent
1	–1.2	61.1	72.8	93.2
4	–1.0	32.7	39.5	54.5
8	–0.9	24.7	30.4	41.1
16	–0.7	19.0	22.6	29.5
32	–0.6	13.5	16.2	21.4
64	–0.8	9.4	11.0	14.8
128	–1.0	6.5	7.7	10.9
256	–1.0	4.5	5.5	7.5
512	–0.9	3.5	4.1	5.1
1,024	–1.0	2.3	2.8	3.7
2,048	–1.0	1.7	2.0	2.4
4,096	–1.0	1.2	1.4	1.7
8,192	–1.0	0.8	1.0	1.3
16,384	–1.0	0.6	0.7	1.0

Figure 11 (USD4.00/day 2005 PPP line): Households by targeting classification and score, along with "Total Accuracy" and BPAC, scorecard applied to the validation sample

Score	Inclusion: < poverty line correctly targeted	Undercoverage: < poverty line mistakenly non-targeted	Leakage: => poverty line mistakenly targeted	Exclusion: => poverty line correctly non-targeted	Total Accuracy Inclusion + Exclusion	BPAC See text
0–4	1.6	53.5	0.0	45.0	46.5	–94.3
5–9	4.0	51.0	0.1	44.9	48.9	–85.2
10–14	8.7	46.3	0.2	44.8	53.5	–68.0
15–19	14.7	40.3	0.4	44.6	59.2	–45.9
20–24	21.5	33.6	0.8	44.2	65.7	–20.6
25–29	29.3	25.7	1.7	43.2	72.6	+9.8
30–34	36.5	18.5	3.4	41.5	78.1	+39.0
35–39	43.8	11.2	7.0	38.0	81.8	+72.0
40–44	49.3	5.7	11.7	33.2	82.5	+78.6
45–49	52.9	2.1	19.4	25.6	78.5	+64.8
50–54	54.4	0.6	27.0	18.0	72.4	+51.0
55–59	54.8	0.2	31.5	13.5	68.4	+42.8
60–64	54.9	0.1	35.8	9.1	64.1	+34.9
65–69	55.0	0.0	40.0	4.9	60.0	+27.3
70–74	55.0	0.0	42.6	2.4	57.4	+22.7
75–79	55.0	0.0	43.8	1.2	56.2	+20.4
80–84	55.0	0.0	44.6	0.4	55.4	+19.0
85–89	55.0	0.0	44.9	0.1	55.1	+18.4
90–94	55.0	0.0	44.9	0.0	55.1	+18.3
95–100	55.0	0.0	45.0	0.0	55.0	+18.3

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

Figure 12 (USD4.00/day 2005 PPP line): For a given score cut-off, the percentage of all households who are targeted (that is, have a score equal to or less than the cut-off), the percentage of targeted households who are poor (that is, below the poverty line), the percentage of poor households who are targeted, and the number of poor households who are successful targeted (coverage) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample

Targeting cut-off	% all households who are targeted	% targeted who are poor	% of poor who are targeted	Poor households targeted per non-poor household targeted
0–4	1.6	99.0	2.9	103.9:1
5–9	4.1	97.8	7.3	43.6:1
10–14	8.9	97.8	15.8	45.4:1
15–19	15.1	97.2	26.7	35.3:1
20–24	22.2	96.5	39.0	27.6:1
25–29	31.1	94.4	53.3	17.0:1
30–34	40.0	91.4	66.4	10.7:1
35–39	50.8	86.2	79.6	6.3:1
40–44	61.0	80.7	89.6	4.2:1
45–49	72.3	73.2	96.2	2.7:1
50–54	81.3	66.9	98.8	2.0:1
55–59	86.3	63.5	99.7	1.7:1
60–64	90.8	60.5	99.8	1.5:1
65–69	95.0	57.9	100.0	1.4:1
70–74	97.6	56.4	100.0	1.3:1
75–79	98.8	55.7	100.0	1.3:1
80–84	99.6	55.3	100.0	1.2:1
85–89	99.9	55.1	100.0	1.2:1
90–94	100.0	55.0	100.0	1.2:1
95–100	100.0	55.0	100.0	1.2:1

Poverty Lines and Poverty Rates, by Province, by Urban/Rural, and by Household-Level/Person-Level

Figure A1: Poverty lines and poverty rates, by urban/rural and by province, at the household level, 2005

		Poverty line (per capita) and poverty rate (%)																				
	Line or	National			National Food			USAID 'Extreme'			National Upper			International (2005 PPP)								
														$1.25/day			$2.50/day			$4.00/day		
Province	rate	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Western Cape	Line	13.78	14.60		9.03	9.57		9.12	8.87	9.10	25.38	26.88		5.81	6.16		11.63	12.31		18.60	19.70	
	Rate	27.9	55.3		12.5	29.8		12.6	25.1	13.5	57.2	78.3		3.8	13.8		20.4	43.1		43.2	69.8	
Eastern Cape	Line	14.13	14.13		9.26	9.26		8.07	7.34	7.67	26.02	26.02		5.96	5.96		11.92	11.92		19.07	19.07	
	Rate	40.1	62.4		22.9	41.4		16.9	27.7	22.9	60.1	86.0		8.7	17.1		34.0	54.0		50.2	75.4	
Northern Cape	Line	14.20	14.30		9.31	9.37		7.87	6.75	7.52	26.15	26.33		5.99	6.03		11.98	12.06		19.17	19.29	
	Rate	42.0	51.2		25.2	36.2		19.2	21.6	20.0	65.0	74.0		11.5	17.3		35.6	44.7		54.4	63.1	
Free State	Line	13.46	12.06		8.82	7.90		8.54	7.41	8.31	24.79	22.21		5.68	5.09		11.35	10.17		18.17	16.28	
	Rate	31.4	33.8		16.5	18.6		15.2	14.5	15.0	58.6	60.6		5.8	2.6		24.7	28.1		45.4	51.6	
KwaZulu-Natal	Line	13.77	14.50		9.03	9.50		8.21	6.36	7.28	25.36	26.71		5.81	6.12		11.62	12.24		18.59	19.58	
	Rate	33.5	73.5		17.8	52.9		15.5	30.7	23.1	57.9	89.9		7.1	29.3		26.5	65.8		44.6	83.2	
North West	Line	13.89	13.68		9.10	8.97		8.48	7.24	7.72	25.58	25.20		5.86	5.77		11.72	11.54		18.75	18.47	
	Rate	39.9	47.4		22.4	26.2		20.5	20.1	20.2	59.9	74.4		7.5	13.3		32.3	37.5		52.1	61.4	
Gauteng	Line	13.67	14.06		8.96	9.21		9.90	8.44	9.84	25.17	25.88		5.77	5.93		11.53	11.86		18.45	18.97	
	Rate	23.6	36.1		9.0	18.3		11.4	15.4	11.6	47.2	63.4		2.5	7.0		15.9	29.0		36.0	45.0	
Mpumalanga	Line	14.10	14.74		9.24	9.66		8.38	7.27	7.73	25.96	27.15		5.95	6.22		11.89	12.44		19.03	19.90	
	Rate	35.7	62.7		18.6	40.0		16.0	25.7	21.7	59.2	85.2		7.0	19.4		27.8	51.4		45.8	74.4	
Limpopo	Line	13.43	13.76		8.80	9.02		8.40	7.13	7.30	24.73	25.35		5.66	5.80		11.33	11.61		18.12	18.58	
	Rate	19.2	59.8		11.3	36.7		9.8	24.9	22.8	43.2	81.9		3.5	15.6		14.1	49.5		28.9	72.8	
South Africa	Line	13.77	14.07	13.89	9.02	9.22	9.10	8.96	7.09	8.21	25.36	25.91	25.58	5.81	5.93	5.86	11.62	11.87	11.72	18.59	18.99	18.75
	Rate	30.1	60.5	42.3	14.8	39.2	24.6	14.0	25.6	18.7	54.3	82.6	65.7	5.2	18.4	10.5	22.9	51.4	34.4	42.4	72.8	54.6

For African/Black and Coloured households only. Population group determined by the household head.

Figure A2: Poverty lines and poverty rates, by urban/rural and by province, at the person level, 2005

		Poverty line (per capita) and poverty rate (%)																				
	Line or	National			Food			USAID 'Extreme'			National Upper			International (2005 PPP)								
														$1.25/day			$2.50/day			$4.00/day		
Province	rate	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Western Cape	Line	13.78	14.60		9.03	9.57		9.12	8.87		25.38	26.88		5.81	6.16		11.63	12.31		18.60	19.70	
	Rate	35.6	67.2		17.7	39.8		17.8	33.6		67.2	87.9		6.2	19.3		27.5	55.1		52.7	81.7	
Eastern Cape	Line	14.13	14.13		9.26	9.26		8.07	7.34		26.02	26.02		5.96	5.96		11.92	11.92		19.07	19.07	
	Rate	51.1	73.7		33.4	52.6		25.6	36.9		70.4	91.7		13.3	23.9		44.3	65.7		60.9	84.2	
Northern Cape	Line	14.20	14.30		9.31	9.37		7.87	6.75		26.15	26.33		5.99	6.03		11.98	12.06		19.17	19.29	
	Rate	55.8	68.4		35.6	54.1		28.2	34.4		78.4	86.4		16.8	27.2		48.2	62.6		69.3	79.8	
Free State	Line	13.46	12.06		8.82	7.90		8.54	7.41		24.79	22.21		5.68	5.09		11.35	10.17		18.17	16.28	
	Rate	45.0	46.2		24.3	28.4		22.2	23.0		71.1	72.5		9.4	4.3		36.1	40.4		59.4	65.4	
KwaZulu-Natal	Line	13.77	14.50		9.03	9.50		8.21	6.36		25.36	26.71		5.81	6.12		11.62	12.24		18.59	19.58	
	Rate	49.7	84.0		29.6	65.1		25.4	41.9		76.0	95.1		12.6	40.5		40.3	77.4		63.6	91.0	
North West	Line	13.89	13.68		9.10	8.97		8.48	7.24		25.58	25.20		5.86	5.77		11.72	11.54		18.75	18.47	
	Rate	52.8	62.0		32.4	38.3		29.9	31.3		71.5	85.6		12.0	21.2		44.5	51.9		63.9	75.2	
Gauteng	Line	13.67	14.06		8.96	9.21		9.90	8.44		25.17	25.88		5.77	5.93		11.53	11.86		18.45	18.97	
	Rate	33.8	54.4		14.0	33.1		17.1	27.7		59.7	81.5		4.1	12.7		24.0	47.3		48.0	69.1	
Mpumalanga	Line	14.10	14.74		9.24	9.66		8.38	7.27		25.96	27.15		5.95	6.22		11.89	12.44		19.03	19.90	
	Rate	46.2	74.0		26.5	53.6		23.0	37.0		71.0	92.5		11.8	28.3		37.5	64.2		57.6	84.1	
Limpopo	Line	13.43	13.76		8.80	9.02		8.40	7.13		24.73	25.35		5.66	5.80		11.33	11.61		18.12	18.58	
	Rate	35.4	71.5		22.4	49.2		19.9	35.8		65.4	89.2		8.8	23.7		26.8	62.6		46.3	82.9	
South Africa	Line	13.78	14.11	13.93	9.03	9.25	9.13	8.93	7.03	8.06	25.38	25.99	25.66	5.81	5.95	5.88	11.62	11.91	11.75	18.60	19.05	18.81
	Rate	41.9	73.6	56.4	22.6	52.8	36.4	21.3	36.9	28.4	67.6	90.7	78.2	8.6	27.8	17.4	33.1	65.5	47.9	55.6	84.0	68.6

For African/Black and Coloured households only. Population group determined by the household head.