

# Simple Poverty Scorecard<sup>®</sup> Poverty-Assessment Tool Mongolia

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## Abstract

The Simple Poverty Scorecard-brand poverty-assessment tool uses 12 low-cost indicators from Mongolia’s 2014 Household Socio-Economic 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 Mongolia to measure poverty rates, to track changes in poverty rates over time, and to segment clients for differentiated services.

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# Simple Poverty Scorecard® Poverty-Assessment Tool

Interview ID: _____	<u>Name</u>	<u>Identifier</u>
Interview date: _____	Participant: _____	_____
Country: <u>MNG</u>	Field agent: _____	_____
Scorecard: <u>001</u>	Service point: _____	_____
Sampling wgt.: _____	Number of household members: _____	

Indicator	Response	Points	Score
1. How many members does the household have?	A. Six or more	0	
	B. Five	4	
	C. Four	8	
	D. Three	15	
	E. Two	25	
	F. One	30	
2. What is the highest educational level completed by the male head/spouse?	A. None, primary, or lower or higher secondary	0	
	B. No male head/spouse	0	
	C. Vocational	3	
	D. Technical secondary	4	
	E. Degree, higher-education diploma, or bachelor's degree or higher	7	
3. In what type of residence does the household currently live?	A. Ger	0	
	B. House in ger district, dormitory, public dwelling for employees, other public dwelling, shelter not meant for human habitation, or other	0	
	C. Apartment, or villa	100	
4. If the residence is not a ger, then what is the main construction material of the walls?	A. Ger	0	
	B. Wood, stone, or other	6	
	C. Bricks, or concrete	10	
5. If the residence is a ger, then how many segments/walls does it have?	A. Not a ger	0	
	B. Three, or four	0	
	C. Five	5	
	D. Six or more	9	
6. How many head of cattle does the household currently own?	A. Zero to four	0	
	B. 5 to 9	4	
	C. 10 to 29	8	
	D. 30 or more	13	
7. Does the household have any washing machines in working condition?	A. No	0	
	B. Yes	2	
8. Does the household have any iron/brick stoves, electric or gas stoves, or ovens in working condition?	A. None	0	
	B. Iron/brick, but no others	3	
	C. Electric or gas, but no oven (regardless of iron/brick)	4	
	D. Oven (regardless of any others)	8	
9. Does the household have any pressure cookers in working condition?	A. No	0	
	B. Yes	3	
10. Does the household have any electric irons in working condition?	A. No	0	
	B. Yes	2	
11. Does the household have any vacuum cleaners in working condition?	A. No	0	
	B. Yes	4	
12. Does the household have any motorcycles or automobiles (cars, trucks, large trucks, or buses) in working condition?	A. None	0	
	B. Motorcycle only	5	
	C. Automobile (regardless of motorcycle)	11	

## Back-page Worksheet: Household Membership

In the scorecard header, write the interview’s unique identifier (if known), interview date, and the participant’s sampling weight (if known). Then record the names and the unique identification numbers of the participant, of yourself as the field agent, and of the service point used by the participant. Note that the participant need not be the same as the respondent.

Ask the respondent: *Please tell me the first name of each member of this household, starting with the head. A household is one or more people—regardless of blood or marital ties—who usually live in the same residence, eat together, and share resources.*

To qualify as a *household member*, a person must have usually lived, ate, and shared resources with the household for at least six of the past 12 months. The head of the household and students qualify as long as they met the three criteria for at least one of the past 12 months.

Count the number of household members and write it in the header under “Number of household members:”. Also mark the corresponding response for the first scorecard indicator.

Keep in mind the full definitions of *household* and *household member* in the “Guidelines for the Interpretation of Indicators”.

<b>First name</b>
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
<b>Total members:</b>

## Look-up table to convert scores to poverty likelihoods

Score	National poverty lines			Poorest half <100% Natl.	2005 PPP poverty lines				2011 PPP poverty lines				Percentile poverty lines				
	100%	150%	200%		\$1.25	\$2.00	\$2.50	\$5.00	\$1.90	\$3.10	\$3.80	\$4.00	20 <sup>th</sup>	40 <sup>th</sup>	50 <sup>th</sup>	60 <sup>th</sup>	80 <sup>th</sup>
0-4	100.0	100.0	100.0	89.4	8.8	58.2	83.2	100.0	8.8	56.8	82.9	83.2	100.0	100.0	100.0	100.0	100.0
5-9	93.3	99.3	100.0	77.4	8.5	58.2	67.0	98.2	7.5	55.8	65.0	67.0	93.3	96.4	99.3	100.0	100.0
10-14	80.0	96.7	99.6	61.9	1.1	24.2	46.7	93.6	1.1	21.4	41.5	46.7	78.1	91.9	96.9	98.8	99.7
15-19	67.6	92.1	97.4	42.6	1.0	12.4	31.3	89.3	0.9	10.5	26.5	31.3	63.4	87.9	92.6	95.0	98.4
20-24	50.6	85.8	94.6	23.6	0.4	5.5	13.4	79.3	0.1	3.4	11.2	13.4	47.0	76.9	85.9	89.9	97.8
25-29	35.0	74.7	92.4	12.9	0.1	1.8	6.6	67.9	0.1	1.6	4.1	6.6	31.7	63.7	75.7	86.2	96.6
30-34	17.1	60.4	84.5	4.6	0.1	0.8	2.7	51.7	0.1	0.7	1.7	2.7	14.6	48.2	62.1	74.3	93.5
35-39	9.7	48.1	76.3	2.6	0.0	0.3	1.5	39.3	0.0	0.3	0.9	1.5	8.5	33.9	49.5	63.4	87.3
40-44	4.5	32.5	65.7	1.1	0.0	0.0	0.7	23.1	0.0	0.0	0.5	0.7	3.9	19.1	33.7	49.7	82.4
45-49	2.3	23.5	50.8	0.2	0.0	0.0	0.1	14.1	0.0	0.0	0.1	0.1	2.0	12.2	24.2	36.1	68.3
50-54	1.2	11.4	34.6	0.2	0.0	0.0	0.1	7.6	0.0	0.0	0.1	0.1	1.2	5.9	11.8	20.8	54.4
55-59	0.9	9.3	25.8	0.2	0.0	0.0	0.1	6.7	0.0	0.0	0.1	0.1	0.9	5.9	9.4	17.4	47.7
60-64	0.9	9.3	25.8	0.2	0.0	0.0	0.1	6.7	0.0	0.0	0.1	0.1	0.9	5.9	9.4	17.4	40.4
65-69	0.9	9.3	25.8	0.2	0.0	0.0	0.1	6.7	0.0	0.0	0.1	0.1	0.9	5.9	9.4	17.4	40.4
70-74	0.9	9.3	25.8	0.2	0.0	0.0	0.1	6.7	0.0	0.0	0.1	0.1	0.9	5.9	9.4	17.4	40.4
75-79	0.9	9.3	25.8	0.2	0.0	0.0	0.1	6.7	0.0	0.0	0.1	0.1	0.9	5.9	9.4	17.4	40.4
80-84	0.9	9.3	25.8	0.2	0.0	0.0	0.1	6.7	0.0	0.0	0.1	0.1	0.9	5.9	9.4	17.4	40.4
85-89	0.9	9.3	25.8	0.2	0.0	0.0	0.1	6.7	0.0	0.0	0.1	0.1	0.9	5.9	9.4	17.4	40.4
90-94	0.9	9.3	25.8	0.2	0.0	0.0	0.1	6.7	0.0	0.0	0.1	0.1	0.9	5.9	9.4	17.4	40.4
95-100	0.9	9.3	25.8	0.2	0.0	0.0	0.1	6.7	0.0	0.0	0.1	0.1	0.9	5.9	9.4	17.4	40.4

# Simple Poverty Scorecard<sup>®</sup> Poverty-Assessment Tool Mongolia

## 1. Introduction

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

The direct approach to poverty measurement via consumption surveys is difficult and costly. As a case in point, Mongolia's 2014 Socio-Economic Survey (HSES) has 43 pages and includes more than 700 questions, many of which may be asked multiple times (for example, for each household member or for each consumption item).

According to the National Registration and Statistical Office (NRSO), a typical HSES interview took about two hours.

In comparison, the indirect approach of the scorecard is simple, quick, and low-cost. It uses 12 verifiable indicators (such as "In what type of residence does the household currently live?" and "Does the household have any washing machines in working condition?") to get a score that is correlated with poverty status as measured by the exhaustive HSES survey.

The scorecard differs from “proxy-means tests” (Coady, Grosh, and Hoddinott, 2004) in that it is transparent, it is freely available,<sup>1</sup> and it is tailored to the capabilities and purposes not of national governments but rather of local, pro-poor organizations. The feasible poverty-measurement options for local organizations are typically blunt (such as rules based on land ownership or housing quality) or subjective and relative (such as participatory wealth ranking facilitated by skilled field workers). Poverty measures from these approaches may be costly, their accuracy is unknown, and they are not comparable across places, organizations, nor time.

The scorecard can be used to measure the share of a program’s participants who are below a given poverty line (for example, Mongolia’s national line). USAID microenterprise partners in Mongolia can use scoring with the line that marks the poorest half of people with consumption below 100% of the national poverty line to report how many of their participants are “very poor”.<sup>2</sup> Scoring can also be used to measure net movement across a poverty line over time. In all these applications, the scorecard provides a consumption-based, objective tool with known accuracy. While consumption surveys are costly even for governments, some local pro-poor organizations

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<sup>1</sup> The Simple Poverty Scorecard tool for Mongolia is not, however, in the public domain. Copyright is held by the sponsor and by Microfinance Risk Management, L.L.C.

<sup>2</sup> USAID defines a household as *very poor* if its daily per-capita consumption is less than the highest of the \$1.25/day 2005 PPP line (which is not defined for Mongolia) or the line (MNT3,769) that marks the poorest half of people below 100% of the national line (Table 1). USAID (2014, p. 8) has approved the scorecard—when re-branded as a Progress Out of Poverty Index<sup>®</sup>—for use by its microenterprise partners.

may be able to implement a low-cost scorecard to help with monitoring poverty and (if desired) segmenting clients for differentiated services.

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, then they must first trust that it works. Transparency and simplicity build trust. Getting “buy-in” matters; proxy-means tests and regressions on the “determinants of poverty” have been around for decades, but they are rarely used to inform decisions by local, pro-poor organizations. This is not because they do not work, but because they are often presented (when they are presented at all) as tables of regression coefficients incomprehensible to non-specialists (with cryptic indicator names such as “LGHHSZ\_2” and with points with negative values and many decimal places). Thanks to the predictive-modeling phenomenon known as the “flat maximum”, simple, transparent approaches are usually about as accurate as complex, opaque ones (Schreiner, 2012a; Caire and Schreiner, 2012).

Beyond its low cost and transparency, the technical approach of the scorecard is innovative in how it associates scores with poverty likelihoods, in the extent of its accuracy tests, and in how it derives formulas for standard errors. Although the accuracy tests are simple and commonplace in statistical practice and in the for-profit field of credit-risk scoring, they have rarely been applied to poverty measurement via scorecards.

The scorecard is based on data from the 2014 HSES from Mongolia's NRSO.

Indicators are selected to be:

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

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

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 estimate the poverty rate of a group of households at a point in time. This estimate is the average of poverty likelihoods among the households in the group.

Third, the scorecard can estimate the annual rate of change in the poverty rate. With two independent samples from the same population, this is the difference in the average poverty likelihood in the baseline sample versus the average likelihood in the follow-up sample, divided by the difference (in years) between the average interview date in the baseline sample and the average interview date in the follow-up sample. With one sample in which each household is scored twice, the estimate is the sum of each household's change in its poverty likelihood from baseline to follow-up, divided by

the sum the years that passed between each household's two interviews (Schreiner, 2014a).

The scorecard can also be used to segment participants for differentiated services. To help managers choose appropriate targeting cut-offs for their purposes, this several measures of targeting accuracy are reported for a range of possible cut-offs.

This paper presents a single scorecard whose indicators and points are derived with 100% of the national poverty line applied to data from the 2014 HSES. Scores from this one scorecard are calibrated with data from the 2014 HSES to poverty likelihoods for 13 poverty lines.

The scorecard is constructed using half of the data from the 2014 HSES. That same half of the 2014 data is also used to calibrate scores to poverty likelihoods for 13 poverty lines. The other half of the 2014 HSES data is used to validate the scorecard's accuracy for estimating households' poverty likelihoods, for estimating groups' poverty rates at a point in time, and for segmenting participants.

All three scoring-based estimators (the poverty likelihood of a household, the poverty rate of a group of households at a point in time, and the annual rate of change in the poverty rate) are *unbiased*. That is, they match the true value on average in repeated samples when constructed from (and applied to) a single, unchanging population in which the relationship between scorecard indicators and poverty is unchanging. Like all predictive models, the scorecard here is constructed from a single sample and so misses the mark to some unknown extent when applied (as in this paper)

to validation samples. Furthermore, it makes errors when applied (in practice) to a different population or when applied before or after 2014 (because the relationships between indicators and poverty change over time).<sup>3</sup>

Thus, while the indirect scoring approach is less costly than the direct survey approach, it makes errors when applied in practice. (Estimates from the direct survey approach are correct by definition.) There are errors because scoring necessarily assumes that future relationships between indicators and poverty in all possible groups of households will be the same as in the construction data. Of course, this assumption—inevitable in predictive modeling—holds only partly.

On average across 1,000 bootstraps of  $n = 16,384$  from the validation sample, the difference between scorecard estimates of groups' poverty rates versus the true rates at a point in time for 100% of the national poverty line is  $-1.0$  percentage points. Across all 13 poverty lines, the average absolute difference is about 0.5 percentage points, and the maximum absolute difference is 1.1 percentage points. These differences reflect estimation errors due to sampling variation, not bias; the average difference would be zero if the whole 2014 HSES survey were to be repeatedly re-fielded and divided into sub-samples before repeating the entire process of constructing and validating scorecards.

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<sup>3</sup> Important cases include nationally representative samples at a later point in time or sub-groups that are not nationally representative (Diamond *et al.*, 2016; Tarozzi and Deaton, 2009).

With  $n = 16,384$ , the 90-percent confidence intervals are  $\pm 0.7$  percentage points or less. For  $n = 1,024$ , the 90-percent intervals are  $\pm 2.7$  percentage points or less.

Section 2 below documents data and the definition of *poverty*. Sections 3 and 4 describe scorecard construction and offer guidelines for implementation. Sections 5 and 6 tell how to estimate households' poverty likelihoods and groups' poverty rates at a point in time. Section 7 discusses estimating changes in poverty rates over time. Section 8 covers targeting. Section 9 places the scorecard here in the context of a related exercise for Mongolia. The last section is a summary.

The "Guidelines for the Interpretation of Scorecard Indicators" tells how to ask questions (and how to interpret responses) so as to mimic practice in Mongolia's HSES as closely as possible. These "Guidelines" (and the "Back-page Worksheet") are integral parts of the Simple Poverty Scorecard tool.

## 2. Data and the definition of *poverty*

This section discusses the data used to construct and validate the scorecard. It also documents the definition of *poverty* as well as the 13 poverty lines to which scores are calibrated.

### 2.1 Data

Indicators and points for the scorecard are selected (*constructed*) based on a random half of the data from the 16,174 households in the 2014 HSES, Mongolia's most recent national consumption survey.

The half of the 2014 data that is used in scorecard construction is also used to associate (*calibrate*) scores to poverty likelihoods for all poverty lines.

The other half of the 2014 data is used to test (*validate*) scorecard accuracy *out-of-sample*, that is, with data that was not used in construction/calibration.

The 2014 HSES was in the field from 1 January 2014 to 31 December 2014. Consumption is in units of MNT in average prices for Mongolia as a whole during calendar-year 2014.

## 2.2 Poverty rates at the household, person, or participant level

A *poverty rate* is the share of units in households in which total household consumption (divided by the number of household members) is below a given poverty line. The unit of analysis is either the household itself or a person in the household. By assumption, each household member has the same poverty status (or estimated poverty likelihood) as the other members in that same household.

To illustrate, suppose a program serves two households. The first household is poor (its per-capita consumption is less than a given poverty line), and it has three members, one of whom is a program participant. The second household is non-poor and has four members, two of whom are program participants.

Poverty rates are in terms of either households or people. If the program defines its *participants* as households, then the household level is relevant. The estimated household-level poverty rate is the weighted<sup>4</sup> average of poverty statuses (or estimated poverty likelihoods) across households with participants. This is

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

In the “1 · 1” term in the numerator, the first “1” is the first household’s weight, and the second “1” is the first household’s poverty status (poor). In the “1 · 0” term in the numerator, the “1” is the second household’s weight, and the “0” is the second household’s poverty status (non-poor). The “1 + 1” in the

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<sup>4</sup> The example here assumes simple random sampling at the household level. This means that each household has the same weight, taken here to be one (1).

denominator is the sum of the weights of the two households. Household-level weights are used because the unit of analysis is the household.

Alternatively, a person-level rate is relevant if a program defines all people in households that benefit from its services as *participants*. In the example here, the person-level rate is the household-size-weighted<sup>5</sup> average of poverty statuses for

households with participants, or  $\frac{3 \cdot 1 + 4 \cdot 0}{3 + 4} = \frac{3}{7} = 0.43 = 43$  percent. In the “3 · 1” term

in the numerator, the “3” is the first household’s weight because it has three members, and the “1” is its poverty status (poor). In the “4 · 0” term in the numerator, the “4” is the second household’s weight because it has four members, and the zero is its poverty status (non-poor). The “3 + 4” in the denominator is the sum of the weights of the two households. A household’s weight is its number of members because the unit of analysis is the household member.

As a final example, a program might count as *participants* only those household members with whom it deals with directly. For the example here, this means that some—but not all—household members are counted. The person-level rate is now the participant-weighted average<sup>6</sup> of the poverty statuses of households with participants, or

$\frac{1 \cdot 1 + 2 \cdot 0}{1 + 2} = \frac{1}{3} = 0.33 = 33$  percent. The first “1” in the “1 · 1” in the numerator is the

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<sup>5</sup> Given simple random sampling at the household level, a household’s person-level weight is the number of people in the household.

<sup>6</sup> Given simple random sampling at the household level, a household’s participant-level weight is the number of participants in the household.

first household’s weight because it has one participant, and the second “1” is its poverty status (poor). In the “ $2 \cdot 0$ ” term in the numerator, the “2” is the second household’s weight because it has two participants, and the zero is its poverty status (non-poor). The “ $1 + 2$ ” in the denominator is the sum of the weights of the two households. Each household’s weight is its number of participants because the unit of analysis is the participant.

To sum up, estimated poverty rates are weighted averages of households’ poverty statuses (or estimated poverty likelihoods), where—assuming simple random sampling—the weights are the number of relevant units in the household. When reporting, organizations should make explicit the unit of analysis—household, household member, or participant—and explain why that unit is relevant.

Table 1 reports poverty lines and poverty rates for households and people in the 2014 HSES for Mongolia as a whole, for the construction/calibration sample, and for the validation sample. Table 2 (in its four versions) reports these same things for Mongolia as a whole and then by:

- Aimag
- West, Highlands, Central, East, and Ulaanbaatar
- Ulaanbaatar, Aimag centers, Soum centers, and Rural
- Ulaanbaatar, Aimag centers, and Soum centers together with rural

Household-level poverty rates are reported because—as shown above—household-level poverty likelihoods can be straightforwardly converted into poverty rates for other units of analysis. This is also why the scorecard is constructed, calibrated, and validated with household weights. Person-level poverty rates are also included in Tables

1 and 2 because these are the rates reported by the government of Mongolia.

Furthermore, popular discussions and policy discourse usually proceed in terms of person-level rates.

### **2.3 Definition of *poverty*, and the national poverty line**

*Poverty* is whether a household is poor or non-poor. In Mongolia and for the purposes here, poverty status is determined by whether per-capita aggregate household consumption is below a given poverty line. Thus, a definition of *poverty* has two aspects: a measure of aggregate household consumption, and a poverty line.

Cumpa Castro (2009) documents the measurement of aggregate household consumption with the 2007/8 HSES, and that method has been used since.

The derivation of Mongolia's national poverty line follows the cost-of-basic-needs approach of Ravallion (1998). It begins with the cost of a food basket that provides 2,100 Calories. A single basket is used for all of Mongolia. The shares of items in the basket are those in the 2010 HSES for people in the bottom 40 percent of per-capita consumption (NRSO, 2005). The food component of the national poverty line is then defined as the cost of the food basket, found by applying median prices for the basket's items as reported by the same reference group used to find the items' shares. In 2014, the food component is MNT2,625 per person per day.

For the non-food component of the national line (Cumpa Castro, 2009), Mongolia first finds a "lower non-food component" (average non-food consumption for households

whose observed *total* consumption is within 10 percent of the food component, with triangular weights centered on the value of the food component) and an “upper non-food component” (triangle-weighted average non-food consumption for households whose observed *food* consumption is within 10 percent of the food component). Second, Mongolia defines a “moderate non-food component” as the food component divided by the average of the food component divided by the sum of the food component and the lower non-food component, and the food component divided by the sum of the food component and the upper non-food component.

Finally, Mongolia’s national (food-plus-non-food) poverty line (usually called here “100% of the national line”) is the food component, plus the moderate non-food component. This was derived first with data for the 2007/8 HSES (Cumpa Castro, 2009), and then derived again with data from the 2010 HSES. Since then, the 2010 line has been updated for changes in Mongolia’s overall consumer price index (CPI). In all HSES rounds, the overall national line is adjusted for regional and temporal price differences at the level of primary sampling units.

In 2014, the average national line is MNT4,821 per person per day in average prices for Mongolia as a whole in during calendar-year 2014 (Table 1). The corresponding household-level poverty rate is 16.2 percent, and the person-level poverty rate is 21.6 percent.<sup>7</sup>

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<sup>7</sup> The person-level rate matches NRSO (2015, p. 10), suggesting that this paper uses the same data as NRSO and replicates NRSO’s derivation of households’ poverty status.

## 2.4 Supported poverty lines

Because pro-poor organizations in Mongolia may want to use different or various poverty lines, this paper calibrates scores from its single scorecard to poverty likelihoods for 13 lines:

- 100% of national
- 150% of national
- 200% of national
- Line marking the poorest half of people below 100% of the national line
- \$1.90/day 2011 PPP
- \$3.10/day 2011 PPP
- \$3.80/day 2011 PPP
- \$4.00/day 2011 PPP
- First-quintile (20<sup>th</sup>-percentile) line
- Second-quintile (40<sup>th</sup>-percentile) line
- Median (50<sup>th</sup>-percentile) line
- Third-quintile (60<sup>th</sup>-percentile) line
- Fourth-quintile (80<sup>th</sup>-percentile) line

Unlike in almost all other countries, the scorecard does not support 2005 PPP poverty lines in Mongolia. This is because the experts in charge of the World Bank's PovcalNet have judged that the 2005 PPP factor for Mongolia is so inaccurate as to render it useless or misleading.<sup>8</sup>

There are also concerns about the accuracy of the 2011 PPP factors. The scorecard supports 2011 PPP lines for Mongolia, but it is advised not to use them. In any case, the 2011 PPP lines are so low (even \$4.00/day 2011 PPP is lower than Mongolia's national line) that they are unlikely to be relevant for most purposes.

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<sup>8</sup> Personal communication. For Mongolia, PovcalNet notes, "No valid PPP available. International poverty measures can not be computed" ([iresearch.worldbank.org/PovcalNetPPP2005/index.htm?2](http://iresearch.worldbank.org/PovcalNetPPP2005/index.htm?2), retrieved 13 April 2016).

The lines for 150% and 200% of the national line are multiples of 100% of the national line.

The line that marks the poorest half of people below 100% of the national line is defined as the median aggregate household per-capita consumption of people (not households) below 100% of the national line (U.S. Congress, 2004).<sup>9</sup>

The \$1.90/day 2011 PPP line is derived from:

- 2011 PPP exchange rate for “individual consumption expenditure by households”:<sup>10</sup> MNT 590.330 per \$1.00
- Average Consumer Price Index (CPI) for all of Mongolia:<sup>11</sup>
  - In calendar-year 2011: 196.160
  - In calendar-year 2014: 276.740
- Regional/temporal price deflators  $d_p$  for the 2010 HSES’  $P$  primary sampling units<sup>12</sup>
- Person-weighted average price deflator: 0.9994605

Given this, the average \$1.90/day 2005 PPP line in average prices in Mongolia overall during the 2014 HSES fieldwork is (Sillers, 2006):

$$(\text{2011 PPP factor}) \cdot \$1.90 \cdot \left( \frac{\text{CPI}_{2014}}{\text{CPI}_{2011}} \right) = \left( \frac{\text{MNT}590.330}{\$1.00} \right) \cdot \$1.90 \cdot \left( \frac{276.740}{196.160} \right) = \text{MNT}1,582.38.$$

The other 2011 PPP lines are multiples of the \$1.90/day line.

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<sup>9</sup> In general, the USAID “very poor” line is the highest of \$1.25/day 2005 PPP and the line that marks the poorest half of people below 100% of the national line. There is no \$1.25/day 2005 PPP line in Mongolia, so by default the USAID “very poor” line is that marking the poorest half of people below 100% of the national line.

<sup>10</sup> [iresearch.worldbank.org/PovcalNet/Detail.aspx?Format=Detail&C0=MNG\\_3&PPP0=590.33&PL0=1.90&Y0=2012&NumOfCountries=1](http://iresearch.worldbank.org/PovcalNet/Detail.aspx?Format=Detail&C0=MNG_3&PPP0=590.33&PL0=1.90&Y0=2012&NumOfCountries=1), retrieved 13 April 2016.

<sup>11</sup> The index has been re-based to December 2004 = 100 and comes from the Bank of Mongolia’s *Monthly Statistical Bulletin* for December 2008, December 2013, and December 2015 ([mongolbank.mn/documents/statistic/2008/12.pdf](http://mongolbank.mn/documents/statistic/2008/12.pdf), [.../2013/12.pdf](http://mongolbank.mn/documents/statistic/2013/12.pdf) and [.../2015/12.pdf](http://mongolbank.mn/documents/statistic/2015/12.pdf), retrieved 15 April 2016).

<sup>12</sup> The NRSO provides the deflators with the 2014 HSES data.

The 2011 PPP lines in Table 1 are all-Mongolia averages. For a given primary sampling unit, the \$1.90/day line is the all-Mongolia \$1.90/day line, multiplied the deflator for that primary sampling unit, and divided by the all-Mongolia person-weighted average deflator of 0.9994605.

The World Bank's PovcalNet does not report \$1.90/day 2011 PPP poverty lines nor person-level poverty rates for 2014. For 2012, PovcalNet reports a person-level poverty rate of 0.4 percent and a poverty line of MNT1,290.<sup>13</sup>

The \$1.90/day estimates here are to be preferred (Schreiner, 2014b) not only because they are based on more recent data but also because PovcalNet does not report:

- What survey its data come from
- The time/place of its price units
- Its price deflators and their source
- Whether/how it adjusts for regional differences in prices
- How it deflates 2011 PPP factors over time

USAID microenterprise partners in Mongolia who use the scorecard to report the number of their participants who are “very poor” to USAID should use the line that marks the poorest half of people below 100% of the national poverty line. This is because USAID defines the “very poor” as those people in households whose daily per-capita consumption is below the highest of the following two poverty lines:

- The line that marks the poorest half of people below 100% of the national line (MNT3,769 in 2014, with a person-level poverty rate of 10.8 percent, Table 1)

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<sup>13</sup> [iresearch.worldbank.org/PovcalNet/Detail.aspx?Format=Detail&C0=MNG\\_3&PPP0=590.33&PLO=1.90&Y0=2012&NumOfCountries=1](http://iresearch.worldbank.org/PovcalNet/Detail.aspx?Format=Detail&C0=MNG_3&PPP0=590.33&PLO=1.90&Y0=2012&NumOfCountries=1), retrieved 13 April 2016.

- \$1.25/day 2005 PPP (a line which does not exist for Mongolia)

Mongolia is the first country for which the scorecard supports relative (percentile-based) poverty lines. These lines allow the scorecard to be applied in a number of additional types of analyses.

For example, the second-quintile (40<sup>th</sup>-percentile) line—as well as the first-quintile (20<sup>th</sup>-percentile) line—might be used to help track progress toward the World Bank’s (2013) goal of “shared prosperity/inclusive economic growth”, defined as income growth among the bottom 40 percent of the world’s people.

Also, the five quintile lines can be used together to analyze the relationship of consumption with health outcomes (or anything else related with the distribution of consumption). Until now, such analyses often used a “wealth index” such as that supplied with the data from USAID’s Demographic and Health Surveys (Rutstein and Johnson, 2004; Henry *et al.*, 2003; Sahn and Stifel, 2003).

Of course, analysts could always do (and still can do) relative-wealth analyses with scores from the scorecard. But support for relative consumption lines now allows the use of a single tool (the scorecard) to analyze all of:

- Relative wealth (via scores)
- Absolute consumption (via poverty likelihoods and absolute poverty lines)
- Relative consumption (via poverty likelihoods and percentile-based poverty lines)

Wealth indexes are relevant only for analyzing relative wealth. Furthermore, the scorecard—unlike wealth indexes based on Principal Component Analysis or similar approaches—is tied to a straightforward, well-understood standard (consumption

related to a poverty line defined in monetary terms) whose definition is external to the scorecard itself. In contrast, a wealth index defines poverty in terms of its own indicators and points. This means that two wealth indexes with different indicators or different points—both constructed with the same data for the same country—imply two different (opaque) definitions of *poverty*, whereas two scorecards in that same situation still measure a single, externally-defined definition of *poverty*.<sup>14</sup>

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<sup>14</sup> Relative definitions of *poverty* have the drawback of being unable to measure the *size* of change over time; they can only sometimes indicate the *sign* (direction) of change.

### 3. Scorecard construction

For Mongolia, about 100 candidate indicators are initially prepared in the areas of:

- Household composition (such as the number of members)
- Education (such as the educational attainment of the male head/spouse)
- Housing (such as the construction material of the walls)
- Ownership of durable assets (such as washing machines or electric irons)
- Employment (such as the number of household members who work)
- Agriculture (such as the number of horses or sheep owned)

Table 3 lists the candidate indicators, ordered by the entropy-based “uncertainty coefficient” (Goodman and Kruskal, 1979) that measures how well a given indicator predicts poverty status on its own.<sup>15</sup>

One possible application of the scorecard is to measure *changes* in poverty through time. Thus, when selecting indicators—and holding other considerations constant—preference is given to more sensitive indicators. For example, the ownership of a pressure cooker is probably more likely to change in response to changes in poverty than is the education of the male head/spouse.

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

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<sup>15</sup> The uncertainty coefficient is not used to help select scorecard indicators; it is just a way to order the candidate indicators listed in Table 3.

One of these one-indicator scorecards is then selected based on several factors (Schreiner *et al.*, 2014; Zeller, 2004). These include improvement in accuracy, likelihood of acceptance by users (determined by simplicity, cost of collection, and “face validity” in terms of experience, theory, and common sense), sensitivity to changes in poverty, variety among indicators, applicability across regions, tendency to have a slow-changing relationship with poverty over time, relevance for distinguishing among households at the poorer end of the distribution of consumption, and verifiability.

A series of two-indicator scorecards are then built, each adding a second indicator to the one-indicator scorecard selected from the first round. The best two-indicator scorecard is then selected, again using judgment to balance statistical accuracy with the non-statistical criteria. These steps are repeated until the scorecard has 12 indicators that work well together.<sup>16</sup>

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).

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<sup>16</sup> For Mongolia, indicator selection was also informed by feedback from a field test by World Vision International/Mongolia, VisionFund Mongolia, and Xac Bank.

This algorithm is similar to common  $R^2$ -based stepwise least-squares regression. It differs from naïve stepwise in that the selection of indicators considers both statistical<sup>17</sup> and non-statistical criteria. The use of non-statistical criteria can improve robustness through time and helps ensure that indicators are simple, common-sense, and acceptable to users.

The single scorecard here applies to all of Mongolia. Tests for Indonesia (World Bank, 2012), Bangladesh (Sharif, 2009), India and Mexico (Schreiner, 2006 and 2005a), Sri Lanka (Narayan and Yoshida, 2005), and Jamaica (Grosh and Baker, 1995) suggest that segmenting scorecards by urban/rural does not improve targeting accuracy much. In general, segmentation may improve the accuracy of estimates of poverty rates (Diamond *et al.*, 2016; Tarozzi and Deaton, 2009), but it may also increase the risk of overfitting (Haslett, 2012).

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<sup>17</sup> The statistical criterion for selecting an indicator is not the  $p$  values of its coefficients but rather the indicator's contribution to the ranking of households by poverty status.

## 4. Practical guidelines for scorecard use

The main challenge of scorecard design is not to maximize statistical accuracy but rather to improve the chances that the scorecard is actually used (Schreiner, 2005b). When scoring projects fail, the reason is not usually statistical inaccuracy but rather the failure of an organization to decide to do what is needed to integrate scoring in its processes and to train and convince its employees to use the scorecard properly (Schreiner, 2002). After all, most reasonable scorecards have similar targeting accuracy, thanks to the empirical phenomenon known as the “flat maximum” (Caire and Schreiner, 2012; Hand, 2006; Baesens *et al.*, 2003; Lovie and Lovie, 1986; Kolesar and Showers, 1985; Stillwell, Barron, and Edwards, 1983; Dawes, 1979; Wainer, 1976; Myers and Forgy, 1963). The bottleneck is less technical and more human, not statistics but organizational-change management. Accuracy is easier to achieve than adoption.

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

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

- Only 12 indicators
- Only “multiple-choice” indicators
- Only simple points (non-negative integers, and no arithmetic beyond addition)

The scorecard (and its back-page worksheet) is ready to be photocopied. A field worker using Mongolia’s scorecard would:

- Record the interview identifier, interview date, county code (“MNG”), scorecard code (“001”) and the sampling weight assigned by the organization’s survey design to the household of the participant
- Record the names and identifiers of the participant (who may not be the same as the respondent), field agent, and relevant organizational service point
- Complete the back-page worksheet with each household member’s first name
- Record household size in the scorecard header next to “Number of household members:”, and record the response to the first scorecard indicator based on the number of household members listed on the back-page worksheet
- Read each of the remaining 11 questions one-by-one from the scorecard, drawing a circle around the relevant responses and their points, and writing each point value in the far right-hand column
- Add up the points to get a total score
- Implement targeting policy (if any)
- Deliver the paper scorecard to a central office for data entry and filing

Of course, field workers must be trained. The quality of outputs depends on the quality of inputs. If organizations or field workers gather their own data and believe that they have an incentive to exaggerate poverty rates (for example, if managers or 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).<sup>18</sup> 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 alternative ways of measuring poverty, it is still absolutely difficult. Training and explicit definitions of terms and concepts in the scorecard are essential, and field workers should scrupulously study and follow the “Guidelines for the Interpretation of Scorecard Indicators” found at the end of this paper, as the “Guidelines”—along with the “Back-page Worksheet”—are an integral part of the Simple Poverty Scorecard tool.<sup>19</sup>

For the example of Nigeria, one study (Onwujekwe, Hanson, and Fox-Rushby, 2006) found distressingly low inter-rater and test-retest correlations for indicators as seemingly simple as whether a household owns an automobile. At the same time, Grosh and Baker (1995) suggest that gross underreporting of assets does not affect targeting. For the first stage of targeting in a conditional cash-transfer program in Mexico,

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<sup>18</sup> If a program does not want field workers and respondents to know the points associated with responses, then it can use a version of the scorecard that does not display the points and then apply the points and compute scores later at a central office. Even if points are hidden, however, field workers and respondents can apply common sense to guess how response options are linked with poverty. Schreiner (2012a) argues that hiding points in Colombia (Camacho and Conover, 2011) did little to deter cheating and that, in any case, cheating by the user’s central office was more damaging than cheating by field workers and respondents.

<sup>19</sup> The guidelines here are the only ones that organizations should give to field workers. All other issues of interpretation should be left to the judgment of field workers and respondents, as this seems to be what Mongolia’s NRSO does in the HSES.

Martinelli and Parker (2007, pp. 24–25) find that “underreporting [of asset ownership] is widespread but not overwhelming, except for a few goods . . . [and] overreporting is common for a few goods”. Still, as is done in Mexico in the second stage of its targeting process, most false self-reports can be corrected (or avoided in the first place) by field workers who make a home visit. This is the recommended procedure for organizations who use scoring for targeting in Mongolia.

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

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

In general, the sampling design should follow from the organization’s goals for the exercise, the questions to be answered, and the budget. The main goal should be to make sure that the sample is representative of a well-defined population and that the scorecard will inform an issue that matters to the organization.

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

- Employees of the organization
- Third parties

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

- Paper in the field, and then filed at a central office
- Paper in the field, and then keyed into a database or spreadsheet at a central office
- Portable electronic devices in the field, and then uploaded to a database

Given a population of participants relevant for a particular business question, the participants to be scored can be:

- All relevant participants (a census)
- A representative sample of relevant participants
- All relevant participants in a representative sample of relevant field offices and/or field agents
- A representative sample of relevant participants in a representative sample of relevant field offices and/or field agents

If not determined by other factors, the number of participants to be scored can be derived from sample-size formulas (presented later) to achieve a desired confidence level and a desired confidence interval. To have a chance to meaningfully inform questions that matter to the organization, however, the focus should not be on having a sample size large enough to achieve some arbitrary level of statistical significance but rather on having a representative sample from a well-defined population.

The frequency of application can be:

- As a once-off project (precluding measuring change)
- Every two years (or at any other fixed or variable time interval, allowing measuring change)
- Each time a field worker visits a participant at home (allowing measuring change)

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

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

An example set of choices is illustrated by BRAC and ASA, two microfinance organizations in Bangladesh who each have about 7 million participants and who declared their intention to apply the Simple Poverty Scorecard tool for Bangladesh (Schreiner, 2013) with a sample of about 25,000. Their design is that all loan officers in a random sample of branches score all participants each time they visit a homestead (about once a year) as part of their standard due diligence prior to loan disbursement. They record responses on paper in the field before sending the forms to a central office to be entered into a database and converted to poverty likelihoods.

## 5. Estimates of household poverty likelihoods

The sum of scorecard points for a household is called the *score*. For Mongolia, 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 poor, the scores themselves have only relative units. For example, doubling the score decreases the likelihood of being below a given poverty line, but it does not cut it in half.

To get absolute units, scores must be converted to *poverty likelihoods*, that is, probabilities of being below a poverty line. This is done via simple look-up tables. For the example of 100% of the national line, scores of 20–24 correspond with a poverty likelihood of 50.6 percent, and scores of 25–29 correspond with a poverty likelihood of 35.0 percent (Table 4).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 20–24 are associated with a poverty likelihood of 50.6 percent for 100% of the national line but of 3.4 percent for the \$3.10/day line.<sup>20</sup>

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<sup>20</sup> Starting with Table 4, many tables have 13 versions, one for each poverty line. To keep them straight, tables are grouped by line. Tables pertaining to all lines are placed with the tables for 100% of the national line.

## 5.1 Calibrating scores with poverty likelihoods

A given score is associated (“calibrated”) with a poverty likelihood by defining the poverty likelihood as the share of households in the calibration sub-sample who have the score and who have per-capita consumption below a given poverty line.

For the example of 100% of the national line (Table 5), there are 7,040 (normalized) households in the calibration sub-sample with a score of 20–24. Of these, 3,563 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 20–24 is then 50.6 percent, because  $3,563 \div 7,040 = 50.6$  percent.

To illustrate with 100% of the national line and a score of 25–29, there are 9,701 (normalized) households in the calibration sub-sample, of whom 3,395 (normalized) are below the line (Table 5). The poverty likelihood for this score range is then  $3,395 \div 9,701 = 35.0$  percent.

The same method is used to calibrate scores with estimated poverty likelihoods for all 13 poverty lines.<sup>21</sup>

Even though the scorecard is constructed partly based on judgment related to non-statistical criteria, the calibration process produces poverty likelihoods that are objective, that is, derived from quantitative poverty lines and from survey data on

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<sup>21</sup> To ensure that poverty likelihoods never increase as scores increase, likelihoods across series of adjacent scores are sometimes iteratively averaged before grouping scores into ranges. This preserves unbiasedness while keeping users from balking when sampling variation in score ranges with few households would otherwise lead to higher scores being linked with higher poverty likelihoods.

consumption. The calibrated poverty likelihoods would be objective even if the process of selecting indicators and points did not use any data at all. In fact, objective scorecards of proven accuracy are often constructed using only expert judgment to select indicators and points (Fuller, 2006; Caire, 2004; Schreiner *et al.*, 2014). 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 objectivity depends on using data in score calibration, not on using data (and nothing else) in scorecard construction.

Although the points in the Mongolia scorecard are transformed coefficients from a Logit regression, (untransformed) scores are not converted to poverty likelihoods via the Logit formula of  $2.718281828^{\text{score}} \times (1 + 2.718281828^{\text{score}})^{-1}$ . 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. Going from scores to poverty likelihoods in this way requires no arithmetic at all, just a look-up table. This approach to calibration can also improve accuracy, especially with large samples.

## 5.2 Accuracy of estimates of households' poverty likelihoods

As long as the relationships between indicators and poverty do not change over time, and as long as the scorecard is applied to households who are representative of the same population from which the scorecard was originally constructed, then this calibration process produces unbiased estimates of poverty likelihoods. *Unbiased* means that in repeated samples from the same population, the average estimate matches the true value. Given the assumptions above, the scorecard also produces unbiased estimates of poverty rates at a point in time and unbiased estimates of changes in poverty rates between two points in time.<sup>22</sup>

Of course, the relationships between indicators and poverty do change to some unknown extent over time and also across sub-national groups in Mongolia's population. Thus, the scorecard will generally be biased when applied after December 2014 (the last month of fieldwork for the 2014 HSES) or when applied with sub-groups that are not nationally representative.

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<sup>22</sup> This follows because these estimates of groups' poverty rates are linear functions of the unbiased estimates of households' poverty likelihoods.

How accurate are estimates of households' poverty likelihoods, given the assumption of unchanging relationships between indicators and poverty over time and the assumption of a sample that is representative of Mongolia as a whole? To find out, the scorecard is applied to 1,000 bootstrap samples of size  $n = 16,384$  from the validation sample. Bootstrapping means to:

- Score each household in the validation sample
- Draw a bootstrap sample *with replacement* from the validation sample
- For each score, compute the true poverty likelihood in the bootstrap sample, that is, the share of households with the score and with consumption below a poverty line
- For each score, record the difference between the estimated poverty likelihood (Table 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 intervals containing the central 900, 950, and 990 differences between estimated and true poverty likelihoods

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

For the example of 100% of the national line, the average poverty likelihood across bootstrap samples for scores of 20–24 in the validation sample is too high by 5.2 percentage points. For scores of 25–29, the estimate is too low by 10.2 percentage points.<sup>23</sup>

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<sup>23</sup> These differences are not zero, despite the estimator's unbiasedness, because the scorecard comes from a single sample from the 2014 HSES. The average difference by score range would be zero if the HSES was repeatedly applied to samples of the

The 90-percent confidence interval for the differences for scores of 20–24 is  $\pm 2.7$  percentage points (100% of the national line, Table 6). This means that in 900 of 1,000 bootstraps, the difference between the estimate and the true value is between +2.5 and +7.9 percentage points (because  $+5.2 - 2.7 = +2.5$ , and  $+5.2 + 2.7 = +7.9$ ). In 950 of 1,000 bootstraps (95 percent), the difference is  $+5.2 \pm 3.2$  percentage points, and in 990 of 1,000 bootstraps (99 percent), the difference is  $+5.2 \pm 4.4$  percentage points.

A couple differences between estimated poverty likelihoods and true values in Table 6 are large. There are differences because the validation sample is a single sample that—thanks to sampling variation—differs in distribution from the construction/calibration sub-samples and from Mongolia’s population. For targeting, however, what matters is less the difference in all score ranges and more the differences in the score ranges just above and below the targeting cut-off. This mitigates the effects of bias and sampling variation on targeting (Friedman, 1997). Section 8 below looks at targeting accuracy in detail.

In addition, if estimates of groups’ poverty rates are to be usefully accurate, then errors for individual households’ poverty likelihoods must largely balance out. As discussed in the next section, this is generally the case for nationally representative samples, although it holds less well for sub-national groups.

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population of Mongolia and then split into sub-samples before repeating the entire process of scorecard construction/calibration and validation.

Another possible source of differences between estimates and true values is overfitting. The scorecard here is unbiased, but it may still be *overfit* when applied after the end of the HSES fieldwork in December 2014. That is, the scorecard may fit the data from the 2014 HSES so closely that it captures not only some real patterns but also some random patterns that, due to sampling variation, show up only in the 2014 HSES but not in the overall population of Mongolia. Or the scorecard may be overfit in the sense that it is not robust when relationships between indicators and poverty change over time or when the scorecard is applied to samples that are not nationally representative.

Overfitting can be mitigated by simplifying the scorecard and by not relying only on data but rather also considering theory, experience, and judgment. Of course, the scorecard here does this. Combining scorecards can also reduce overfitting, at the cost of greater complexity.

Most errors in individual households' likelihoods do balance out in the estimates of groups' poverty rates for nationally representative samples (see the next two sections). Furthermore, at least some of the differences in change-through-time estimates come from non-scorecard sources such as changes in the relationships between indicators and poverty, sampling variation, changes in poverty lines, inconsistencies in data quality across time, and imperfections in cost-of-living adjustments across time and across geographic regions. These factors can be addressed only by improving the availability, frequency, quantity, and quality of data from national consumption surveys (which is beyond the scope of the scorecard) or by reducing overfitting (which likely has limited returns, given the scorecard's parsimony).

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

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

To illustrate, suppose an organization samples three households on 1 January 2016 and that they have scores of 20, 30, and 40, corresponding to poverty likelihoods of 50.6, 17.1, and 4.5 percent (100% of the national line, Table 4). The group's estimated poverty rate is the households' average poverty likelihood of  $(50.6 + 17.1 + 4.5) \div 3 = 24.1$  percent.

Be careful; the group's poverty rate is *not* the poverty likelihood associated with the average score. Here, the average score is 30, which corresponds to a poverty likelihood of 17.1 percent. This differs from the 24.1 percent found as the average of the three individual poverty likelihoods associated with each of the three scores. Unlike poverty likelihoods, scores are ordinal symbols, like letters in the alphabet or colors in the spectrum. Because scores are not cardinal numbers, they cannot meaningfully be added up or averaged across households. Only three operations are valid for scores: conversion to poverty likelihoods, analysis of distributions (Schreiner, 2012a), or comparison—if desired—with a cut-off for targeting. The safest rule to follow is: if you are not sure what to do, then use poverty likelihoods, not scores.

Scores from the scorecard are calibrated with data from the 2014 HSES for all 13 poverty lines. The process of calibrating scores to poverty likelihoods and the approach to estimating poverty rates is exactly the same for all lines, regardless of their

definition. For users, the only difference is in the specific look-up table used to convert scores to poverty likelihoods.

## 6.1 Accuracy of estimated poverty rates at a point in time

For the scorecard applied to 1,000 bootstraps of  $n = 16,384$  from the validation sample and 100% of the national poverty line, the average difference between the estimated poverty rate at a point in time versus the true rate is  $-1.0$  percentage points (Table 8, summarizing Table 7 across all poverty lines). Across all 13 poverty lines in the validation sample, the maximum absolute difference is 1.1 percentage points, and the average absolute difference is about 0.5 percentage points. At least part of these differences is due to sampling variation in the division of the 2014 HSES into two sub-samples.

When estimating poverty rates at a point in time for a given poverty line, the average error reported in Table 8 should be subtracted from the average poverty likelihood to give a corrected estimate. For the example of the scorecard and 100% of the national line in the validation sample, the error is  $-1.0$  percentage points, so the corrected estimate in the three-household example above is  $24.1 - (-1.0) = 25.1$  percent.

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  $\pm 0.7$  percentage points or better for all poverty lines (Table 8). This means that in 900 of 1,000 bootstraps of this size, the

estimate (after correcting for the known average error) is within 0.7 percentage points of the true value.

For example, suppose that the (uncorrected) average poverty likelihood in a sample of  $n = 16,384$  with the Mongolia scorecard and 100% of the national line is 24.1 percent. Then estimates in 90 percent of such samples would be expected to fall in the range of  $24.1 - (-1.0) - 0.4 = 24.7$  percent to  $24.1 - (-1.0) + 0.4 = 25.5$  percent, with the most likely true value being the corrected estimate in the middle of this range, that is,  $24.1 - (-1.0) = 25.1$  percent. This is because the original (uncorrected) estimate is 24.1 percent, the average error is  $-1.0$  percentage points, and the 90-percent confidence interval for 100% of the national line in the validation sample with this sample size is  $\pm 0.4$  percentage points (Table 8).

## 6.2 Formula for standard errors for estimates of poverty rates

How precise are the point-in-time estimates? Because these estimates are averages, they have (in “large” samples) a Normal distribution and can be characterized by their average difference vis-à-vis true values (*error*), together with their standard error (*precision*).

Schreiner (2008a) proposes an approach to deriving a formula for the standard errors of estimated poverty rates at a point in time from indirect measurement via scorecards. It starts with Cochran’s (1977) textbook formula of  $\pm c = \pm z \cdot \sigma$  that relates confidence intervals with standard errors in the case of direct measurement of ratios, where:

$\pm c$  is a confidence interval as a proportion (*e.g.*, 0.02 for  $\pm 2$  percentage points),

$z$  is from the Normal distribution and is  $\begin{cases} 1.04 \text{ for confidence levels of 70 percent} \\ 1.28 \text{ for confidence levels of 80 percent,} \\ 1.64 \text{ for confidence levels of 90 percent} \end{cases}$

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

$\hat{p}$  is the estimated proportion of households below the poverty line in the sample,

$\phi$  is the finite population correction factor  $\sqrt{\frac{N - n}{N - 1}}$ ,

$N$  is the population size, and

$n$  is the sample size.

For example, Mongolia’s 2014 HSES gives a direct-measurement estimate of the household-level poverty rate for 100% of the national line in the validation sample of  $\hat{p} = 16.2$  percent (Table 1). If this estimate came from a sample of  $n = 16,384$  households from a population  $N$  of 822,871 (the number of households in Mongolia in 2014 according to the HSES sampling weights), then the finite population correction  $\phi$  is

$$\sqrt{\frac{822,871 - 16,384}{822,871 - 1}} = 0.9900, \text{ which close to } \phi = 1. \text{ If the desired confidence level is 90-}$$

percent ( $z = 1.64$ ), then the confidence interval  $\pm c$  is

$$\pm z \cdot \sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}} = \pm 1.64 \cdot \sqrt{\frac{0.162 \cdot (1 - 0.162)}{16,384}} \cdot \sqrt{\frac{822,871 - 16,384}{822,871 - 1}} = \pm 0.467$$

percentage points. (If  $\phi$  were taken as 1, then the interval is  $\pm 0.472$  percentage points.)

Unlike the 2014 HSES, however, the scorecard does not measure poverty directly, so this formula is not applicable. To derive a formula for the Mongolia scorecard, consider Table 7, which reports empirical confidence intervals  $\pm c$  for the differences for the scorecard applied to 1,000 bootstraps of various sizes from the validation sample. For example, with  $n = 16,384$  and 100% of the national line in the validation sample, the 90-percent confidence interval is  $\pm 0.445$  percentage points.<sup>24</sup>

Thus, the 90-percent confidence interval with  $n = 16,384$  is  $\pm 0.445$  percentage points for the Mongolia scorecard and  $\pm 0.467$  percentage points for direct measurement. The ratio of the two intervals is  $0.445 \div 0.467 = 0.95$ .

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<sup>24</sup> Due to rounding, Table 7 displays 0.4, not 0.445.

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

$$\pm 1.64 \cdot \sqrt{\frac{0.162 \cdot (1 - 0.162)}{8,192}} \cdot \sqrt{\frac{822,871 - 8,192}{822,871 - 1}} = \pm 0.664 \text{ percentage points.}$$

The empirical confidence interval with the Mongolia scorecard (Table 7) is  $\pm 0.620$  percentage points. Thus for  $n = 8,192$ , the ratio of the two intervals is  $0.620 \div 0.664 = 0.93$ .

This ratio of 0.93 for  $n = 8,192$  is close to the ratio of 0.95 for  $n = 16,384$ . Across all sample sizes of 256 or more in Table 7, these ratios are generally close to each other, and the average of these ratios in the validation sample turns out to be 0.93, implying that confidence intervals for indirect estimates of poverty rates via the Mongolia scorecard and 100% of the national poverty line are—for a given sample size—about 7-percent narrower than confidence intervals for direct estimates via the 2014 HSES. This 0.93 appears in Table 8 as the “ $\alpha$  factor for precision” because if  $\alpha = 0.93$ , then the formula for confidence intervals  $c$  for the Mongolia scorecard is  $\pm c = \pm z \cdot \alpha \cdot \sigma$ . That is, the formula for the standard error  $\sigma$  for point-in-time estimates of poverty rates via

$$\text{scoring is } \alpha \cdot \sqrt{\frac{\hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\frac{N - n}{N - 1}}.$$

In general,  $\alpha$  can be more or less than 1.00. When  $\alpha$  is less than 1.00, it means that the scorecard is more precise than direct measurement. It turns out that  $\alpha$  is less than 1.00 for eight of 13 poverty lines in Table 8.

The formula relating confidence intervals with standard errors for the scorecard can be rearranged to give a formula for determining sample size before measurement. If  $\tilde{p}$  is the expected poverty rate before measurement, then the formula for sample size  $n$  from a population of size  $N$  that is based on the desired confidence level that corresponds to  $z$  and the desired confidence interval  $\pm c$  is

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

If the population  $N$  is “large” relative to the sample size  $n$ , then the finite-population correction factor  $\phi$  can be taken as one (1),

$$\text{and the formula becomes } n = \left( \frac{\alpha \cdot z}{c} \right)^2 \cdot \tilde{p} \cdot (1 - \tilde{p}).$$

To illustrate how to use this, suppose the population  $N$  is 822,871 (the number of households in Mongolia in 2014), suppose  $c = 0.03397$ ,  $z = 1.64$  (90-percent confidence), and the relevant poverty line is 100% of the national line so that the most sensible expected poverty rate  $\tilde{p}$  is Mongolia’s overall poverty rate for that line in 2014 (16.2 percent at the household level, Table 1). The  $\alpha$  factor is 0.93 (Table 8). Then the sample-size formula gives

$$n = 822,871 \cdot \left( \frac{1.64^2 \cdot 0.93^2 \cdot 0.162 \cdot (1 - 0.162)}{1.64^2 \cdot 0.93^2 \cdot 0.162 \cdot (1 - 0.162) + 0.03397^2 \cdot (822,871 - 1)} \right) = 274,$$

which is not too far from the sample size of 256 observed for these parameters in Table 7 for

100% of the national line. Taking the finite population correction factor  $\phi$  as one (1)

gives the same result, as  $n = \left( \frac{0.93 \cdot 1.64}{0.03397} \right)^2 \cdot 0.162 \cdot (1 - 0.162) = 274$ .<sup>25</sup>

Of course, the  $\alpha$  factors in Table 8 are specific to Mongolia, its poverty lines, its poverty rates, and its scorecard. The derivation of the formulas for standard errors using the  $\alpha$  factors, however, is valid for any poverty-measurement tool following the approach in this paper.

In practice after the end of fieldwork for the HSES in December 2014, a program would select a poverty line (say, 100% of the national line), note its participants' population size (for example,  $N = 10,000$  participants), select a desired confidence level (say, 90 percent, or  $z = 1.64$ ), select a desired confidence interval (say,  $\pm 2.0$  percentage points, or  $c = \pm 0.02$ ), make an assumption about  $\tilde{p}$  (perhaps based on a previous measurement such as the household-level poverty rate for 100% of the national line for Mongolia of 16.2 percent in the 2014 HSES in Table 1), look up  $\alpha$  (here, 0.93 in Table 8), assume that the scorecard will still work in the future and for sub-groups that are

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<sup>25</sup> Although USAID has not specified confidence levels nor intervals, IRIS Center (2007a and 2007b) says that a sample size of  $n = 300$  is sufficient for USAID reporting. USAID microenterprise partners in Mongolia should report using the line marking the poorest half of people below 100% of the national line. Given the  $\alpha$  factor of 1.07 for this line in 2014 (Table 8), an expected before-measurement household-level poverty rate of 7.5 percent (the all-Mongolia rate for this line in 2014, Table 1), and a confidence level of 90 percent ( $z = 1.64$ ), then  $n = 300$  implies a confidence interval of

$$\pm 1.64 \cdot 1.07 \cdot \sqrt{\frac{0.075 \cdot (1 - 0.075)}{300}} = \pm 2.7 \text{ percentage points.}$$

not nationally representative,<sup>26</sup> and then compute the required sample size. In this

$$\text{illustration, } n = 10,000 \cdot \left( \frac{1.64^2 \cdot 0.93^2 \cdot 0.162 \cdot (1 - 0.162)}{1.64^2 \cdot 0.93^2 \cdot 0.162 \cdot (1 - 0.162) + 0.02^2 \cdot (10,000 - 1)} \right) = 732.$$

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<sup>26</sup> This paper reports accuracy for the scorecard applied to the validation sample, but it cannot test accuracy for later years or for sub-groups. Performance after December 2014 will resemble that in the 2014 HSES with deterioration over time to the extent that the relationships between indicators and poverty status change.

## 7. Estimates of changes in poverty rates over time

The change in a group's poverty rate between two points in time is estimated as the change in the average poverty likelihood of the households in the group.

With data only from the 2014 HSES, this paper cannot test estimates of change over time for Mongolia, and it can only suggest approximate formulas for standard errors. Nonetheless, the relevant concepts are presented here because, in practice, pro-poor organizations in Mongolia can apply the scorecard to collect their own data and measure change through time.

### 7.1 Warning: Change is not necessarily 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 participation requires knowing what would have happened to participants if they had not been participants. Knowing this requires either strong assumptions or a control group that resembles participants in all ways except participation. To belabor the point, the scorecard can help estimate the impact of participation only if there is some way to know—or explicit assumptions about—what would have happened in the absence of participation. And that information must come from beyond the scorecard.

## 7.2 Estimating changes in poverty rates over time

Consider the illustration begun in the previous section. On 1 January 2016, an organization samples three households who score 20, 30, and 40 and so have poverty likelihoods of 50.6, 17.1, and 4.5 percent (100% of the national line, Table 4). Correcting for the known average error in the validation sample of  $-1.0$  percentage points (Table 8), the group's corrected baseline estimated poverty rate is the households' average poverty likelihood of  $[(50.6 + 17.1 + 4.5) \div 3] - (-1.0) = 25.1$  percent.

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

- Score a new, independent sample from the same population
- Score the same sample that was scored at baseline

By way of illustration, suppose that two years later on 1 January 2018, the organization samples three additional households who are in the same population as the three original households and finds that their scores are 25, 35, and 45 (poverty likelihoods of 35.0, 9.7, and 2.3 percent, 100% of the national line, Table 4). Adjusting for the known average error, the average poverty likelihood at follow-up is  $[(35.0 + 9.7 + 2.3) \div 3] - (-1.0) = 16.7$  percent, an improvement of  $25.1 - 16.7 = 8.4$  percentage points.<sup>27</sup> Supposing that exactly two years passed between the average baseline interview and the average follow-up interview, the estimated annual rate of decrease in poverty is  $8.4 \div 2 = 4.2$  percentage points per year. About one in 12 participants in this

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<sup>27</sup> Of course, such a huge reduction in poverty in two years is highly unlikely, but this is just an example to show how the scorecard can be used to estimate change.

hypothetical example cross the poverty line in 2016/8.<sup>28</sup> Among those who start below the line, about one in three ( $8.4 \div 25.1 = 33.5$  percent) on net end up above the line.<sup>29</sup>

Alternatively, suppose that the three original households who were scored at baseline are scored again on 1 January 2018. Given scores of 25, 35, and 45, their follow-up poverty likelihoods are 35.0, 9.7, and 2.3 percent. The average across households of the difference in each given household's baseline poverty likelihood and its follow-up poverty likelihood is  $[(50.6 - 35.0) + (17.1 - 9.7) + (4.5 - 2.3)] \div 3 = 8.4$  percentage points. Assuming in this example that there are exactly two years between each household's interviews, the estimated annual decrease in poverty is (again)  $8.4 \div 2 = 4.2$  percentage points per year.

Both approaches to estimating change through time are unbiased. In general (and unlike in the simple example here), however, they will give different estimates due to differences in the timing of interviews, in the composition of the samples, and in the nature of two samples being scored once versus one sample being scored twice (Schreiner, 2014a).

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<sup>28</sup> This is a net figure; some start above the line and end below it, and vice versa.

<sup>29</sup> The scorecard does not reveal the reasons for this change.

### 7.3 Precision for estimates of change in two samples

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

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

Here,  $z$ ,  $c$ ,  $\hat{p}$  and  $N$  are defined as above,  $n$  is the sample size at both baseline and follow-up,<sup>30</sup> and  $\alpha$  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.

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

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

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

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<sup>30</sup> This means that—for a given level of precision—estimating the change in a poverty rate between two points in time requires four times as many interviews (not twice as many) as does estimating a poverty rate at a point in time.

This  $\alpha$  has been measured for 11 countries (Schreiner, 2015a, 2015b, 2015c, 2013a, 2013b, 2012c, 2010, 2009a, 2009b, 2009c; and Chen and Schreiner, 2009). The simple average of  $\alpha$  across countries—after averaging  $\alpha$  across poverty lines and survey years within each country—is 1.03. This rough figure is as reasonable as any to use for Mongolia.

To illustrate the use of this formula to determine sample size for estimating changes in poverty rates across two independent samples, suppose the desired confidence level is 90 percent ( $z = 1.64$ ), the desired confidence interval is  $\pm 2$  percentage points ( $\pm c = \pm 0.02$ ), the poverty line is 100% of the national line,  $\alpha = 1.03$ ,  $\hat{p} = 0.162$  (the household-level poverty rate in 2014 for 100% of the national line in Table 1), and the population  $N$  is large enough relative to the expected sample size  $n$  that the finite population correction  $\phi$  can be taken as one. Then the baseline sample size is  $n = 2 \cdot \left( \frac{1.03 \cdot 1.64}{0.02} \right)^2 \cdot 0.162 \cdot (1 - 0.162) \cdot 1 = 1,937$ , and the follow-up sample size is also 1,937.

## 7.4 Precision for estimated change for one sample, scored twice

Analogous to previous derivations, the general formula relating the confidence interval  $\pm c$  to the standard error  $\sigma$  when using a scorecard to estimate change for a single group of households, all of whom are scored at two points in time, is:<sup>31</sup>

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

where  $z$ ,  $c$ ,  $\alpha$ ,  $N$ , and  $n$  are defined as usual,  $\hat{p}_{12}$  is the share of all sampled households that move from below the poverty line to above it, and  $\hat{p}_{21}$  is the share of all sampled households that move from above the line to below it. With only the 2014 HSES data for Mongolia, it is not possible to estimate values of  $\alpha$  here.

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

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

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<sup>31</sup> See McNemar (1947) and Johnson (2007). John Pezzullo helped find this formula.

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

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

Given this, a sample-size formula for a group of households to whom the Mongolia scorecard is applied twice (once after December 2014 and then again later) is

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

In Peru (the only source of a data-based estimate, Schreiner, 2009d), the average  $\alpha$  across years and poverty lines is about 1.30.

To illustrate the use of this formula, suppose the desired confidence level is 90 percent ( $z = 1.64$ ), the desired confidence interval is  $\pm 2.0$  percentage points ( $\pm c = \pm 0.02$ ), the poverty line is 100% of the national line, the sample will first be scored in 2016 and then again in 2019 ( $y = 3$ ), and the population  $N$  is so large relative to the expected sample size  $n$  that the finite population correction  $\phi$  can be taken as one. The pre-baseline poverty rate  $p_{2016}$  is taken as 16.2 percent (Table 1), and  $\alpha$  is assumed to be 1.30. Then the baseline sample size is

$$n = 2 \cdot \left( \frac{1.30 \cdot 1.64}{0.02} \right)^2 \cdot \{-0.02 + 0.016 \cdot 3 + 0.47 \cdot [0.162 \cdot (1 - 0.162)]\} \cdot 1 = 2,087. \text{ The}$$

same group of 2,087 households is scored at follow-up as well.

## 8. Targeting

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

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

Households who score at or below a given cut-off should be labeled as *targeted*,<sup>32</sup> not as *poor*. After all, unless all targeted households have poverty likelihoods of 100 percent, some of them are non-poor (their consumption is above a given poverty line). With scoring, the terms *poor* and *non-poor* have specific definitions. Using these same terms for targeting status is incorrect and misleading.

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*).

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<sup>32</sup> A label is acceptable as long as it describes the segment and does not confuse targeting status (having a score below a program-selected cut-off) with poverty status (having consumption below an externally-defined poverty line). Examples of acceptable labels include *Groups A, B, and C*; *Households scoring 29 or less, 30 to 69, or 70 or more*; and *Households who qualify for reduced fees, or do not qualify for reduced fees*.

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*).

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

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

Table 10 shows the distribution of households by targeting outcome for Mongolia. For an example cut-off of 24 or less, outcomes for 100% of the national line in the validation sample are:

- Inclusion: 8.0 percent are below the line and correctly targeted
- Undercoverage: 8.2 percent are below the line and mistakenly not targeted
- Leakage: 6.2 percent are above the line and mistakenly targeted
- Exclusion: 77.6 percent are above the line and correctly not targeted

Increasing the cut-off to 29 or less improves inclusion and undercoverage but worsens leakage and exclusion:

- Inclusion: 11.5 percent are below the line and correctly targeted
- Undercoverage: 4.7 percent are below the line and mistakenly not targeted
- Leakage: 12.4 percent are above the line and mistakenly targeted
- Exclusion: 71.4 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 Table 10 for a given poverty line
- Select the cut-off with the highest total net benefit

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

A common choice of benefits and costs is the “hit rate”, where total net benefit is the number of households correctly included or correctly excluded:

Hit rate =	1	x	Households correctly included	–
	0	x	Households mistakenly undercovered	–
	0	x	Households mistakenly leaked	+
	1	x	Households correctly excluded.	

Table 10 shows the hit rate for all cut-offs for the scorecard for Mongolia. For 100% of the national line in the validation sample, total net benefit—under the hit rate—is greatest (86.2) for a cut-off of 19 or less, with about six in seven households in Mongolia correctly classified.

The hit rate weighs successful inclusion of households below the line the same as successful exclusion of households above the line. If a program values inclusion more (say, twice as much) than exclusion, then it can reflect this by setting the benefit for inclusion to 2 and the benefit for exclusion to 1. Then the chosen cut-off will maximize  $(2 \times \text{Households correctly included}) + (1 \times \text{Households correctly excluded})$ .<sup>33</sup>

As an alternative to assigning benefits and costs to targeting outcomes and then choosing a cut-off to maximize total net benefits, a program could set a cut-off to achieve a desired poverty rate among targeted households. The third column of Table 11 (“% targeted HHs who are poor”) shows, for Mongolia’s scorecard applied to the validation sample, the expected poverty rate among households who score at or below a given cut-off. For the example of 100% of the national line, targeting households in the validation sample who score 24 or less would target 14.2 percent of all households (second column) and would be associated with a poverty rate among those targeted of 56.3 percent (third column).

Table 11 also reports two other measures of targeting accuracy. The first is a version of coverage (“% poor HHs who are targeted”). For the example of 100% of the

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<sup>33</sup> Figure 10 also reports BPAC, the Balanced Poverty Accuracy Criteria adopted by USAID for certifying poverty-assessment tools. IRIS Center (2005) made BPAC to consider accuracy in terms of the bias of estimated poverty rates and in terms of targeting inclusion.  $BPAC = (\text{Inclusion} - |\text{Undercoverage} - \text{Leakage}|) \times [100 \div (\text{Inclusion} + \text{Undercoverage})]$ . Schreiner (2014b) explains why BPAC does not add any useful information over-and-above that provided by the other, more-standard measures here.

national line with the validation sample and a cut-off of 24 or less, 49.4 percent of all poor households are covered.

The final targeting measure in Table 11 is the number of successfully targeted poor households for each non-poor household mistakenly targeted (right-most column). For 100% of the national line with the validation sample and a cut-off of 24 or less, covering 1.3 poor households means leaking to 1 non-poor household.

## 9. Context for poverty-measurement tools in Mongolia

This section discusses an existing poverty-measurement tool for Mongolia in terms of its goals, methods, definitions of *poverty*, data, indicators, bias, precision, and cost. In general, the advantages of the scorecard are its:

- Use of data from the most recent available nationally representative consumption survey
- Fewer and lower-cost indicators
- Use of a consumption-based definition of *poverty* that is widely understood and that is used by government of Mongolia
- Reporting of errors and precision for estimates of poverty rates at a point in time from out-of-sample tests, including formulas for standard errors
- Targeting accuracy that is likely similar to that of alternative approaches
- Feasibility for local, pro-poor programs, due to its low cost and transparency

Coulombe and Altankhuyag (2012) use a poverty-measurement tool to construct a “poverty map” (Elbers, Lanjouw, and Lanjouw, 2003) of poverty rates for Mongolia’s 5 regions, 22 aimags, 329 soums, and 9 düüreg. Their goal is to improve the geographical targeting of pro-poor policies. “Telling Mongolian policymakers that the neediest people are in rural areas is not too impressive because that information is well-known and not useful because it is too vague; telling them in which aimags—or even in which soums—the poorest households are concentrated is more useful. . . . Better information at the local level . . . permits more cost-effective anti-poverty schemes” (p. 6)

Coulombe and Altankhuyag build five tools (one for each of West, Highlands, Central, East, and Ulaanbaatar regions) using stepwise ordinary least-squares

regression on the logarithm of per-capita consumption for the 11,179 households in the 2011 HSES, using only indicators found also in the 2010 Population and Housing Census.

They apply the five poverty-assessment tools with data from households in the 2010 census to estimate poverty rates by administrative region based on the national poverty line associated with the 2011 HSES. Coulombe and Altankhuyag then make “poverty maps” that quickly show—in a way that is clear for non-specialists—how poverty rates vary across regions.

Poverty mapping in Coulombe and Altankhuyag (and poverty mapping in general) is similar to the scorecard in this paper in that they both:

- Build poverty-measurement tools with data that is representative of a population (all-Mongolia for the scorecard, and the HSES five-level survey strata for poverty mapping) and then apply the tools to other data on groups that are not, in general, representative of the same populations
- Use simple, verifiable indicators that are quick and inexpensive to collect
- Estimate poverty rates for groups
- Test accuracy *out-of-sample* (that is, with data not used in scorecard construction)
- Provide unbiased estimates when their assumptions hold
- 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 (such as the poverty gap) beyond head-count poverty rates
- Accounts for uncertainty in the estimation of scorecard points when estimating standard errors
- Requires data on fewer households for construction and calibration
- Includes community-level indicators, decreasing errors and increasing precision
- Uses only indicators that appear in a census
- Reports standard errors (and complex formula for standard errors)

Strengths of the scorecard include that it:

- Is simpler in terms of both construction and application
- Associates poverty likelihoods with scores non-parametrically
- Reduces overfitting by selecting indicators with statistical and non-statistical criteria and by having only a single, all-Mongolia scorecard<sup>34</sup>
- Surfaces estimates of poverty likelihoods for individual households
- Reports straightforward formulas for standard errors
- Reports errors

The basic difference between the two approaches is that poverty mapping seeks to help governments to target pro-poor policies, while the scorecard seeks to help local, pro-poor organizations to manage their social performance.<sup>35</sup> On a technical level, Coulombe and Altankhuyag estimate consumption levels, whereas the scorecard estimates poverty likelihoods.

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<sup>34</sup> According to Mahadevan, Yoshida, and Praslova (2013, pp. 6–7) “the latest recommendation from poverty-map experts in the World Bank Research Department is not to use multiple [poverty-measurement tools] to predict household consumption” because multiple tools can be “problematic since the number of observations for each area becomes small and, as a result, the regression coefficients become less stable.” To reduce overfitting, Haslett (2012) likewise recommends that poverty maps be based on a single, all-country scorecard.

<sup>35</sup> Another apparent difference is that the developers of poverty mapping (Elbers, Lanjouw, and Lanjouw, 2003; Demombynes *et al.*, 2004) say that poverty mapping is too inaccurate to be used for targeting at the household level. In contrast, Schreiner (2008b) supports household-level targeting as a legitimate, potentially useful application of the scorecard. In Elbers *et al.* (2007), the developers of poverty mapping seem to take a step back from their previous position.

Coulombe and Altankhuyag's five tools for Mongolia use an average of about 13

of the following 26 indicators:

- Demographics of the household:
  - Marital status of the head
  - Age of the spouse of the head
  - Number of members (of any age)
  - Number of members ages 0 to 6
  - Number of members ages 60 or older
  - Number of male members:
    - Ages 7 to 14
    - Ages 15 to 59
  - Number of female members:
    - Ages 7 to 14
    - Ages 15 to 59
- Education:
  - Highest level completed by the head
  - Highest level completed by the spouse of the head
  - Share of children who attend school
- Employment:
  - Share of household members who work
  - Whether the head is employed
  - Sector of employment of the head
  - Sector of employment of the spouse of the head
  - Employment status of the spouse of the head
- Characteristics of the residence:
  - Type of residence
  - Tenancy status
  - Type of heating arrangement
  - Type of toilet arrangement
  - Area in m<sup>2</sup>
- Assets: Presence of a telephone
- Characteristics of the soum (average):
  - Cattle per person
  - Goats per person
- Region: Aimag

To measure the accuracy of their estimated poverty rates, Coulombe and Altankhuyag apply their poverty map to data from the 2010 census and compare the estimates with those from the 2011 HSES for Mongolia's five regions. The average absolute error is about 0.3 percentage points, and the maximum absolute error is 0.9 percentage points.

For comparison, when the the scorecard is applied out-of-sample in the five regions with the 2014 HSES and with 100% of the national poverty line, the average absolute error is about 2.1 percentage points, and the maximum absolute error is 3.7 percentage points. Thus, the poverty map of Coulombe and Altankhuyag is more accurate at the 5-region level by about 2.0 percentage points on average. This is a small difference, given that the poverty map has five region-specific tools (versus a single all-Mongolia scorecard) and that the map is more complex. The scorecard compares so well probably because the poverty map does not include indicators for asset ownership because the census does not collect them.

Coulombe and Altankhuyag report standard errors, but not sample sizes, so the precision of their estimates cannot be compared with those of the scorecard.

## 10. Conclusion

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

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

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

The scorecard is constructed with half of the data from Mongolia's 2014 HSES. Its scores are then calibrated with that same data to poverty likelihoods for 13 poverty lines. The accuracy of the scorecard is tested on data that is not used in scorecard construction. Errors and precision are reported for estimates of households' poverty likelihoods, populations' poverty rates at a point in time, and changes in populations' poverty rates over time. Of course, the scorecard's estimates of change are not necessarily the same as estimates of program impact. Targeting accuracy is also reported.

When the scorecard is applied to the 13 poverty lines in the validation sample, the maximum absolute error for estimates versus true poverty rates for groups of households at a point in time is 1.1 percentage points. The average absolute error is about 0.5 percentage points. Corrected estimates may be had by subtracting the known average error for a given poverty line from the original, uncorrected estimates.

For  $n = 16,384$  and 90-percent confidence, the precision of point-in-time estimates of poverty rates is  $\pm 0.7$  percentage points or better. With  $n = 1,024$ , the 90-percent confidence intervals are  $\pm 2.7$  percentage points or better.

If an organization wants to use the scorecard for segmenting clients for differentiated services, then the results here provide useful information for selecting a targeting cut-off that fits its values and mission.

Although the statistical technique is innovative, and although technical accuracy is important, the design of the scorecard focuses on transparency and ease-of-use. After all, accuracy is irrelevant if an organization's managers feel so daunted by a scorecard's complexity or its cost that they do not even try to use it.

For this reason, the scorecard uses 12 indicators that are straightforward, low-cost, and verifiable. Points are all zeros or positive integers, and scores range from 0 (most likely below a poverty line) to 100 (least likely below a poverty line). Scores are converted to poverty likelihoods via simple look-up tables, and targeting cut-offs are likewise straightforward to apply. The design attempts to facilitate voluntary adoption by helping managers to understand and trust scoring and by allowing non-specialists to add up scores quickly in the field.

In summary, the scorecard is a practical, objective way for pro-poor programs in Mongolia to estimate consumption-based poverty rates, track changes in poverty rates over time, and target services. The same approach can be applied to any country with similar data.

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## Guidelines for the Interpretation of Scorecard Indicators

The excerpts below come from:

National Registration and Statistical Office. (2013) “Enumerator Manual: Household Socio-Economic Survey 2014”, [the *Manual*], Ulaanbaatar,

and

National Registration and Statistical Office. (2013) “Questionnaire: Household Socio-Economic Survey 2014”, [the *Questionnaire*], Ulaanbaatar.

### **Only train enumerators and promulgate rules from these “Guidelines”**

When an issue comes up that is not addressed here, its resolution should be left to the unaided judgment of the enumerator, as that seems to have been what Mongolia’s National Registration and Statistical Office (NRSO) did in the 2014 HSES. That is, an organization using the scorecard should not promulgate any definitions nor rules (other than those in these “Guidelines”) to be used by all its field agents. Anything not explicitly addressed in these “Guidelines” is to be left to the unaided judgment of the individual enumerator. This is meant to mimic the practice in the 2014 HSES.

### **General guidelines for asking scorecard questions**

Fill out the scorecard header and the “Back-page Worksheet” first, following the directions on the “Back-page Worksheet”.

Do not ask the first scorecard indicator directly (“How many members does the household have?”). Instead, use the information that you will have already recorded on the “Back-page Worksheet” to determine the response to mark. You must also record the number of household members in the scorecard header next to “Number of household members:”.

Read the questions word-for-word exactly as they are written and in the order that they appear in the scorecard.

When you mark a response to a scorecard indicator, circle the spelled-out response option and its point value, and write the point value in the “Score” column, like this:

3. In what type of residence does the household currently live?	A. Ger	0	
	B. House in ger district, dormitory, public dwelling for employees, other public dwelling, shelter not meant for human habitation, or other	0	0
	C. Apartment, or villa	100	

The scorecard, the back-page worksheet, and these “Guidelines” have been translated to Mongolian. While the scorecard has also been documented in English, the scorecard itself should always be applied in the language of the responding household (usually Mongolian). In the case of an inconsistency between the English and Mongolian versions, use the Mongolian version. In particular, the wording of the scorecard’s indicators and response options has been taken as directly as possible from the original Mongolian text in the *Questionnaire*. These “Guidelines” are based on the original text of the *Manual* in Mongolian.

In general, do not read the response options to the respondent. Just read the question, and then stop; wait for a response. If the respondent asks for clarification or otherwise hesitates or seems confused, then read the question again or provide additional assistance based on these “Guidelines” or as you, the enumerator, deem appropriate.

In general, you should accept the responses given by the respondent. Nevertheless, if the respondent says something—or if you see or sense something—that suggests that the response may not be accurate, that the respondent is uncertain, or that the respondent desires assistance in figuring out how to respond, then you should read the question again and provide whatever help you deem appropriate based on these “Guidelines”.

While most indicators in the scorecard are verifiable, you do not—in general—need to verify responses. You should verify a response only if something suggests to you that the response may not be accurate and thus that verification might improve data quality.

For example, you might choose to verify if the respondent hesitates, seems nervous, or otherwise gives signals that he/she may be lying or be confused. Likewise, verification is probably appropriate if a child in the household or a neighbor says something that does not square with the respondent’s answer.

Verification is also a good idea if you happen to see something yourself—such as a consumer durable that the respondent avers not to possess, or a child eating in the room who has not been counted as a member of the household—that suggests that the response may not be accurate.

In general, your application of the scorecard should mimic as closely as possible NRSO's application of the 2014 HSES. For example, poverty-scoring interviews should take place in respondents' homesteads because the 2014 HSES took place in respondents' homesteads.

**Confidentiality:**

Keep a household's responses strictly confidential. Do not share them with anyone outside of your organization's team that has a reason to have the data.

**Who should be the respondent?**

According to the NRSO, the preferred respondent is the head of the household. If the head is not available, then the preferred alternative is the most knowledgeable other household member.

The respondent need not be the same person as the household member who is a participant with your organization.

**What to take with you:**

Study these "Guidelines" until you master them, and carry them with you to all interviews.

### Art of interviewing:

According to the *Manual*, “Your first responsibility as an enumerator is to establish a good rapport with the respondent. . . . Be friendly. Before starting the interview, greet the household—for example, by saying “Good afternoon”—and explain the purpose of your visit. Explain the purpose of the survey [is to know more about how your organization’s participants live], and assure the household that all information that you collect will be kept strictly confidential. Say that the interview will last 10–15 minutes.

“Always be positive and up-beat.

“Interview the respondent out of ear-shot of third parties who are not members of the household being interviewed. The presence of non-household members during the interview can lead the respondent to be less than frank in his/her answers.

“Always be neutral. Do not allow yourself to send signals—whether by words, body language, or tone of voice—that might suggest to the respondent that he/she has given a ‘right’ or ‘wrong’ answer. Do not seem to approve nor disapprove of any replies.

“When reading questions, read them in the order that they appear in the questionnaire. Read each question word-for-word, in its entirety. Do not change the sequencing of the questions nor their wording.

“If the respondent gives an ambiguous, unclear, or irrelevant answer, try to probe in a neutral way. Never suggest answers to the respondent. Rather, probe in such a manner that the respondent his/herself comes up with the relevant answer.

“If the respondent has not understood the question, then repeat the question, slowly and clearly. If the respondent still does not understand, then you may re-state the question in other words, being careful to maintain the original meaning without adding to it nor subtracting from it.

“Work to build an atmosphere of trust and confidence throughout the interview. Ideally, the respondent will see you, the interviewer, as a friendly, empathetic, responsive, and non-intimidating.

“Remember that you cannot force the respondent to answer. If the respondent answers carelessly or seems to be in a rush because it is not a convenient time for the interview, then offer to make an appointment to come back at a better time.

“Always be polite with respondents. Do not be rough, mean, and do not threaten violence.

“Do not falsify information. Record only responses provided by the respondent.”

## Guidelines for specific scorecard indicators

1. How many members does the household have?
  - A. Six or more
  - B. Five
  - C. Four
  - D. Three
  - E. Two
  - F. One

Do not ask this question directly of the respondent as it is worded here. Instead, mark the response based on the information that you will have already gathered about household members on the “Back-page Worksheet”.

According to the *Manual*, a *household* is “one or more people—regardless of blood or marital ties—who usually live in the same residence, eat together, and share resources.”

According to p. 2 of the *Questionnaire*, a person qualifies as a *household member* if he/she has met the three criteria listed above (usually lived, ate, and shared resources with the household) for at least six of the past 12 months. Exceptions are the head of the household and students, who qualify as *household members* as long as they met the three criteria for at least one of the past 12 months.

According to the *Manual*, “a *household* is not the same concept as a *family*. A family includes only people who are related by blood or marriage, but a household may include people who do not have such ties. Furthermore, all members of a given family are not necessarily also members of the same household (and vice versa).

“It is not always easy to determine whether a person qualifies as a *household member*. Here are some example cases:

- A domestic servant counts as a member of the household where he/she works only if he/she is not his/herself the head of another household and only if he/she does not recognize someone other than his/her employer as the head of the household in which he/she is a member
- A lodger is not a household member because paying the household for food and shelter is not the same as sharing resources”

According to the NRSO, new household members (such as newborns or new spouses) who have not been with the household for at least six months do not count as *household members* for the purposes of this question. This is because the main goal of the HSES is to measure consumption over the past 12 months, and new arrivals did not contribute to those things for more than half of the past 12 months.

By the same logic, all people who spent six or more of the past 12 months with the household should be counted as *household members*, even those who, on the day of the interview, are no longer with the household (for example, because they left or died).

2. What is the highest educational level completed by the male head/spouse?
- A. None, primary, or lower or higher secondary
  - B. No male head/spouse
  - C. Vocational
  - D. Technical secondary
  - E. Degree, higher-education diploma, or bachelor's degree or higher

According to the *Manual*, “Record the highest level completed. For example, if the person completed technical secondary but then completed only one year of a degree program without completing the entire degree program, then mark [‘D. Technical secondary’], not [‘E. Degree, higher-education diploma, or bachelor’s degree or higher’]

“Do not consider classes or courses of study that are not part of the academic levels encompassed in the response options. For example, having completed courses of study to obtain a truck-driver’s license, or completing beautician school, or finishing some classes at a language school does not represent the completion of any of the educational levels encompassed in the response options. If the male head/spouse did not finish higher secondary but did complete a course in welding and did not receive a professional certification, for example, then you would still mark [‘A. None, primary, or lower or higher secondary’].”

According to the *Manual*, *completed higher secondary* means that the male head/spouse passed:

- 10<sup>th</sup> grade (in 2005 or before)
- 11<sup>th</sup> grade (in 2006 or 2007)
- 12<sup>th</sup> grade (in 2008 or after)

According to the *Manual*, *completed vocational or technical secondary* means that the male head/spouse graduated from a technical or vocational training institute and has a professional certification. *Technical secondary* also includes those who graduated at a specialized professional/technical secondary school (or equivalent schools/institutes) who have a professional certification.

To qualify as “E. Degree, higher-education diploma, or bachelor’s degree or higher”, the male head/spouse must have graduated from a college or university (be it domestic or foreign, and regardless of whether it runs a day, evening, or weekend schedule). The higher-education diploma requires at least 90 credit hours; higher degrees require at least 120 credit hours. Also counted here are pre-1964 graduates of the Teacher’s Institute’s 3-year program, pre-1966 graduates of the Party’s Institute, graduates of 2-year courses at a sub-branch of the Party’s Institute, graduates of the Marxist-Leninist Evening University, and graduates of the Workers’ East Side University.

According to p. 13 of the *Manual*, the *head of the household* is “the person who the respondent says is the head. While the respondent is free to use his/her own criteria to determine who is the head, headship is often ascribed to the household’s principal decision-maker, the one in charge of the household’s activities and finances.

“The head must be an adult who has been with the household for at least one of the past 12 months. If the respondent reports that a non-adult is the head, then count some other adult household member as the head.”

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

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

Remember that you already know the name of the male head/spouse (and whether he exists) from the notes you will have taken for your own use while compiling the “Back-page Worksheet”. Thus, if there is a male head/spouse, do not mechanically ask, “What is the highest educational level completed by the male head/spouse?”. Instead, use the actual name of the male head/spouse, for example: “What is the highest educational level completed by Chingis?”. If there is no male head/spouse, then do not read the question at all; just mark “B. No male head/spouse” and proceed to the next indicator.

3. In what type of residence does the household currently live?
  - A. Ger
  - B. House in ger district, dormitory, public dwelling for employees, other public dwelling, shelter not meant for human habitation, or other
  - C. Apartment, or villa

If the household lives in an apartment or villa, then it gets 100 points for this question. The maximum score is 100, so the score for a household that lives in an apartment or villa will be 100, regardless of its responses to all the other questions. Nevertheless, you should ask and mark responses for all the other questions.

According to the *Manual*, a *residence* includes “all types of dwellings where a person or household lives. This includes all types of houses, gers, reindeer-herder tents, dormitories and rooming houses for students or employees, military camps, prison camps, nursing homes and sections of other types of dwellings (entrance corridor, boiler room or steam pipe, well, wagon, and so on). All type of buildings or dwellings built for business, trade, service, manufacturing, or agriculture but which are used—after modification—for human habitation count as *residences*.

“*Ger* includes all types of Mongolian gers and reindeer-herder tents.

A apartment is “a building built for habitation and not used for other purposes. The building houses multiple households inside, and each household has one or more separate rooms, the set of which are equipped with the following basic infrastructure inside the apartment:

- Electricity, central heating, and piped-in water
- Toilet
- Bath or shower
- Kitchen or cooking area

A *house in ger district* is a house “usually located in a ger district. It has one or more rooms and is equipped with the following basic infrastructure:

- Heating, and piped-in water
- Toilet
- Bathroom
- Shower
- Kitchen

A *villa* (detached house) is a “house built for one household to live in. It has its own, independent connections to central water, sewage and electricity networks. It has a heating system, and it may have its own air conditioning. It may be one-story or two-story, and it also features:

- An inside toilet
- Rooms that are not next to another household’s rooms or sections
- Non-public entrance, basement, loft, and utility spaces
- Bedrooms, living rooms, kitchen, bathrooms,/toilet, and storage rooms

“A *public dwelling or dormitory* is a dwelling with many rooms where people live in a group. Public dwellings have a public kitchen, bathroom, toilet, shower, and meeting room. *Public dwelling* encompasses all type of student dormitories and all types of employee dormitories, regardless of whether the employer is public or private and regardless of whether the employees work alone or as a team.

“*Other public dwellings* include resorts, health resorts, hospitals, nursing homes, prisons, and military camps where groups of people live.

- *Resort*: A complex located outside of urban areas that provides entertainment and puts equipment for sports and games at the disposal of its guests
- *Health resorts*: Resorts featuring medical equipment and health treatments
- *Hotel*: Establishments that provide shelter, food, and other services to guests and customers
- *Temporary overnight shelter*: Places such as bus stops, inns, or other places providing similar services

A *shelter not meant for human habitation* is “a building designed for some purpose other than human habitation that, after some modification, now has a person or people living in it. This includes schools, factories, office buildings, or part of a building or room that was built for an institution or organization but which now has people living in it.

*Other* means “a non-permanent, temporary shelter, building, or area that provides rudimentary shelter. Examples include the roof of the house, an entrance way, corridors, inside steam tunnels, water wells, or sewage tunnels, or in forests, mountains, or caves.”

4. If the residence is not a ger, then what is the main construction material of the walls?
  - A. Ger
  - B. Wood, stone, or other
  - C. Bricks, or concrete

If the residence is a ger, then do not read this question to the respondent. Mark “A. Ger” and go on to the next question.

According to the *Manual*, “Record the main type of construction material of the walls. Do not consider any wall coverings (for example, paper or mud) that are not load-bearing.

*Main* means the material that accounts for the largest share of the walls’ construction.

If the respondent says that two or more types of material account for equal shares of the walls’ construction, then mark the response corresponding to the material that gives the household the most points for this question.”

Like all other questions, you must ask this one of the respondent. In particular, you cannot mark a response based solely on your own observation of the walls.

According to the *Manual*, a *concrete wall* is “a manufactured wall (for professionally-buit apartments) or walls that a household builds itself with cement and sand or gravel.”

5. If the residence is a ger, then how many segments/walls does it have?
- A. Not a ger
  - B. Three, or four
  - C. Five
  - D. Six or more

If the residence is not a ger, then do not read this question to the respondent. Mark “A. Not a ger” and go on to the next question.

Like all other questions, you must ask this one of the respondent. In particular, you cannot mark a response based solely on your own observation of the ger’s segments/walls.

The *Manual* contains no information about this indicator.

6. How many head of cattle does the household currently own?
- A. Zero to 4
  - B. 5 to 9
  - C. 10 to 29
  - D. 30 or more

The *Manual* contains no information about this indicator.

According to the NRSO, all cattle that are owned by the interviewed household should be counted, even if someone who is not a household member is taking care of the cattle for the interviewed household.

By the same logic, if the interviewed household cares for cattle that it does not own, then those cattle are not counted for the purposes of this question.

7. Does the household have any washing machines in working condition?
- A. No
  - B. Yes

According to the NRSO, count only usable washing machines, regardless of whether they are manual or automatic. Do not count items that are used exclusively for business purposes, but do count items that are used partly for a business and partly for the household.

8. Does the household have any iron/brick stoves, electric or gas stoves, or ovens in working condition?
- A. None
  - B. Iron/brick, but no others
  - C. Electric or gas, but no oven (regardless of iron/brick)
  - D. Oven (regardless of any others)

According to the NRSO, count only usable iron/brick stoves, electric or gas stoves, or ovens. Do not count items that are used exclusively for business purposes, but do count items that are used partly for a business and partly for the household.

This indicator should be asked in three parts:

- Does the household have any iron/brick stoves in working condition?
- Does the household have any electric or gas stoves in working condition?
- Does the household have any ovens in working condition?

Mark the response according to the combination the three responses to these three sub-questions as follows:

<b>Iron stoves/brick stoves?</b>	<b>Electric or gas stoves?</b>	<b>Ovens?</b>	<b>Response</b>
No	No	No	A
Yes	No	No	B
No	Yes	No	C
Yes	Yes	No	C
No	No	Yes	D
Yes	No	Yes	D
No	Yes	Yes	D
Yes	Yes	Yes	D

9. Does the household have any pressure cookers in working condition?
- A. No
  - B. Yes

According to the NRSO, count only usable pressure cookers. Do not count items that are used exclusively for business purposes, but do count items that are used partly for a business and partly for the household.

For purposes of this question, a *pressure cooker* is a pot—with its own electric heating element or design to receive heat by being placed on a stove—to heat food and whose lid clamps on. It is not an electric appliance used to heat water for hot drinks, nor is it an electric pot with a non-clamping lid, nor is it a pot (of any kind) with a non-clamping lid.

10. Does the household have any electric irons in working condition?

A. No

B. Yes

According to the NRSO, count only usable electric irons. Do not count items that are used exclusively for business purposes, but do count items that are used partly for a business and partly for the household.

11. Does the household have any vacuum cleaners in working condition?

A. No

B. Yes

According to the NRSO, count only usable vacuum cleaners. Do not count items that are used exclusively for business purposes, but do count items that are used partly for a business and partly for the household.

12. Does the household have any motorcycles or automobiles (cars, trucks, large trucks, or buses) in working condition?
- A. None
  - B. Motorcycle only
  - C. Automobile (regardless of motorcycle)

According to the NRSO, count only usable motorcycles, cars, trucks, large trucks, or buses. Do not count items that are used exclusively for business purposes, but do count items that are used partly for a business and partly for the household.

For the purposes of this questions, an *automobile* is a motorized vehicle with at least four wheels.

This indicator should be asked in two parts:

- Does the household have any motorcycles in working condition?
- Does the household have any cars, trucks, large trucks, or buses in working condition?

Mark the response according to the combination the two responses to these two sub-questions as follows:

<b>Motorcycles?</b>	<b>Automobiles?</b>	<b>Response</b>
No	No	A
Yes	No	B
No	Yes	C
Yes	Yes	C

**Table 1: Poverty lines, poverty rates, and sample sizes for all of Mongolia and for the construction and validation samples, by households and people in 2014**

Line or Rate	HHs or People	HHs in HSES	Poverty lines (MNT per person per day) and poverty rates (%)												
			National poverty lines			Poorest half	2011 PPP poverty lines				Percentile poverty lines				
			100%	150%	200%	<100% Natl.	\$1.90	\$3.10	\$3.80	\$4.00	20 <sup>th</sup>	40 <sup>th</sup>	50 <sup>th</sup>	60 <sup>th</sup>	80 <sup>th</sup>
<b>All-Mongolia</b>															
Line	People		4,821	7,232	9,643	3,769	1,582	2,582	3,165	3,331	4,692	6,397	7,318	8,412	11,636
Rate	HHs	16,174	16.2	40.9	61.5	7.5	0.1	1.7	4.0	4.9	14.9	32.1	41.7	51.6	73.4
Rate	People		21.6	49.3	69.3	10.8	0.2	2.7	5.9	7.2	20.0	40.0	50.0	60.0	80.0
<b>Construction and calibration</b> (Selecting indicators and points, and associating scores with poverty likelihoods)															
Rate	HHs	7,992	16.2	41.0	61.5	7.5	0.1	1.7	4.0	4.9	14.9	32.4	41.7	51.7	73.2
<b>Validation</b> (Measuring accuracy)															
Rate	HHs	8,182	16.2	40.9	61.4	7.5	0.1	1.7	3.9	4.9	14.9	31.9	41.7	51.5	73.6

Source: 2014 HSES.

Poverty lines are in units of daily per-capita MNT in average prices for all of Mongolia in calendar-year 2014.

**Table 2 (All of Mongolia and by aimag) Poverty lines and poverty rates for households and people in 2014**

Aimag	Line/rate	HHs in HSES	Poverty lines (MNT per person per day) and poverty rates (%)												
			National poverty lines			Poorest half	2011 PPP poverty lines				Percentile poverty lines				
			100%	150%	200%	<100% Natl.	\$1.90	\$3.10	\$3.80	\$4.00	20th	40th	50th	60th	80th
All-Mongolia	Line		4,821	7,232	9,643	3,769	1,582	2,582	3,165	3,331	4,692	6,397	7,318	8,412	11,636
	Rate (people)		16.2	40.9	61.5	7.5	0.1	1.7	4.0	4.9	14.9	32.1	41.7	51.6	73.4
	Rate (HHs)	16,174	21.6	49.3	69.3	10.8	0.2	2.7	5.9	7.2	20.0	40.0	50.0	60.0	80.0
Ulaanbaatar	Line		4,968	7,452	9,935	3,883	1,630	2,660	3,261	3,432	4,834	6,591	7,540	8,667	11,989
	Rate (people)		12.1	32.1	51.5	6.1	0.2	1.6	3.7	4.4	11.4	24.8	32.6	41.2	64.1
	Rate (HHs)	3,581	16.4	40.1	59.9	9.2	0.2	2.6	5.8	6.6	15.7	32.0	40.6	49.9	72.1
Dornod	Line		4,693	7,039	9,385	3,668	1,540	2,513	3,080	3,242	4,567	6,226	7,123	8,188	11,325
	Rate (people)		20.7	53.8	74.4	9.5	0.0	0.9	3.2	3.9	18.7	43.1	54.8	67.4	83.0
	Rate (HHs)	624	29.8	65.4	83.2	14.9	0.0	1.6	5.4	6.4	27.2	54.9	65.9	77.2	89.9
Sukhbaatar	Line		4,743	7,115	9,486	3,707	1,557	2,540	3,113	3,277	4,616	6,293	7,199	8,275	11,447
	Rate (people)		24.1	53.8	72.7	14.0	0.1	4.9	8.3	9.9	22.9	43.6	54.6	63.0	82.1
	Rate (HHs)	624	30.7	62.2	79.9	18.8	0.4	7.5	11.9	14.0	29.0	52.2	62.7	70.3	87.3
Khentii	Line		4,765	7,148	9,531	3,725	1,564	2,552	3,128	3,293	4,638	6,323	7,233	8,314	11,501
	Rate (people)		26.1	48.3	67.2	15.7	0.2	4.3	8.6	9.8	23.9	40.1	49.0	59.1	76.8
	Rate (HHs)	624	33.7	56.8	74.1	21.8	0.4	7.1	12.7	14.2	31.4	49.2	57.2	66.7	82.7
Tov	Line		4,691	7,036	9,381	3,666	1,539	2,512	3,079	3,241	4,565	6,223	7,119	8,184	11,320
	Rate (people)		12.4	34.5	54.6	4.7	0.0	1.3	2.9	3.4	10.9	26.4	34.6	43.7	66.5
	Rate (HHs)	624	17.1	42.1	61.7	6.8	0.0	2.5	4.3	4.9	15.4	33.2	42.2	51.5	72.3
Govisumber	Line		4,750	7,125	9,500	3,713	1,559	2,544	3,118	3,282	4,623	6,302	7,210	8,288	11,464
	Rate (people)		40.0	70.4	83.3	23.9	0.6	4.0	8.9	12.8	35.2	61.1	71.3	78.9	89.5
	Rate (HHs)	216	47.9	76.8	88.2	30.6	1.0	6.1	11.8	16.0	43.3	68.4	77.6	84.4	93.1
Selenge	Line		4,700	7,050	9,400	3,674	1,543	2,517	3,085	3,248	4,574	6,236	7,134	8,200	11,343
	Rate (people)		26.0	52.4	70.8	14.3	0.7	4.2	8.1	10.9	24.2	45.2	52.5	62.9	81.8
	Rate (HHs)	624	35.2	64.2	80.0	21.0	1.6	7.3	13.0	17.0	32.8	56.6	64.3	74.1	88.4
Dornogovi	Line		4,893	7,339	9,785	3,824	1,606	2,620	3,212	3,381	4,761	6,491	7,426	8,536	11,808
	Rate (people)		14.1	39.3	61.1	5.5	0.0	1.0	3.5	4.0	11.8	30.2	41.0	53.0	75.3
	Rate (HHs)	622	17.8	46.3	69.2	7.5	0.0	1.4	5.0	5.6	15.0	36.5	48.0	61.3	81.8
Darkhan-Uul	Line		4,823	7,235	9,647	3,770	1,583	2,583	3,166	3,333	4,694	6,399	7,321	8,415	11,641
	Rate (people)		15.6	37.9	61.0	7.8	0.0	2.2	4.3	5.2	14.4	31.4	38.9	50.7	72.8
	Rate (HHs)	549	21.4	47.9	69.9	11.1	0.0	3.8	6.5	7.8	20.1	40.6	49.0	60.7	81.2
Omnogovi	Line		4,908	7,362	9,817	3,837	1,611	2,628	3,222	3,391	4,777	6,512	7,450	8,564	11,846
	Rate (people)		6.9	27.2	47.4	2.1	0.0	0.0	0.8	0.8	5.6	18.8	27.9	38.3	61.8
	Rate (HHs)	622	10.1	35.1	56.8	3.0	0.0	0.0	1.1	1.1	8.1	25.3	36.0	47.8	71.2
Dundgovi	Line		4,624	6,937	9,249	3,615	1,518	2,476	3,035	3,195	4,500	6,136	7,019	8,068	11,161
	Rate (people)		16.6	43.6	67.8	7.6	0.0	1.0	3.6	4.4	15.9	34.2	44.8	54.8	83.1
	Rate (HHs)	624	20.9	51.4	74.8	10.7	0.0	1.4	5.3	6.2	20.4	40.7	52.9	63.6	88.6
Orkhon	Line		4,876	7,313	9,751	3,811	1,600	2,611	3,200	3,369	4,745	6,469	7,400	8,507	11,767
	Rate (people)		10.2	26.2	45.5	5.2	0.3	1.3	3.0	3.3	9.6	19.0	26.8	36.2	56.9
	Rate (HHs)	600	14.8	33.3	53.5	8.4	0.5	2.2	5.2	5.8	14.0	25.6	33.8	44.0	65.0
Ovorkhangai	Line		4,592	6,887	9,183	3,589	1,507	2,459	3,014	3,173	4,468	6,092	6,969	8,011	11,082
	Rate (people)		25.0	58.4	78.2	10.2	0.0	2.3	5.0	6.4	22.6	48.0	60.0	69.7	87.8
	Rate (HHs)	624	34.2	67.3	83.9	14.4	0.0	4.2	7.8	9.5	30.8	57.9	68.3	77.1	91.5
Bulgan	Line		4,677	7,015	9,353	3,655	1,535	2,504	3,070	3,231	4,551	6,205	7,098	8,159	11,286
	Rate (people)		17.9	50.8	72.5	8.2	0.0	1.5	3.8	4.4	16.7	40.4	52.4	64.1	84.8
	Rate (HHs)	624	26.2	63.1	81.3	12.8	0.0	1.9	5.8	6.8	24.8	51.9	64.5	74.6	90.4
Bayankhongor	Line		4,655	6,983	9,311	3,639	1,528	2,493	3,056	3,217	4,530	6,177	7,066	8,122	11,235
	Rate (people)		15.8	44.3	70.6	4.2	0.0	0.9	2.0	2.5	13.6	34.3	45.0	58.8	82.8
	Rate (HHs)	624	21.5	54.2	79.2	5.6	0.0	1.0	2.7	3.2	18.5	44.1	54.9	68.4	88.4
Arkhangai	Line		4,640	6,959	9,279	3,627	1,523	2,484	3,045	3,206	4,515	6,156	7,042	8,095	11,197
	Rate (people)		15.2	47.3	76.8	6.8	0.0	0.9	2.8	4.1	13.9	31.9	48.5	64.4	90.3
	Rate (HHs)	624	20.3	54.3	83.1	9.3	0.0	1.0	3.8	5.6	18.7	39.4	55.4	71.6	93.3
Khovsgol	Line		4,602	6,904	9,205	3,597	1,511	2,465	3,021	3,180	4,479	6,106	6,986	8,030	11,107
	Rate (people)		24.4	59.3	79.0	11.0	0.3	0.9	4.4	7.2	22.7	48.2	60.4	72.1	88.9
	Rate (HHs)	624	31.0	68.8	86.6	15.4	0.3	1.3	6.8	10.7	29.2	57.1	69.9	80.6	94.1
Zavkhan	Line		4,848	7,271	9,695	3,789	1,591	2,596	3,182	3,349	4,718	6,432	7,358	8,458	11,699
	Rate (people)		11.7	39.2	60.8	1.5	0.0	0.3	0.8	1.0	10.2	27.2	39.8	47.2	78.9
	Rate (HHs)	624	15.5	45.4	66.8	2.2	0.0	0.5	1.3	1.6	13.3	32.4	46.1	53.4	84.3
Govi-Altai	Line		4,687	7,031	9,374	3,664	1,538	2,510	3,077	3,239	4,561	6,219	7,114	8,178	11,312
	Rate (people)		30.9	66.9	87.9	14.5	0.6	3.3	7.1	8.2	28.0	55.3	68.0	78.7	94.3
	Rate (HHs)	624	37.4	72.4	90.6	18.4	0.9	4.8	9.8	11.1	33.7	62.4	73.5	83.7	96.0
Bayan-Olgii	Line		4,640	6,960	9,280	3,627	1,523	2,485	3,046	3,206	4,516	6,156	7,043	8,096	11,198
	Rate (people)		19.7	47.5	71.0	6.5	0.0	0.8	2.3	3.4	17.3	38.2	49.1	58.5	82.1
	Rate (HHs)	624	21.7	49.7	74.3	7.4	0.0	0.9	2.5	3.6	18.8	40.5	51.3	61.4	84.6
Khovd	Line		4,772	7,157	9,543	3,730	1,566	2,555	3,132	3,297	4,644	6,331	7,242	8,325	11,516
	Rate (people)		22.0	53.3	73.4	9.8	0.0	1.2	3.2	5.7	21.0	41.4	54.2	64.7	84.1
	Rate (HHs)	624	29.1	62.7	80.7	13.6	0.0	2.0	4.5	8.1	28.0	51.7	63.9	73.4	89.1
Uvs	Line		4,602	6,903	9,205	3,597	1,510	2,464	3,021	3,180	4,479	6,106	6,985	8,030	11,107
	Rate (people)		22.1	56.6	77.6	8.9	0.1	2.3	4.0	5.0	19.8	43.9	57.3	68.5	86.9
	Rate (HHs)	624	30.2	67.8	85.8	12.8	0.3	3.8	6.1	7.7	27.4	55.4	68.7	78.5	91.8

Source and definitions: See Table 1.

**Table 2 (All of Mongolia, West, Highlands, Central, East, and Ulaanbaatar) Poverty lines and poverty rates for households and people in 2014**

5-level region	Line/rate	HHs in HSES	Poverty lines (MNT per person per day) and poverty rates (%)												
			National poverty lines			Poorest half	2011 PPP poverty lines				Percentile poverty lines				
			100%	150%	200%	<100% Natl.	\$1.90	\$3.10	\$3.80	\$4.00	20th	40th	50th	60th	80th
All-Mongolia	Line		4,821	7,232	9,643	3,769	1,582	2,582	3,165	3,331	4,692	6,397	7,318	8,412	11,636
	Rate (people)		16.2	40.9	61.5	7.5	0.1	1.7	4.0	4.9	14.9	32.1	41.7	51.6	73.4
	Rate (HHs)	16,174	21.6	49.3	69.3	10.8	0.2	2.7	5.9	7.2	20.0	40.0	50.0	60.0	80.0
West	Line		4,704	7,055	9,407	3,677	1,544	2,519	3,087	3,250	4,577	6,241	7,139	8,207	11,352
	Rate (people)		20.7	51.8	73.3	7.9	0.1	1.5	3.3	4.4	18.8	40.4	52.8	62.6	84.7
	Rate (HHs)	3,120	26.0	58.4	78.9	10.4	0.2	2.2	4.4	6.1	23.5	47.4	59.6	69.0	88.5
Highlands	Line		4,664	6,997	9,329	3,646	1,531	2,498	3,062	3,223	4,539	6,189	7,080	8,138	11,257
	Rate (people)		18.7	48.8	71.4	7.9	0.1	1.3	3.6	4.9	17.1	38.0	50.0	62.0	82.7
	Rate (HHs)	3,720	25.3	57.7	78.8	11.2	0.1	1.9	5.5	7.3	23.2	46.9	58.7	70.3	87.7
Central	Line		4,768	7,152	9,535	3,727	1,565	2,553	3,130	3,294	4,640	6,326	7,236	8,318	11,506
	Rate (people)		16.7	40.6	61.4	8.0	0.2	1.9	4.3	5.5	15.1	32.7	41.4	51.9	73.8
	Rate (HHs)	3,881	22.2	49.5	69.6	11.3	0.4	3.3	6.5	8.0	20.3	40.8	50.3	61.1	80.8
East	Line		4,733	7,099	9,465	3,699	1,553	2,534	3,106	3,270	4,606	6,279	7,183	8,257	11,422
	Rate (people)		23.6	51.9	71.4	12.9	0.1	3.2	6.5	7.6	21.7	42.2	52.7	63.3	80.5
	Rate (HHs)	1,872	31.4	61.4	79.0	18.4	0.3	5.2	9.8	11.3	29.2	52.1	61.9	71.5	86.7
Ulaanbaatar	Line		4,968	7,452	9,935	3,883	1,630	2,660	3,261	3,432	4,834	6,591	7,540	8,667	11,989
	Rate (people)		12.1	32.1	51.5	6.1	0.2	1.6	3.7	4.4	11.4	24.8	32.6	41.2	64.1
	Rate (HHs)	3,581	16.4	40.1	59.9	9.2	0.2	2.6	5.8	6.6	15.7	32.0	40.6	49.9	72.1

Source and definitions: See Table 1.

**Table 2 (All of Mongolia, Ulaanbaatar, Aimag centers, Soum centers, and Rural)**  
**Poverty lines and poverty rates for households and people in 2014**

4-level region	Line/rate	HHs in HSES	Poverty lines (MNT per person per day) and poverty rates (%)												
			National poverty lines			Poorest half	2011 PPP poverty lines				Percentile poverty lines				
			100%	150%	200%	<100% Natl.	\$1.90	\$3.10	\$3.80	\$4.00	20th	40th	50th	60th	80th
All-Mongolia	Line		4,821	7,232	9,643	3,769	1,582	2,582	3,165	3,331	4,692	6,397	7,318	8,412	11,636
	Rate (people)		16.2	41.0	61.5	7.5	0.1	1.7	4.0	4.9	14.9	32.1	41.7	51.6	73.4
	Rate (HHs)	16,174	21.6	49.3	69.3	10.8	0.2	2.7	5.9	7.2	20.0	40.0	50.0	60.0	80.0
Ulaanbaatar	Line		4,968	7,452	9,935	3,883	1,630	2,660	3,261	3,432	4,834	6,591	7,540	8,667	11,989
	Rate (people)		12.1	32.1	51.5	6.1	0.2	1.6	3.7	4.4	11.4	24.8	32.6	41.2	64.1
	Rate (HHs)	3,581	16.4	40.1	59.9	9.2	0.2	2.6	5.8	6.6	15.7	32.0	40.6	49.9	72.1
Aimag center	Line		4,832	7,247	9,663	3,777	1,586	2,587	3,171	3,338	4,702	6,410	7,333	8,430	11,660
	Rate (people)		18.1	43.2	64.4	8.8	0.2	2.0	4.3	5.1	16.6	34.1	44.0	54.9	76.0
	Rate (HHs)	5,400	23.8	50.9	71.5	12.3	0.3	3.1	6.3	7.3	22.1	41.7	51.7	62.5	82.0
Soum center	Line		4,674	7,011	9,348	3,653	1,534	2,503	3,068	3,229	4,548	6,201	7,094	8,154	11,280
	Rate (people)		18.3	46.5	68.3	8.1	0.2	1.8	3.6	5.2	16.8	36.6	47.7	57.9	80.3
	Rate (HHs)	3,794	24.7	55.7	75.8	11.6	0.4	3.0	5.6	7.7	22.8	45.3	56.7	66.7	85.9
Rural	Line		4,616	6,924	9,232	3,608	1,515	2,472	3,030	3,189	4,492	6,124	7,006	8,053	11,140
	Rate (people)		21.5	53.4	74.6	8.8	0.0	1.5	4.4	5.8	19.2	42.3	54.2	65.7	85.1
	Rate (HHs)	3,399	27.9	62.2	82.0	12.0	0.0	2.2	6.1	8.0	25.0	51.4	63.1	73.9	90.2

Source and definitions: See Table 1.

**Table 2 (All of Mongolia, Ulaanbaatar, Aimag centers, and Soum centers or rural)**  
**Poverty lines and poverty rates for households and people in 2014**

4-level region	Line/rate	HHs in HSES	Poverty lines (MNT per person per day) and poverty rates (%)												
			National poverty lines			Poorest half	2011 PPP poverty lines				Percentile poverty lines				
			100%	150%	200%	<100% Natl.	\$1.90	\$3.10	\$3.80	\$4.00	20th	40th	50th	60th	80th
All-Mongolia	Line		4,821	7,232	9,643	3,769	1,582	2,582	3,165	3,331	4,692	6,397	7,318	8,412	11,636
	Rate (people)		16.2	41.0	61.5	7.5	0.1	1.7	4.0	4.9	14.9	32.1	41.7	51.6	73.4
	Rate (HHs)	16,174	21.6	49.3	69.3	10.8	0.2	2.7	5.9	7.2	20.0	40.0	50.0	60.0	80.0
Ulaanbaatar	Line		4,968	7,452	9,935	3,883	1,630	2,660	3,261	3,432	4,834	6,591	7,540	8,667	11,989
	Rate (people)		12.1	32.1	51.5	6.1	0.2	1.6	3.7	4.4	11.4	24.8	32.6	41.2	64.1
	Rate (HHs)	3,581	16.4	40.1	59.9	9.2	0.2	2.6	5.8	6.6	15.7	32.0	40.6	49.9	72.1
Aimag center	Line		4,832	7,247	9,663	3,777	1,586	2,587	3,171	3,338	4,702	6,410	7,333	8,430	11,660
	Rate (people)		18.1	43.2	64.4	8.8	0.2	2.0	4.3	5.1	16.6	34.1	44.0	54.9	76.0
	Rate (HHs)	5,400	23.8	50.9	71.5	12.3	0.3	3.1	6.3	7.3	22.1	41.7	51.7	62.5	82.0
Soum center or rural	Line		4,643	6,965	9,287	3,630	1,524	2,486	3,048	3,208	4,519	6,161	7,048	8,101	11,206
	Rate (people)		19.9	50.0	71.5	8.5	0.1	1.7	4.0	5.5	18.0	39.5	51.0	61.8	82.7
	Rate (HHs)	7,193	26.4	59.1	79.1	11.8	0.2	2.6	5.9	7.9	24.0	48.5	60.1	70.5	88.1

Source and definitions: See Table 1.

**Table 3: Poverty indicators**

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
1,247	How many household members are 17-years-old or younger? (Three or more; Two; One; None)
1,242	How many household members are 18-years-old or younger? (Four or more; Three; Two; One; None)
1,202	How many household members are 16-years-old or younger? (Three or more; Two; One; None)
1,193	How many household members are 15-years-old or younger? (Three or more; Two; One; None)
1,139	How many household members are 14-years-old or younger? (Three or more; Two; One; None)
1,112	How many members does the household have? (Six or more; Five; Four; Three; Two; One)
1,064	How many household members are 13-years-old or younger? (Three or more; Two; One; None)
1,021	How many household members are 12-years-old or younger? (Three or more; Two; One; None)
1,003	How many household members are 11-years-old or younger? (Three or more; Two; One; None)
682	How many household members are 6-years-old or younger? (Two or more; One; None)
591	Does the household have any motorcycles, or cars, trucks, large trucks, or buses in working condition? (None; Motorcycle only; Automobile (regardless of motorcycle))
587	Does the household have any cars, trucks, large trucks, or buses in working condition? (No; Yes)

**Table 3 (cont.): Poverty indicators**

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
537	What is the highest educational level completed by the female head/spouse? (None, or primary; No female head/spouse; Lower secondary; Higher secondary; Vocational; Technical secondary; Degree or higher-education diploma, Bachelor's degree, Master's degree, or doctorate)
533	Do all household members ages 6 to 15 currently attend school? (No; Yes; No members in this age range)
519	Do all household members ages 6 to 17 currently attend school? (No; Yes; No members in this age range)
515	Do all household members ages 6 to 16 currently attend school? (No; Yes; No members in this age range)
507	Do all household members ages 6 to 14 currently attend school? (No; Yes; No members in this age range)
498	Do all household members ages 6 to 18 currently attend school? (No; Yes; No members in this age range)
488	Does the household have any carpets or vacuum cleaners in working condition? (No carpets (regardless of vacuum); Carpet(s), but no vacuum; Vacuum (regardless of carpet))
439	Do all household members ages 6 to 13 currently attend school? (No; Yes; No members in this age range)
428	Do all household members ages 6 to 12 currently attend school? (No; Yes; No members in this age range)
414	Do all household members ages 6 to 11 currently attend school? (No; Yes; No members in this age range)
365	Does the household have any vacuum cleaners in working condition? (No; Yes)

**Table 3 (cont.): Poverty indicators**

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
345	Does the household have any computers, cars, trucks, large trucks, or buses in working condition?
336	In the past seven days, what was the occupation of the female head/spouse in her main job? (Elementary occupations; Did not work; Skilled agricultural or fishery workers; Craft and related trades workers; Personal service workers, clerks, or plant or machine operator/assemblers; No female head/spouse; Professionals, technicians or associate professionals, legislators, senior officials, managers, or armed forces)
325	If the residence is not a ger, then what is its total area (living and non-living) (m <sup>2</sup> )? (Ger; 1 to 24; 25 to 29; 30 to 34; 35 to 39; 40 to 44; 45 to 49; 50 to 59; 60 to 69; 70 or more)
324	If the residence is not a ger, then what is its living area (m <sup>2</sup> )? (Ger; 1 to 24; 25 to 39; 40 to 59; 60 or more)
317	In the past seven days, how many household members worked in their main occupation as clerks, professionals, technicians or associate professionals, managers, senior officials, legislators, or members of the armed forces? (None; One; Two or more)
298	If the residence is not a ger, then what is the main construction material of the roof (Ger; Other; Metal; Tile; Asphalt shingles)
277	If the residence is a ger, then does it have a single or double covering on the top? (Not a ger; Single; Double)
276	Does the household live in a ger, and does it currently own any cattle, horses/racehorses, goats, sheep, or camels? (Not in ger, without large livestock; Not in ger, with large livestock; In ger, without large livestock; In ger, with large livestock)
269	Does the household have any computers in working condition? (No; Yes)

**Table 3 (cont.): Poverty indicators**

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
267	What is the highest educational level completed by the male head/spouse? (None, primary, or lower or higher secondary; No male head/spouse; Vocational; Technical secondary; Degree, higher-education diploma, or bachelor's degree or higher)
262	If the residence is not a ger, then what is the main construction material of the floor (Ger; Other; Wood; Dirt; Concrete)
261	If the residence is a ger, then does it have a single or double covering on the frame (Not a ger; Single; Double)
254	If the residence is not a ger, then what is the main construction material of the walls? (Ger; Wood, stone, or other; Bricks, or concrete)
253	How many carpets does the household have? (None; One; Two; Three or more)
236	Does the household live in a ger, and did any household members work in herding/animal husbandry/livestock raising or in farming in the past seven days? (In ger, and not a herder; In ger, and is a herder; Not in ger, and is a herder; Not in ger, and not a herder)
233	In the past seven days, what was the occupation of the male head/spouse in his main job? (Elementary occupations; Craft and related trades workers; Skilled agricultural or fishery workers; Did not work; No male head/spouse; Plant or machine operator/assemblers; Personal service workers, technicians or associate professionals, or clerks; Armed forces; Professionals, legislators, senior officials, or managers)
231	Does the household have any sofas in working condition? (No; Yes)
217	If the residence is a ger, then what is the main material of its floor? (Not a ger; Dirt; Other; Wood)

**Table 3 (cont.): Poverty indicators**

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
215	In what type of residence does the household currently live? (Ger; House in ger district, dormitory, public dwelling for employees, other public dwelling, shelter not meant for human habitation, or other; Apartment, or villa)
215	If the residence is not a ger, then how many rooms does it have? (do not include kitchens, hallways, or bathrooms) (One; Two; Three; Four or more)
208	Does the household have any boilers/rice cookers in working condition? (No; Yes)
190	Does the household have any cameras or video cameras in working condition? (No; Yes)
188	Does the household have any iron/brick stoves, electric or gas stoves, or ovens in working condition? (None; Iron/brick, but no others; Electric or gas, but no oven (regardless of iron/brick); Oven (regardless of any others))
180	Does the household have any washing machines or refrigerators in working condition? (None; Only refrigerator; Only washing machine; Both)
164	In the past seven days, what was the employment status of the female head/spouse in her main job? (Did not work; Self-employed in animal husbandry/livestock raising, self-employed in farming, or in an unpaid job; Paid job; No female head/spouse; Self-employed in non-agricultural activity)
151	Does any member of the household have savings? (No; Yes)
147	Does the household have any shelves in working conditions? (No; Yes)
142	Does the household have any ovens in working condition? (No; Yes)
126	Does the household have any traditional-style beds or wooden beds, iron beds, or bedroom furniture sets? (Only iron; Both iron and traditional or wood, but no bedset; Only traditional or wood; None of these; Bedset (regardless of iron and trad. or wood))

**Table 3 (cont.): Poverty indicators**

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
116	What is the main source of heating for the residence? (Traditional wood/coal/dung stove; Private low-pressure boiler, central, private electric heater, or other)
108	Does anyone in the household own or use land? (No; Yes)
104	How many cattle-equivalents on the Bod Scale from among cattle, horses/racehorses, goats, sheep, and camels does the household currently own? (None; 1 to 10; 11 to 20; 21 to 40; 41 to 60; 61 to 100; 101 or more)
103	How many head of cattle does the household currently own? (Zero to four; 5 to 9; 10 to 29; 30 or more)
101	Does the household have any refrigerators in working condition? (No; Yes)
98	Does the household have any washing machines in working condition? (No; Yes)
96	In the past seven days, did the female head/spouse work? (No; No female head/spouse; Yes)
96	How many wooden tables does the household have? (None; One; Two or more)
96	Does the household have any kitchen furniture sets? (No; Yes)
92	How many head of cattle, horses/racehorses, goats, sheep, or camels does the household currently own? (None; 1 to 24; 25 to 74; 75 to 124; 125 to 199; 200 to 399; 400 or more)
86	How many sheep does the household currently own? (None; 1 to 19; 20 to 39; 40 to 99; 100 to 199; 200 or more)
85	Does the household have any iron beds in working condition? (No; Yes)
84	Do any household members have disabilities? (Yes; No)
82	In the past seven days, how many household members worked in their main occupation as skilled agricultural or fishery workers or in elementary occupations? (Two or more; One; None)

**Table 3 (cont.): Poverty indicators**

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
80	Does the household have any electric or gas stoves in working condition? (No; Yes)
79	Does the household have any electric heaters in working condition? (No; Yes)
77	Does the household have any sewing machines in working condition? (No; Yes)
76	Does the household have any televisions (color or black-and-white), VCRs, or CD players or VCD players? (No television (regardless of others); Television, but none of the others; Television, and at least one of the others)
69	Is the female head/spouse literate? Can she read and write? (Yes, with difficulty; No; Yes, easily; No female head/spouse)
67	What is the current marital status of the female head/spouse? (Separated, or divorced; Married (legally or informally); Widowed; No female head/spouse; Never-married)
67	Does the household have any wardrobe closets in working condition? (No; Yes)
63	How many goats does the household currently own? (None; 1 to 9; 10 to 29; 30 to 59; 60 to 99; 100 to 199; 200 or more)
61	Is the male head/spouse literate? Can he read and write? (Yes, with difficulty; No; No male head/spouse; Yes, easily)
58	If the residence is a ger, then how many segments/walls does it have? (Not a ger; Three, or four; Five; Six or more)
54	Does the household have any bedroom furniture sets in working condition? (No; Yes)
50	Does the household have any electric irons in working condition? (No; Yes)
48	What is the current marital status of the male head/spouse? (Married (legally or informally); No male head/spouse; Widowed; Separated, or divorced; Never-married)
44	Does the household have any CD players or VCD players in working condition? (No; Yes)

**Table 3 (cont.): Poverty indicators**

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
41	In the past seven days, were any household members self-employed in non-agriculture? (No; Yes)
40	What is the structure of household headship? (Both male and female heads/spouses; Female head/spouse only; Male head/spouse only)
38	In the past seven days, what was the employment status of the male head/spouse in his main job? (Did not work; Self-employed in animal husbandry/livestock raising, self-employed in farming, or unpaid job; No male head/spouse; Paid job; Self-employed in non-agricultural activity)
35	In the past seven days, how many household members worked in their main occupation as skilled agricultural or fishery workers? (Two or more; One; None)
33	How many horses/racehorses does the household currently own? (None; 1 to 4; 5 to 9; 10 or more)
33	Does the household have any televisions (color or black-and-white) in working condition? (No; Yes)
32	What is the main type of toilet arrangement used by the household? (None/open/bush; Private pit latrine, ventilated pit latrine, shared pit latrine, or composting toilet; Flush toilet to sewer system, septic tank, soak pit (unpumped septic tank), or pumped septic tank)
32	What is the main source of water for the household? (Truck designed for water delivery; Surface water, rainwater, common truck used for water delivery; Spring; Water distribution point; Dug well; Public network, or bottled water)
31	How many residences does your household own? (None; One; Two or more)

**Table 3 (cont.): Poverty indicators**

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
31	In the past seven days, how many household members worked in a paid job? (None; One; Two or more)
24	In the past seven days, how many household members worked in herding/animal husbandry/livestock raising or in farming? (Two or more; One; None)
19	Does the household have any bicycles in working condition? (No; Yes)
18	In the past seven days, did the male head/spouse work? (No; Yes; No male head/spouse)
16	In the past seven days, how many household members worked? (None; One; Two; Three or more)
16	How many types of livestock from among cattle, horses/racehorses, goats, sheep, and camels does the household currently own? (Four or more; Three; Two; One; None)
13	Does the household have any summer houses? (No; Yes)
9	Does the household currently own any cattle, horses/racehorses, goats, sheep, or camels? No; Yes)
6	Does the household have any VCRs in working condition? (No; Yes)
6	Does the household have any electric generators in working condition? (No; Yes)
5	Does the household have any water purifiers in working condition? (No; Yes)
4	Does the household have any iron stoves/brick stoves in working condition? (No; Yes)
4	In the past seven days, did any household members work in herding/animal husbandry/livestock raising or in farming? (Yes; No)

**Table 3 (cont.): Poverty indicators**

<u>Uncertainty coefficient</u>	<u>Indicator (Responses ordered starting with those linked with higher poverty likelihoods)</u>
4	Does the household have any traditional-style beds or wooden beds in working condition? (Yes; No)
3	In the past 12 months, did any member of the household own any farmland or use any land for farming, including growing hay and feed/fodder? (No; Yes)
3	How many wooden trunks in working condition does the household have? (Three or more; Two; One; None)
2	Does the household have any motorcycles in working condition? (No; Yes)
2	What is the main source of lighting for the residence? (Solar, diesel station, wind, small generator, candle, or other; Central grid)
0	Does the household currently own any camels? (Yes; No)

Source: 2014 HSES and 100% of the national poverty line

**Tables for  
100% of the National Poverty Line  
  
(and Tables Pertaining  
to All Poverty Lines)**

**Table 4 (100% of the national line): Estimated poverty likelihoods associated with scores**

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0-4	100.0
5-9	93.3
10-14	80.0
15-19	67.6
20-24	50.6
25-29	35.0
30-34	17.1
35-39	9.7
40-44	4.5
45-49	2.3
50-54	1.2
55-59	0.9
60-64	0.9
65-69	0.9
70-74	0.9
75-79	0.9
80-84	0.9
85-89	0.9
90-94	0.9
95-100	0.9

**Table 5 (100% of the national line): Derivation of estimated poverty likelihoods associated with scores**

Score	Households in range and < poverty line		All households in range		Poverty likelihood (%)
0-4	67	÷	67	=	100.0
5-9	459	÷	492	=	93.3
10-14	1,571	÷	1,964	=	80.0
15-19	3,116	÷	4,613	=	67.6
20-24	3,563	÷	7,040	=	50.6
25-29	3,395	÷	9,701	=	35.0
30-34	1,752	÷	10,228	=	17.1
35-39	1,356	÷	13,926	=	9.7
40-44	481	÷	10,783	=	4.5
45-49	174	÷	7,637	=	2.3
50-54	60	÷	4,888	=	1.2
55-59	29	÷	3,170	=	0.9
60-64	10	÷	1,130	=	0.9
65-69	4	÷	434	=	0.9
70-74	2	÷	195	=	0.9
75-79	1	÷	72	=	0.9
80-84	0	÷	18	=	0.9
85-89	0	÷	0	=	0.9
90-94	0	÷	0	=	0.9
95-100	220	÷	23,643	=	0.9

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

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

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0-4	+36.6	25.4	32.5	37.0
5-9	+13.1	7.3	8.5	11.0
10-14	-1.3	3.7	4.3	5.5
15-19	+2.4	3.1	3.6	4.6
20-24	+5.2	2.7	3.2	4.4
25-29	-10.2	6.5	6.7	7.1
30-34	-4.7	3.4	3.5	3.9
35-39	-2.5	1.9	2.0	2.2
40-44	-0.7	1.0	1.1	1.4
45-49	+1.4	0.4	0.5	0.6
50-54	+0.7	0.4	0.4	0.6
55-59	+0.9	0.0	0.0	0.0
60-64	+0.9	0.0	0.0	0.0
65-69	+0.9	0.0	0.0	0.0
70-74	+0.9	0.0	0.0	0.0
75-79	+0.9	0.0	0.0	0.0
80-84	+0.9	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	+0.4	0.1	0.2	0.2

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

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	+0.6	57.8	66.7	83.3
4	-0.7	28.9	33.9	46.4
8	-0.7	20.0	23.7	31.8
16	-0.8	13.5	17.3	25.7
32	-1.1	9.9	12.0	16.4
64	-1.2	7.1	8.6	11.4
128	-1.1	4.9	5.7	7.5
256	-1.0	3.4	4.2	5.4
512	-1.0	2.5	2.9	3.5
1,024	-1.0	1.7	2.1	3.0
2,048	-1.0	1.3	1.5	1.9
4,096	-1.0	0.9	1.0	1.3
8,192	-0.9	0.6	0.8	1.0
16,384	-1.0	0.4	0.5	0.7

**Table 8: Average differences between estimates and true values for poverty rates of a group of households at a point in time, precision, and the  $\alpha$  factor for precision, scorecard applied to the validation sample**

	Poverty lines												
	National poverty lines			Poorest half	2011 PPP poverty lines				Percentile poverty lines				
	100%	150%	200%	<100% Natl.	\$1.90	\$3.10	\$3.80	\$4.00	20th	40th	50th	60th	80th
Estimate minus true value	-1.0	+0.4	+0.3	-1.0	-0.1	-0.3	-0.5	-0.6	-1.1	-0.1	+0.4	+0.9	+0.2
Precision of difference	0.4	0.5	0.6	0.4	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.7
$\alpha$ factor for precision	0.93	0.81	1.07	1.07	1.34	1.01	0.96	0.95	0.95	0.84	0.82	0.91	1.16

Results pertain to the 2014 scorecard applied to the 2014 validation sample.

Differences between estimates and true values are displayed in units of percentage points.

Precision is measured as 90-percent confidence intervals in units of  $\pm$  percentage points.

Differences and precision estimated from 1,000 bootstraps with  $n = 16,384$ .

$\alpha$  is estimated from 1,000 bootstrap samples of  $n = 256, 512, 1,024, 2,048, 4,096, 8,192, \text{ and } 16,384$ .

**Table 9 (All poverty lines): Possible targeting outcomes**

		<u>Targeting segment</u>	
		<u>Targeted</u>	<u>Non-targeted</u>
<u>True poverty status</u>	<u>Below poverty line</u>	<u>Inclusion</u> Below poverty line correctly targeted	<u>Undercoverage</u> Below poverty line mistakenly non-targeted
	<u>Above poverty line</u>	<u>Leakage</u> Above poverty line mistakenly targeted	<u>Exclusion</u> Above poverty line correctly non-targeted

**Table 10 (100% of the national line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	16.1	0.0	83.8	83.9	-99.3
≤9	0.4	15.8	0.1	83.7	84.1	-94.0
≤14	1.9	14.3	0.6	83.2	85.1	-72.6
≤19	4.8	11.4	2.4	81.4	86.2	-26.5
≤24	8.0	8.2	6.2	77.6	85.6	+37.0
≤29	11.5	4.7	12.4	71.4	82.9	+23.3
≤34	13.5	2.7	20.6	63.2	76.8	-27.3
≤39	15.2	1.0	32.9	51.0	66.1	-103.3
≤44	15.7	0.4	43.1	40.8	56.5	-166.3
≤49	15.8	0.3	50.6	33.2	49.0	-212.9
≤54	15.9	0.3	55.5	28.4	44.2	-242.9
≤59	15.9	0.3	58.6	25.2	41.1	-262.5
≤64	15.9	0.3	59.8	24.1	39.9	-269.5
≤69	15.9	0.3	60.2	23.6	39.5	-272.1
≤74	15.9	0.3	60.4	23.4	39.3	-273.3
≤79	15.9	0.3	60.5	23.4	39.2	-273.8
≤84	15.9	0.3	60.5	23.3	39.2	-273.9
≤89	15.9	0.3	60.5	23.3	39.2	-273.9
≤94	15.9	0.3	60.5	23.3	39.2	-273.9
≤100	16.2	0.0	83.8	0.0	16.2	-418.3

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

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

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	69.5	0.3	2.3:1
≤9	0.6	74.9	2.6	3.0:1
≤14	2.5	75.5	11.8	3.1:1
≤19	7.1	66.7	29.4	2.0:1
≤24	14.2	56.3	49.4	1.3:1
≤29	23.9	48.1	71.0	0.9:1
≤34	34.1	39.6	83.6	0.7:1
≤39	48.0	31.6	93.7	0.5:1
≤44	58.8	26.8	97.3	0.4:1
≤49	66.5	23.8	97.9	0.3:1
≤54	71.3	22.3	98.2	0.3:1
≤59	74.5	21.3	98.2	0.3:1
≤64	75.6	21.0	98.2	0.3:1
≤69	76.1	20.9	98.2	0.3:1
≤74	76.3	20.8	98.2	0.3:1
≤79	76.3	20.8	98.2	0.3:1
≤84	76.4	20.8	98.2	0.3:1
≤89	76.4	20.8	98.2	0.3:1
≤94	76.4	20.8	98.2	0.3:1
≤100	100.0	16.2	100.0	0.2:1

**Tables for  
150% of the National Poverty Line**

**Table 4 (150% of the national line): Estimated poverty likelihoods associated with scores**

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0-4	100.0
5-9	99.3
10-14	96.7
15-19	92.1
20-24	85.8
25-29	74.7
30-34	60.4
35-39	48.1
40-44	32.5
45-49	23.5
50-54	11.4
55-59	9.3
60-64	9.3
65-69	9.3
70-74	9.3
75-79	9.3
80-84	9.3
85-89	9.3
90-94	9.3
95-100	9.3

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

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0-4	+36.6	25.4	32.5	37.0
5-9	+4.6	3.5	4.3	5.4
10-14	-0.2	1.3	1.6	2.0
15-19	-3.0	2.1	2.2	2.4
20-24	-0.6	1.8	2.1	2.8
25-29	-6.2	3.9	4.1	4.5
30-34	-3.0	2.6	2.8	3.2
35-39	-3.8	2.8	3.0	3.3
40-44	-0.3	2.1	2.6	3.5
45-49	+6.0	2.0	2.5	3.4
50-54	+2.4	1.7	2.0	2.8
55-59	+7.9	0.6	0.7	0.8
60-64	+7.7	1.1	1.3	1.6
65-69	+9.3	0.0	0.0	0.0
70-74	+9.3	0.0	0.0	0.0
75-79	+9.3	0.0	0.0	0.0
80-84	+9.3	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	+2.7	0.7	0.8	1.1

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

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	-0.6	63.9	81.7	88.2
4	+0.1	32.5	39.4	53.8
8	0.0	23.2	27.2	37.6
16	+0.3	16.1	19.0	25.3
32	+0.2	11.8	13.7	17.6
64	+0.2	8.4	10.2	13.0
128	+0.3	5.8	7.0	9.2
256	+0.4	3.9	4.9	6.5
512	+0.4	3.0	3.6	4.5
1,024	+0.4	2.0	2.3	3.0
2,048	+0.4	1.4	1.7	2.2
4,096	+0.4	1.0	1.2	1.6
8,192	+0.4	0.7	0.8	1.1
16,384	+0.4	0.5	0.6	0.8

**Table 10 (150% of the national line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	40.8	0.0	59.1	59.1	-99.7
≤9	0.5	40.4	0.1	59.1	59.6	-97.4
≤14	2.4	38.5	0.2	59.0	61.3	-88.1
≤19	6.7	34.2	0.5	58.7	65.3	-66.2
≤24	12.6	28.3	1.6	57.5	70.1	-34.5
≤29	20.0	20.8	3.8	55.3	75.3	+7.4
≤34	26.3	14.6	7.8	51.3	77.6	+47.7
≤39	33.2	7.7	14.8	44.3	77.5	+63.7
≤44	36.6	4.3	22.3	36.9	73.4	+45.6
≤49	38.0	2.9	28.5	30.6	68.6	+30.4
≤54	38.6	2.3	32.8	26.3	64.9	+19.8
≤59	38.7	2.2	35.8	23.3	62.0	+12.3
≤64	38.7	2.2	36.9	22.2	60.9	+9.7
≤69	38.7	2.2	37.4	21.8	60.5	+8.6
≤74	38.7	2.2	37.6	21.6	60.3	+8.1
≤79	38.7	2.2	37.6	21.5	60.2	+8.0
≤84	38.7	2.2	37.6	21.5	60.2	+7.9
≤89	38.7	2.2	37.6	21.5	60.2	+7.9
≤94	38.7	2.2	37.6	21.5	60.2	+7.9
≤100	40.9	0.0	59.1	0.0	40.9	-44.6

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

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

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	69.5	0.1	2.3:1
≤9	0.6	89.4	1.2	8.5:1
≤14	2.5	93.4	5.8	14.2:1
≤19	7.1	93.5	16.3	14.5:1
≤24	14.2	88.9	30.8	8.0:1
≤29	23.9	83.9	49.0	5.2:1
≤34	34.1	77.0	64.3	3.4:1
≤39	48.0	69.1	81.2	2.2:1
≤44	58.8	62.2	89.4	1.6:1
≤49	66.5	57.2	92.9	1.3:1
≤54	71.3	54.1	94.3	1.2:1
≤59	74.5	51.9	94.6	1.1:1
≤64	75.6	51.2	94.7	1.0:1
≤69	76.1	50.9	94.7	1.0:1
≤74	76.3	50.8	94.7	1.0:1
≤79	76.3	50.7	94.7	1.0:1
≤84	76.4	50.7	94.7	1.0:1
≤89	76.4	50.7	94.7	1.0:1
≤94	76.4	50.7	94.7	1.0:1
≤100	100.0	40.9	100.0	0.7:1

**Tables for  
200% of the National Poverty Line**

**Table 4 (200% of the national line): Estimated poverty likelihoods associated with scores**

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0-4	100.0
5-9	100.0
10-14	99.6
15-19	97.4
20-24	94.6
25-29	92.4
30-34	84.5
35-39	76.3
40-44	65.7
45-49	50.8
50-54	34.6
55-59	25.8
60-64	25.8
65-69	25.8
70-74	25.8
75-79	25.8
80-84	25.8
85-89	25.8
90-94	25.8
95-100	25.8

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

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0-4	0.0	0.0	0.0	0.0
5-9	+0.8	1.2	1.3	1.7
10-14	+0.6	0.7	0.8	1.0
15-19	-1.3	0.9	1.0	1.1
20-24	-1.9	1.4	1.5	1.6
25-29	-3.0	1.9	2.0	2.1
30-34	-2.2	1.9	2.0	2.3
35-39	-0.5	1.7	2.0	2.6
40-44	+2.4	2.2	2.6	3.3
45-49	+2.2	3.1	3.6	4.7
50-54	-14.9	9.4	9.7	10.5
55-59	-5.4	5.2	6.0	7.9
60-64	+17.1	3.6	4.3	5.4
65-69	+18.7	4.2	5.1	6.8
70-74	+25.8	0.0	0.0	0.0
75-79	+24.5	2.2	2.7	4.9
80-84	+25.8	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	+3.4	1.3	1.6	2.1

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

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	-1.5	75.2	75.2	81.3
4	+0.6	35.8	41.6	52.8
8	+0.4	26.0	31.9	44.0
16	+0.4	20.5	24.2	30.3
32	+0.5	14.6	17.3	21.9
64	+0.4	10.7	13.3	17.2
128	+0.3	7.5	9.0	12.1
256	+0.2	5.4	6.5	8.1
512	+0.3	3.9	4.5	6.1
1,024	+0.3	2.7	3.1	4.1
2,048	+0.3	1.8	2.2	2.9
4,096	+0.3	1.3	1.5	2.0
8,192	+0.3	0.9	1.0	1.3
16,384	+0.3	0.6	0.7	1.0

**Table 10 (200% of the national line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.1	61.3	0.0	38.6	38.7	-99.8
≤9	0.6	60.9	0.0	38.6	39.1	-98.2
≤14	2.5	58.9	0.0	38.5	41.0	-91.9
≤19	7.0	54.4	0.1	38.5	45.5	-77.0
≤24	13.7	47.7	0.5	38.1	51.9	-54.6
≤29	22.8	38.6	1.1	37.5	60.3	-24.0
≤34	31.5	29.9	2.6	36.0	67.5	+6.8
≤39	42.0	19.4	6.0	32.6	74.6	+46.7
≤44	48.8	12.6	10.0	28.5	77.3	+75.2
≤49	52.3	9.2	14.2	24.4	76.6	+76.9
≤54	54.3	7.2	17.1	21.5	75.8	+72.2
≤59	55.0	6.4	19.5	19.1	74.0	+68.2
≤64	55.1	6.3	20.5	18.1	73.2	+66.6
≤69	55.2	6.3	20.9	17.7	72.8	+65.9
≤74	55.2	6.3	21.1	17.5	72.6	+65.6
≤79	55.2	6.3	21.2	17.4	72.6	+65.5
≤84	55.2	6.3	21.2	17.4	72.5	+65.5
≤89	55.2	6.3	21.2	17.4	72.5	+65.5
≤94	55.2	6.3	21.2	17.4	72.5	+65.5
≤100	61.4	0.0	38.6	0.0	61.4	+37.2

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

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

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	100.0	0.1	Only poor targeted
≤9	0.6	98.8	0.9	79.0:1
≤14	2.5	98.3	4.0	56.6:1
≤19	7.1	98.3	11.4	56.9:1
≤24	14.2	96.8	22.3	30.5:1
≤29	23.9	95.5	37.1	21.0:1
≤34	34.1	92.3	51.3	12.1:1
≤39	48.0	87.5	68.5	7.0:1
≤44	58.8	82.9	79.4	4.9:1
≤49	66.5	78.6	85.1	3.7:1
≤54	71.3	76.1	88.3	3.2:1
≤59	74.5	73.8	89.5	2.8:1
≤64	75.6	72.9	89.7	2.7:1
≤69	76.1	72.5	89.8	2.6:1
≤74	76.3	72.3	89.8	2.6:1
≤79	76.3	72.3	89.8	2.6:1
≤84	76.4	72.2	89.8	2.6:1
≤89	76.4	72.2	89.8	2.6:1
≤94	76.4	72.2	89.8	2.6:1
≤100	100.0	61.4	100.0	1.6:1

**Tables for  
the Poverty Line Marking the Poorest Half of People  
below 100% of the National Poverty Line**

**Table 4 (Poorest half below 100% of the national line):  
 Estimated poverty likelihoods associated with scores**

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0-4	89.4
5-9	77.4
10-14	61.9
15-19	42.6
20-24	23.6
25-29	12.9
30-34	4.6
35-39	2.6
40-44	1.1
45-49	0.2
50-54	0.2
55-59	0.2
60-64	0.2
65-69	0.2
70-74	0.2
75-79	0.2
80-84	0.2
85-89	0.2
90-94	0.2
95-100	0.2

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

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0-4	+75.9	15.4	17.4	24.7
5-9	+15.7	10.0	11.5	15.4
10-14	-7.2	5.9	6.2	7.2
15-19	+1.5	3.3	4.0	5.2
20-24	-1.4	2.3	2.9	4.0
25-29	-6.2	4.5	4.7	5.3
30-34	-3.2	2.2	2.4	2.7
35-39	-0.8	0.8	0.9	1.2
40-44	+0.1	0.4	0.5	0.7
45-49	+0.2	0.0	0.1	0.1
50-54	+0.2	0.0	0.0	0.0
55-59	+0.2	0.0	0.0	0.0
60-64	+0.2	0.0	0.0	0.0
65-69	+0.2	0.0	0.0	0.0
70-74	+0.2	0.0	0.0	0.0
75-79	+0.2	0.0	0.0	0.0
80-84	+0.2	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	-0.1	0.1	0.1	0.2

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

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	-0.4	40.5	64.8	78.6
4	-0.4	21.3	28.0	38.8
8	-0.4	14.8	18.8	28.7
16	-0.5	10.8	13.1	17.7
32	-0.9	7.9	9.4	14.7
64	-0.9	5.3	6.2	8.6
128	-1.0	3.8	4.5	6.0
256	-1.0	2.9	3.3	4.4
512	-1.0	2.0	2.4	3.2
1,024	-1.0	1.5	1.8	2.2
2,048	-1.0	1.0	1.3	1.7
4,096	-1.0	0.7	0.8	1.1
8,192	-1.0	0.5	0.6	0.8
16,384	-1.0	0.4	0.4	0.5

**Table 10 (Poorest half below 100% of the national line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	7.5	0.1	92.4	92.4	-98.9
≤9	0.3	7.2	0.2	92.2	92.5	-88.4
≤14	1.5	6.1	1.0	91.4	92.9	-46.8
≤19	3.2	4.3	3.9	88.5	91.8	+37.5
≤24	4.9	2.7	9.3	83.1	88.0	-23.6
≤29	6.2	1.3	17.7	74.8	81.0	-134.7
≤34	6.9	0.6	27.2	65.3	72.2	-261.0
≤39	7.3	0.2	40.7	51.7	59.1	-440.7
≤44	7.4	0.1	51.4	41.1	48.5	-582.3
≤49	7.4	0.1	59.0	33.4	40.9	-683.7
≤54	7.4	0.1	63.9	28.6	36.0	-748.6
≤59	7.4	0.1	67.1	25.4	32.8	-790.7
≤64	7.4	0.1	68.2	24.3	31.7	-805.7
≤69	7.4	0.1	68.6	23.8	31.3	-811.5
≤74	7.4	0.1	68.8	23.6	31.1	-814.0
≤79	7.4	0.1	68.9	23.6	31.0	-815.0
≤84	7.4	0.1	68.9	23.5	31.0	-815.2
≤89	7.4	0.1	68.9	23.5	31.0	-815.2
≤94	7.4	0.1	68.9	23.5	31.0	-815.2
≤100	7.5	0.0	92.5	0.0	7.5	-1,127.9

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

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

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	18.7	0.2	0.2:1
≤9	0.6	56.1	4.2	1.3:1
≤14	2.5	58.7	19.7	1.4:1
≤19	7.1	45.1	42.7	0.8:1
≤24	14.2	34.3	64.6	0.5:1
≤29	23.9	26.0	82.3	0.4:1
≤34	34.1	20.3	91.8	0.3:1
≤39	48.0	15.2	97.1	0.2:1
≤44	58.8	12.6	98.6	0.1:1
≤49	66.5	11.2	98.7	0.1:1
≤54	71.3	10.4	98.7	0.1:1
≤59	74.5	10.0	98.7	0.1:1
≤64	75.6	9.8	98.7	0.1:1
≤69	76.1	9.8	98.7	0.1:1
≤74	76.3	9.7	98.7	0.1:1
≤79	76.3	9.7	98.7	0.1:1
≤84	76.4	9.7	98.7	0.1:1
≤89	76.4	9.7	98.7	0.1:1
≤94	76.4	9.7	98.7	0.1:1
≤100	100.0	7.5	100.0	0.1:1

**Tables for  
the \$1.90/day 2011 PPP Poverty Line**

**Table 4 (\$1.90/day 2011 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	8.8
5-9	7.5
10-14	1.1
15-19	0.9
20-24	0.1
25-29	0.1
30-34	0.1
35-39	0.0
40-44	0.0
45-49	0.0
50-54	0.0
55-59	0.0
60-64	0.0
65-69	0.0
70-74	0.0
75-79	0.0
80-84	0.0
85-89	0.0
90-94	0.0
95-100	0.0

**Table 6 (\$1.90/day 2011 PPP line): Average differences between estimated and true poverty likelihoods for households by score range, with confidence intervals, from 1,000 bootstraps of  $n = 16,384$ , scorecard applied to the validation sample**

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0-4	+8.8	0.0	0.0	0.0
5-9	+7.5	0.0	0.0	0.0
10-14	-10.8	7.7	8.1	8.9
15-19	+0.9	0.0	0.0	0.0
20-24	+0.1	0.0	0.0	0.0
25-29	0.0	0.1	0.1	0.2
30-34	+0.1	0.0	0.0	0.0
35-39	0.0	0.0	0.0	0.0
40-44	0.0	0.0	0.0	0.0
45-49	0.0	0.0	0.0	0.0
50-54	0.0	0.0	0.0	0.0
55-59	0.0	0.0	0.0	0.0
60-64	0.0	0.0	0.0	0.0
65-69	0.0	0.0	0.0	0.0
70-74	0.0	0.0	0.0	0.0
75-79	0.0	0.0	0.0	0.0
80-84	0.0	0.0	0.0	0.0
85-89	0.0	0.0	0.0	0.0
90-94	0.0	0.0	0.0	0.0
95-100	0.0	0.0	0.0	0.0

**Table 7 (\$1.90/day 2011 PPP line): Average differences between estimated poverty rates and true values for a group at a point in time by sample size, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample**

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	-0.1	0.5	0.6	0.6
4	-0.1	0.2	0.2	9.0
8	0.0	0.2	0.3	7.5
16	0.0	0.2	0.2	4.8
32	-0.1	0.1	2.0	3.7
64	-0.1	0.9	1.3	2.2
128	-0.1	0.8	0.9	1.4
256	-0.1	0.5	0.7	1.0
512	-0.1	0.4	0.5	0.6
1,024	-0.1	0.3	0.3	0.5
2,048	-0.1	0.2	0.2	0.3
4,096	-0.1	0.1	0.2	0.2
8,192	-0.1	0.1	0.1	0.2
16,384	-0.1	0.1	0.1	0.1

**Table 10 (\$1.90/day 2011 PPP line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	0.1	0.1	99.8	99.8	-55.5
≤9	0.0	0.1	0.6	99.3	99.3	-273.5
≤14	0.1	0.0	2.4	97.5	97.6	-1,494.2
≤19	0.1	0.0	7.0	92.9	93.0	-4,576.4
≤24	0.1	0.0	14.0	85.8	85.9	-9,280.0
≤29	0.1	0.0	23.7	76.1	76.3	-15,752.2
≤34	0.1	0.0	34.0	65.9	66.0	-22,585.2
≤39	0.1	0.0	47.9	52.0	52.1	-31,889.0
≤44	0.1	0.0	58.7	41.2	41.3	-39,092.9
≤49	0.1	0.0	66.3	33.5	33.7	-44,194.9
≤54	0.1	0.0	71.2	28.7	28.8	-47,460.2
≤59	0.1	0.0	74.4	25.5	25.6	-49,578.3
≤64	0.1	0.0	75.5	24.4	24.5	-50,333.4
≤69	0.1	0.0	75.9	23.9	24.1	-50,623.7
≤74	0.1	0.0	76.1	23.7	23.9	-50,753.9
≤79	0.1	0.0	76.2	23.7	23.8	-50,801.9
≤84	0.1	0.0	76.2	23.6	23.8	-50,813.8
≤89	0.1	0.0	76.2	23.6	23.8	-50,813.8
≤94	0.1	0.0	76.2	23.6	23.8	-50,813.8
≤100	0.1	0.0	99.9	0.0	0.1	-66,609.2

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

**Table 11 (\$1.90/day 2011 PPP line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample**

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	0.0	0.0	0.0:1
≤9	0.6	0.0	0.0	0.0:1
≤14	2.5	5.4	91.4	0.1:1
≤19	7.1	1.9	91.4	0.0:1
≤24	14.2	1.0	91.4	0.0:1
≤29	23.9	0.6	100.0	0.0:1
≤34	34.1	0.4	100.0	0.0:1
≤39	48.0	0.3	100.0	0.0:1
≤44	58.8	0.3	100.0	0.0:1
≤49	66.5	0.2	100.0	0.0:1
≤54	71.3	0.2	100.0	0.0:1
≤59	74.5	0.2	100.0	0.0:1
≤64	75.6	0.2	100.0	0.0:1
≤69	76.1	0.2	100.0	0.0:1
≤74	76.3	0.2	100.0	0.0:1
≤79	76.3	0.2	100.0	0.0:1
≤84	76.4	0.2	100.0	0.0:1
≤89	76.4	0.2	100.0	0.0:1
≤94	76.4	0.2	100.0	0.0:1
≤100	100.0	0.1	100.0	0.0:1

**Tables for  
the \$3.10/day 2011 PPP Poverty Line**

**Table 4 (\$3.10/day 2011 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	56.8
5-9	55.8
10-14	21.4
15-19	10.5
20-24	3.4
25-29	1.6
30-34	0.7
35-39	0.3
40-44	0.0
45-49	0.0
50-54	0.0
55-59	0.0
60-64	0.0
65-69	0.0
70-74	0.0
75-79	0.0
80-84	0.0
85-89	0.0
90-94	0.0
95-100	0.0

**Table 6 (\$3.10/day 2011 PPP line): Average differences between estimated and true poverty likelihoods for households by score range, with confidence intervals, from 1,000 bootstraps of  $n = 16,384$ , scorecard applied to the validation sample**

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0-4	+43.3	15.4	17.4	24.7
5-9	+13.6	10.9	12.9	15.9
10-14	-15.9	10.8	11.3	12.3
15-19	+0.4	2.2	2.6	3.5
20-24	-1.2	1.3	1.5	2.0
25-29	-0.2	0.7	0.8	1.1
30-34	-0.3	0.6	0.7	0.9
35-39	+0.1	0.1	0.2	0.2
40-44	0.0	0.0	0.0	0.0
45-49	0.0	0.0	0.0	0.0
50-54	0.0	0.0	0.0	0.0
55-59	0.0	0.0	0.0	0.0
60-64	0.0	0.0	0.0	0.0
65-69	0.0	0.0	0.0	0.0
70-74	0.0	0.0	0.0	0.0
75-79	0.0	0.0	0.0	0.0
80-84	0.0	0.0	0.0	0.0
85-89	0.0	0.0	0.0	0.0
90-94	0.0	0.0	0.0	0.0
95-100	0.0	0.0	0.0	0.0

**Table 7 (\$3.10/day 2011 PPP line): Average differences between estimated poverty rates and true values for a group at a point in time by sample size, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample**

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	-0.3	5.2	5.2	59.0
4	-0.4	9.5	15.8	25.5
8	-0.3	7.1	9.6	16.9
16	-0.3	5.3	6.7	9.6
32	-0.3	3.7	4.8	6.8
64	-0.3	2.6	3.4	4.9
128	-0.3	1.8	2.2	2.9
256	-0.2	1.3	1.6	2.0
512	-0.3	0.9	1.1	1.5
1,024	-0.3	0.6	0.8	1.1
2,048	-0.2	0.5	0.6	0.7
4,096	-0.2	0.3	0.4	0.5
8,192	-0.2	0.2	0.3	0.4
16,384	-0.3	0.2	0.2	0.2

**Table 10 (\$3.10/day 2011 PPP line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	1.7	0.1	98.3	98.3	-95.3
≤9	0.2	1.5	0.4	98.0	98.1	-55.4
≤14	0.7	1.0	1.8	96.5	97.2	-7.5
≤19	1.1	0.5	6.0	92.3	93.5	-256.3
≤24	1.4	0.3	12.7	85.6	87.0	-658.4
≤29	1.6	0.1	22.3	76.0	77.6	-1,225.5
≤34	1.7	0.0	32.4	65.9	67.5	-1,830.5
≤39	1.7	0.0	46.4	52.0	53.6	-2,657.7
≤44	1.7	0.0	57.1	41.2	42.9	-3,299.2
≤49	1.7	0.0	64.8	33.5	35.2	-3,753.6
≤54	1.7	0.0	69.7	28.7	30.3	-4,044.4
≤59	1.7	0.0	72.8	25.5	27.2	-4,233.0
≤64	1.7	0.0	74.0	24.4	26.0	-4,300.3
≤69	1.7	0.0	74.4	23.9	25.6	-4,326.1
≤74	1.7	0.0	74.6	23.7	25.4	-4,337.7
≤79	1.7	0.0	74.7	23.7	25.3	-4,342.0
≤84	1.7	0.0	74.7	23.6	25.3	-4,343.0
≤89	1.7	0.0	74.7	23.6	25.3	-4,343.0
≤94	1.7	0.0	74.7	23.6	25.3	-4,343.0
≤100	1.7	0.0	98.3	0.0	1.7	-5,749.7

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

**Table 11 (\$3.10/day 2011 PPP line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample**

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	18.7	0.7	0.2:1
≤9	0.6	34.0	11.3	0.5:1
≤14	2.5	28.4	42.6	0.4:1
≤19	7.1	16.1	68.2	0.2:1
≤24	14.2	10.1	85.1	0.1:1
≤29	23.9	6.7	95.1	0.1:1
≤34	34.1	4.9	98.7	0.1:1
≤39	48.0	3.5	100.0	0.0:1
≤44	58.8	2.9	100.0	0.0:1
≤49	66.5	2.5	100.0	0.0:1
≤54	71.3	2.4	100.0	0.0:1
≤59	74.5	2.3	100.0	0.0:1
≤64	75.6	2.2	100.0	0.0:1
≤69	76.1	2.2	100.0	0.0:1
≤74	76.3	2.2	100.0	0.0:1
≤79	76.3	2.2	100.0	0.0:1
≤84	76.4	2.2	100.0	0.0:1
≤89	76.4	2.2	100.0	0.0:1
≤94	76.4	2.2	100.0	0.0:1
≤100	100.0	1.7	100.0	0.0:1

**Tables for  
the \$3.80/day 2011 PPP Poverty Line**

**Table 4 (\$3.80/day 2011 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	82.9
5-9	65.0
10-14	41.5
15-19	26.5
20-24	11.2
25-29	4.1
30-34	1.7
35-39	0.9
40-44	0.5
45-49	0.1
50-54	0.1
55-59	0.1
60-64	0.1
65-69	0.1
70-74	0.1
75-79	0.1
80-84	0.1
85-89	0.1
90-94	0.1
95-100	0.1

**Table 6 (\$3.80/day 2011 PPP line): Average differences between estimated and true poverty likelihoods for households by score range, with confidence intervals, from 1,000 bootstraps of  $n = 16,384$ , scorecard applied to the validation sample**

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0-4	+69.4	15.4	17.4	24.7
5-9	+11.2	10.5	12.5	16.7
10-14	-10.8	8.1	8.4	9.6
15-19	+0.2	3.2	3.9	4.9
20-24	+0.2	1.8	2.2	2.8
25-29	-2.9	2.1	2.2	2.5
30-34	-1.9	1.5	1.6	1.8
35-39	-0.1	0.5	0.5	0.8
40-44	+0.2	0.2	0.2	0.2
45-49	+0.1	0.0	0.0	0.0
50-54	+0.1	0.0	0.0	0.0
55-59	+0.1	0.0	0.0	0.0
60-64	+0.1	0.0	0.0	0.0
65-69	+0.1	0.0	0.0	0.0
70-74	+0.1	0.0	0.0	0.0
75-79	+0.1	0.0	0.0	0.0
80-84	+0.1	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	-0.1	0.1	0.1	0.2

**Table 7 (\$3.80/day 2011 PPP line): Average differences between estimated poverty rates and true values for a group at a point in time by sample size, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample**

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	-0.1	5.6	50.0	69.9
4	-0.3	16.2	21.8	34.5
8	-0.2	10.9	14.7	20.6
16	-0.4	7.6	9.0	12.6
32	-0.5	5.3	6.4	8.9
64	-0.5	3.8	4.7	5.9
128	-0.5	2.6	3.1	4.3
256	-0.5	1.9	2.2	2.9
512	-0.5	1.3	1.6	2.1
1,024	-0.5	1.0	1.1	1.5
2,048	-0.5	0.7	0.8	1.1
4,096	-0.5	0.5	0.6	0.8
8,192	-0.5	0.4	0.4	0.5
16,384	-0.5	0.2	0.3	0.4

**Table 10 (\$3.80/day 2011 PPP line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	3.9	0.1	96.0	96.0	-98.0
≤9	0.3	3.7	0.3	95.8	96.0	-79.2
≤14	1.1	2.8	1.4	94.6	95.7	-7.9
≤19	2.1	1.8	5.0	91.1	93.2	-27.0
≤24	2.8	1.1	11.3	84.7	87.6	-188.5
≤29	3.5	0.5	20.4	75.7	79.1	-419.4
≤34	3.7	0.2	30.4	65.7	69.5	-672.5
≤39	3.8	0.1	44.2	51.9	55.7	-1,024.3
≤44	3.9	0.0	54.9	41.1	45.0	-1,297.6
≤49	3.9	0.0	62.6	33.5	37.4	-1,491.9
≤54	3.9	0.0	67.4	28.6	32.5	-1,616.3
≤59	3.9	0.0	70.6	25.5	29.3	-1,696.9
≤64	3.9	0.0	71.7	24.3	28.2	-1,725.7
≤69	3.9	0.0	72.2	23.9	27.8	-1,736.8
≤74	3.9	0.0	72.4	23.7	27.6	-1,741.7
≤79	3.9	0.0	72.4	23.6	27.5	-1,743.5
≤84	3.9	0.0	72.5	23.6	27.5	-1,744.0
≤89	3.9	0.0	72.5	23.6	27.5	-1,744.0
≤94	3.9	0.0	72.5	23.6	27.5	-1,744.0
≤100	3.9	0.0	96.1	0.0	3.9	-2,344.6

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

**Table 11 (\$3.80/day 2011 PPP line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample**

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	18.7	0.3	0.2:1
≤9	0.6	46.6	6.6	0.9:1
≤14	2.5	43.4	27.9	0.8:1
≤19	7.1	30.1	54.6	0.4:1
≤24	14.2	20.0	72.2	0.3:1
≤29	23.9	14.5	88.2	0.2:1
≤34	34.1	11.0	95.4	0.1:1
≤39	48.0	8.0	97.9	0.1:1
≤44	58.8	6.6	99.0	0.1:1
≤49	66.5	5.9	99.0	0.1:1
≤54	71.3	5.5	99.0	0.1:1
≤59	74.5	5.2	99.0	0.1:1
≤64	75.6	5.1	99.0	0.1:1
≤69	76.1	5.1	99.0	0.1:1
≤74	76.3	5.1	99.0	0.1:1
≤79	76.3	5.1	99.0	0.1:1
≤84	76.4	5.1	99.0	0.1:1
≤89	76.4	5.1	99.0	0.1:1
≤94	76.4	5.1	99.0	0.1:1
≤100	100.0	3.9	100.0	0.0:1

**Tables for  
the \$4.00/day 2011 PPP Poverty Line**

**Table 4 (\$4.00/day 2011 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	83.2
5-9	67.0
10-14	46.7
15-19	31.3
20-24	13.4
25-29	6.6
30-34	2.7
35-39	1.5
40-44	0.7
45-49	0.1
50-54	0.1
55-59	0.1
60-64	0.1
65-69	0.1
70-74	0.1
75-79	0.1
80-84	0.1
85-89	0.1
90-94	0.1
95-100	0.1

**Table 6 (\$4.00/day 2011 PPP line): Average differences between estimated and true poverty likelihoods for households by score range, with confidence intervals, from 1,000 bootstraps of  $n = 16,384$ , scorecard applied to the validation sample**

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0–4	+69.7	15.4	17.4	24.7
5–9	+10.6	10.1	12.1	15.5
10–14	–13.6	9.1	9.6	10.5
15–19	–0.6	3.4	4.0	5.2
20–24	–1.0	2.0	2.4	3.2
25–29	–1.9	1.7	1.8	2.1
30–34	–2.5	1.8	2.0	2.1
35–39	+0.1	0.5	0.6	0.8
40–44	+0.4	0.2	0.2	0.3
45–49	+0.1	0.0	0.0	0.0
50–54	+0.1	0.0	0.0	0.0
55–59	+0.1	0.0	0.0	0.0
60–64	+0.1	0.0	0.0	0.0
65–69	+0.1	0.0	0.0	0.0
70–74	+0.1	0.0	0.0	0.0
75–79	+0.1	0.0	0.0	0.0
80–84	+0.1	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	–0.1	0.1	0.1	0.2

**Table 7 (\$4.00/day 2011 PPP line): Average differences between estimated poverty rates and true values for a group at a point in time by sample size, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample**

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	-0.3	23.2	59.0	72.0
4	-0.3	17.7	23.7	35.4
8	0.0	12.0	14.9	22.6
16	-0.3	8.1	9.8	13.4
32	-0.5	5.9	7.4	9.4
64	-0.6	4.3	5.2	6.6
128	-0.5	3.0	3.4	4.5
256	-0.6	2.0	2.4	3.3
512	-0.6	1.5	1.7	2.3
1,024	-0.6	1.0	1.2	1.7
2,048	-0.6	0.8	0.9	1.2
4,096	-0.6	0.5	0.6	0.9
8,192	-0.6	0.4	0.4	0.6
16,384	-0.6	0.3	0.3	0.4

**Table 10 (\$4.00/day 2011 PPP line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	4.9	0.1	95.0	95.0	-98.4
≤9	0.3	4.7	0.3	94.8	95.1	-83.0
≤14	1.3	3.7	1.3	93.8	95.1	-23.3
≤19	2.5	2.4	4.6	90.5	93.0	+6.9
≤24	3.5	1.4	10.7	84.4	87.9	-116.4
≤29	4.3	0.7	19.6	75.5	79.7	-297.3
≤34	4.7	0.3	29.4	65.6	70.3	-496.3
≤39	4.8	0.1	43.2	51.9	56.7	-775.4
≤44	4.9	0.0	53.9	41.1	46.0	-992.8
≤49	4.9	0.0	61.6	33.5	38.4	-1,147.5
≤54	4.9	0.0	66.4	28.6	33.5	-1,246.6
≤59	4.9	0.0	69.6	25.5	30.3	-1,310.9
≤64	4.9	0.0	70.7	24.3	29.2	-1,333.8
≤69	4.9	0.0	71.2	23.9	28.8	-1,342.6
≤74	4.9	0.0	71.4	23.7	28.6	-1,346.5
≤79	4.9	0.0	71.4	23.6	28.5	-1,348.0
≤84	4.9	0.0	71.5	23.6	28.5	-1,348.3
≤89	4.9	0.0	71.5	23.6	28.5	-1,348.3
≤94	4.9	0.0	71.5	23.6	28.5	-1,348.3
≤100	4.9	0.0	95.1	0.0	4.9	-1,826.7

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

**Table 11 (\$4.00/day 2011 PPP line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample**

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	18.7	0.3	0.2:1
≤9	0.6	49.7	5.6	1.0:1
≤14	2.5	49.9	25.5	1.0:1
≤19	7.1	35.6	51.5	0.6:1
≤24	14.2	24.7	70.9	0.3:1
≤29	23.9	17.9	86.6	0.2:1
≤34	34.1	13.7	94.9	0.2:1
≤39	48.0	10.1	98.1	0.1:1
≤44	58.8	8.3	99.2	0.1:1
≤49	66.5	7.4	99.2	0.1:1
≤54	71.3	6.9	99.2	0.1:1
≤59	74.5	6.6	99.2	0.1:1
≤64	75.6	6.5	99.2	0.1:1
≤69	76.1	6.4	99.2	0.1:1
≤74	76.3	6.4	99.2	0.1:1
≤79	76.3	6.4	99.2	0.1:1
≤84	76.4	6.4	99.2	0.1:1
≤89	76.4	6.4	99.2	0.1:1
≤94	76.4	6.4	99.2	0.1:1
≤100	100.0	4.9	100.0	0.1:1

**Tables for  
the First Quintile (20<sup>th</sup> percentile) Poverty Line**

**Table 4 (First quintile (20<sup>th</sup> percentile) line): Estimated poverty likelihoods associated with scores**

If a household's score is . . .	. . . then the likelihood (%) of being below the poverty line is:
0-4	100.0
5-9	93.3
10-14	78.1
15-19	63.4
20-24	47.0
25-29	31.7
30-34	14.6
35-39	8.5
40-44	3.9
45-49	2.0
50-54	1.2
55-59	0.9
60-64	0.9
65-69	0.9
70-74	0.9
75-79	0.9
80-84	0.9
85-89	0.9
90-94	0.9
95-100	0.9

**Table 6 (First quintile (20<sup>th</sup> percentile) line): Average differences between estimated and true poverty likelihoods for households by score range, with confidence intervals, from 1,000 bootstraps of  $n = 16,384$ , scorecard applied to the validation sample**

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0–4	+58.4	26.3	31.1	43.6
5–9	+13.1	7.3	8.5	11.0
10–14	–1.6	3.7	4.4	5.7
15–19	+0.7	3.1	3.8	4.9
20–24	+3.8	2.8	3.3	4.5
25–29	–12.6	7.7	7.9	8.3
30–34	–4.9	3.5	3.7	4.1
35–39	–1.1	1.2	1.4	1.8
40–44	–0.2	0.9	1.1	1.4
45–49	+1.2	0.4	0.5	0.6
50–54	+0.6	0.3	0.4	0.6
55–59	+0.9	0.0	0.0	0.0
60–64	+0.9	0.0	0.0	0.0
65–69	+0.9	0.0	0.0	0.0
70–74	+0.9	0.0	0.0	0.0
75–79	+0.9	0.0	0.0	0.0
80–84	+0.9	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	+0.4	0.1	0.2	0.2

**Table 7 (First quintile (20<sup>th</sup> percentile) line): Average differences between estimated poverty rates and true values for a group at a point in time by sample size, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample**

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	+0.3	57.6	66.2	82.3
4	-0.8	28.5	33.6	49.1
8	-1.0	19.8	24.2	31.1
16	-1.1	13.5	16.6	25.6
32	-1.3	9.9	11.8	15.8
64	-1.3	7.0	8.5	11.8
128	-1.3	4.7	5.7	7.3
256	-1.2	3.4	4.1	5.4
512	-1.2	2.4	2.9	3.7
1,024	-1.2	1.7	2.1	2.9
2,048	-1.2	1.2	1.5	1.9
4,096	-1.2	0.9	1.0	1.3
8,192	-1.1	0.6	0.7	1.0
16,384	-1.1	0.4	0.5	0.7

**Table 10 (First quintile (20<sup>th</sup> percentile) line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	14.9	0.0	85.0	85.1	-99.3
≤9	0.4	14.5	0.2	84.9	85.3	-93.5
≤14	1.8	13.1	0.7	84.4	86.2	-70.8
≤19	4.6	10.3	2.5	82.5	87.1	-21.7
≤24	7.6	7.3	6.6	78.5	86.1	+45.8
≤29	11.0	3.9	12.9	72.2	83.1	+13.5
≤34	12.8	2.1	21.3	63.8	76.5	-43.0
≤39	14.1	0.8	33.9	51.1	65.2	-127.8
≤44	14.5	0.4	44.3	40.8	55.3	-197.2
≤49	14.6	0.3	51.8	33.3	47.8	-247.9
≤54	14.6	0.3	56.7	28.4	43.0	-280.5
≤59	14.6	0.3	59.8	25.2	39.9	-301.7
≤64	14.6	0.3	61.0	24.1	38.7	-309.3
≤69	14.6	0.3	61.4	23.7	38.3	-312.2
≤74	14.6	0.3	61.6	23.5	38.1	-313.6
≤79	14.6	0.3	61.7	23.4	38.0	-314.0
≤84	14.6	0.3	61.7	23.4	38.0	-314.2
≤89	14.6	0.3	61.7	23.4	38.0	-314.2
≤94	14.6	0.3	61.7	23.4	38.0	-314.2
≤100	14.9	0.0	85.1	0.0	14.9	-471.2

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

**Table 11 (First quintile (20<sup>th</sup> percentile) line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample**

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	45.6	0.2	0.8:1
≤9	0.6	72.0	2.7	2.6:1
≤14	2.5	72.7	12.3	2.7:1
≤19	7.1	63.9	30.6	1.8:1
≤24	14.2	53.4	50.8	1.1:1
≤29	23.9	45.9	73.6	0.8:1
≤34	34.1	37.4	85.7	0.6:1
≤39	48.0	29.3	94.4	0.4:1
≤44	58.8	24.7	97.5	0.3:1
≤49	66.5	22.0	98.0	0.3:1
≤54	71.3	20.5	98.3	0.3:1
≤59	74.5	19.6	98.3	0.2:1
≤64	75.6	19.4	98.3	0.2:1
≤69	76.1	19.2	98.3	0.2:1
≤74	76.3	19.2	98.3	0.2:1
≤79	76.3	19.2	98.3	0.2:1
≤84	76.4	19.2	98.3	0.2:1
≤89	76.4	19.2	98.3	0.2:1
≤94	76.4	19.2	98.3	0.2:1
≤100	100.0	14.9	100.0	0.2:1

**Tables for  
the Second Quintile (40<sup>th</sup> percentile) Poverty Line**

**Table 4 (Second quintile (40<sup>th</sup> percentile) 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	96.4
10-14	91.9
15-19	87.9
20-24	76.9
25-29	63.7
30-34	48.2
35-39	33.9
40-44	19.1
45-49	12.2
50-54	5.9
55-59	5.9
60-64	5.9
65-69	5.9
70-74	5.9
75-79	5.9
80-84	5.9
85-89	5.9
90-94	5.9
95-100	5.9

**Table 6 (Second quintile (40<sup>th</sup> percentile) line): Average differences between estimated and true poverty likelihoods for households by score range, with confidence intervals, from 1,000 bootstraps of  $n = 16,384$ , scorecard applied to the validation sample**

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0–4	+36.6	25.4	32.5	37.0
5–9	+1.7	3.5	4.3	5.4
10–14	–3.7	2.6	2.7	2.9
15–19	+0.1	2.0	2.4	3.2
20–24	+1.1	2.3	3.0	3.5
25–29	–5.7	3.9	4.2	4.6
30–34	–2.8	2.6	2.8	3.6
35–39	–0.5	1.9	2.3	3.2
40–44	–3.3	2.6	2.8	3.3
45–49	+2.1	1.7	2.0	2.7
50–54	+2.4	1.0	1.1	1.5
55–59	+5.1	0.4	0.5	0.6
60–64	+5.5	0.4	0.5	0.5
65–69	+5.9	0.0	0.0	0.0
70–74	+5.9	0.0	0.0	0.0
75–79	+5.9	0.0	0.0	0.0
80–84	+5.9	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	+1.6	0.5	0.6	0.8

**Table 7 (Second quintile (40<sup>th</sup> percentile) line): Average differences between estimated poverty rates and true values for a group at a point in time by sample size, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample**

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	-0.5	57.1	75.6	91.0
4	+0.2	33.6	39.9	57.7
8	-0.1	23.2	27.6	36.2
16	+0.1	16.3	19.7	24.8
32	-0.1	11.6	13.7	16.7
64	-0.1	8.2	9.6	11.6
128	-0.2	5.4	6.3	8.7
256	0.0	3.9	4.5	5.8
512	0.0	2.7	3.2	4.1
1,024	-0.1	1.9	2.4	3.2
2,048	-0.1	1.3	1.6	2.2
4,096	-0.1	0.9	1.1	1.5
8,192	-0.1	0.7	0.8	1.1
16,384	-0.1	0.5	0.6	0.8

**Table 10 (Second quintile (40<sup>th</sup> percentile) line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	31.8	0.0	68.1	68.1	-99.6
≤9	0.5	31.4	0.1	68.0	68.5	-96.7
≤14	2.3	29.6	0.2	67.9	70.2	-84.8
≤19	6.3	25.6	0.9	67.3	73.5	-57.9
≤24	11.6	20.3	2.6	65.5	77.1	-19.2
≤29	17.8	14.1	6.1	62.0	79.8	+30.6
≤34	22.6	9.3	11.5	56.6	79.2	+63.9
≤39	27.2	4.7	20.8	47.3	74.5	+34.7
≤44	29.4	2.5	29.4	38.7	68.1	+7.7
≤49	30.1	1.7	36.3	31.8	62.0	-13.8
≤54	30.4	1.5	40.9	27.2	57.6	-28.3
≤59	30.5	1.4	44.0	24.1	54.5	-38.1
≤64	30.5	1.4	45.2	23.0	53.4	-41.6
≤69	30.5	1.4	45.6	22.5	53.0	-43.0
≤74	30.5	1.4	45.8	22.3	52.8	-43.6
≤79	30.5	1.4	45.9	22.3	52.7	-43.8
≤84	30.5	1.4	45.9	22.2	52.7	-43.8
≤89	30.5	1.4	45.9	22.2	52.7	-43.8
≤94	30.5	1.4	45.9	22.2	52.7	-43.8
≤100	31.9	0.0	68.1	0.0	31.9	-113.6

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

**Table 11 (Second quintile (40<sup>th</sup> percentile) line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample**

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	69.5	0.1	2.3:1
≤9	0.6	89.4	1.6	8.5:1
≤14	2.5	91.9	7.3	11.4:1
≤19	7.1	88.0	19.7	7.4:1
≤24	14.2	81.7	36.3	4.5:1
≤29	23.9	74.4	55.7	2.9:1
≤34	34.1	66.2	70.8	2.0:1
≤39	48.0	56.6	85.3	1.3:1
≤44	58.8	50.0	92.1	1.0:1
≤49	66.5	45.4	94.5	0.8:1
≤54	71.3	42.6	95.4	0.7:1
≤59	74.5	40.9	95.6	0.7:1
≤64	75.6	40.3	95.6	0.7:1
≤69	76.1	40.1	95.6	0.7:1
≤74	76.3	40.0	95.6	0.7:1
≤79	76.3	39.9	95.6	0.7:1
≤84	76.4	39.9	95.6	0.7:1
≤89	76.4	39.9	95.6	0.7:1
≤94	76.4	39.9	95.6	0.7:1
≤100	100.0	31.9	100.0	0.5:1

**Tables for  
the Median (50<sup>th</sup> percentile) Poverty Line**

**Table 4 (Median (50<sup>th</sup> percentile) 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	99.3
10-14	96.9
15-19	92.6
20-24	85.9
25-29	75.7
30-34	62.1
35-39	49.5
40-44	33.7
45-49	24.2
50-54	11.8
55-59	9.4
60-64	9.4
65-69	9.4
70-74	9.4
75-79	9.4
80-84	9.4
85-89	9.4
90-94	9.4
95-100	9.4

**Table 6 (Median (50<sup>th</sup> percentile) line): Average differences between estimated and true poverty likelihoods for households by score range, with confidence intervals, from 1,000 bootstraps of  $n = 16,384$ , scorecard applied to the validation sample**

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0–4	+36.6	25.4	32.5	37.0
5–9	+4.6	3.5	4.3	5.4
10–14	–0.1	1.2	1.5	1.9
15–19	–2.9	2.0	2.1	2.3
20–24	–0.5	1.8	2.1	2.8
25–29	–6.5	4.1	4.2	4.6
30–34	–1.6	2.2	2.6	3.2
35–39	–3.5	2.7	2.9	3.3
40–44	–0.7	2.1	2.5	3.5
45–49	+5.4	2.1	2.6	3.2
50–54	+2.5	1.7	2.0	2.8
55–59	+7.8	0.6	0.8	1.0
60–64	+7.8	1.1	1.3	1.6
65–69	+9.4	0.0	0.0	0.0
70–74	+9.4	0.0	0.0	0.0
75–79	+8.1	2.2	2.7	4.9
80–84	+9.4	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	+2.5	0.7	0.8	1.0

**Table 7 (Median (50<sup>th</sup> percentile) line): Average differences between estimated poverty rates and true values for a group at a point in time by sample size, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample**

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	-0.6	64.2	79.1	88.3
4	-0.1	32.8	39.9	53.9
8	-0.1	23.5	27.1	38.4
16	+0.3	15.9	19.1	25.4
32	+0.2	11.7	14.2	18.9
64	+0.2	8.4	10.2	12.8
128	+0.3	5.9	7.1	9.1
256	+0.4	4.1	4.8	6.3
512	+0.4	3.0	3.6	4.6
1,024	+0.3	2.0	2.3	3.2
2,048	+0.3	1.5	1.7	2.2
4,096	+0.3	1.0	1.2	1.6
8,192	+0.3	0.7	0.9	1.2
16,384	+0.4	0.5	0.6	0.8

**Table 10 (Median (50<sup>th</sup> percentile) line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	41.6	0.0	58.3	58.4	-99.7
≤9	0.5	41.2	0.1	58.3	58.8	-97.5
≤14	2.4	39.3	0.2	58.2	60.5	-88.3
≤19	6.7	35.0	0.4	57.9	64.6	-66.8
≤24	12.6	29.0	1.5	56.8	69.4	-35.6
≤29	20.2	21.5	3.7	54.7	74.9	+5.8
≤34	26.5	15.2	7.6	50.7	77.2	+45.4
≤39	33.6	8.1	14.4	43.9	77.5	+65.3
≤44	37.1	4.6	21.7	36.6	73.7	+47.9
≤49	38.6	3.1	27.9	30.5	69.1	+33.2
≤54	39.2	2.5	32.1	26.2	65.4	+22.9
≤59	39.3	2.3	35.2	23.1	62.5	+15.6
≤64	39.4	2.3	36.3	22.1	61.4	+13.0
≤69	39.4	2.3	36.7	21.6	61.0	+11.9
≤74	39.4	2.3	36.9	21.4	60.8	+11.5
≤79	39.4	2.3	37.0	21.4	60.7	+11.3
≤84	39.4	2.3	37.0	21.3	60.7	+11.2
≤89	39.4	2.3	37.0	21.3	60.7	+11.2
≤94	39.4	2.3	37.0	21.3	60.7	+11.2
≤100	41.7	0.0	58.3	0.0	41.7	-40.0

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

**Table 11 (Median (50<sup>th</sup> percentile) line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample**

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	69.5	0.1	2.3:1
≤9	0.6	89.4	1.2	8.5:1
≤14	2.5	93.7	5.7	14.8:1
≤19	7.1	93.9	16.1	15.5:1
≤24	14.2	89.2	30.3	8.3:1
≤29	23.9	84.6	48.5	5.5:1
≤34	34.1	77.7	63.6	3.5:1
≤39	48.0	69.9	80.6	2.3:1
≤44	58.8	63.1	89.0	1.7:1
≤49	66.5	58.1	92.6	1.4:1
≤54	71.3	55.0	94.1	1.2:1
≤59	74.5	52.8	94.4	1.1:1
≤64	75.6	52.0	94.5	1.1:1
≤69	76.1	51.7	94.5	1.1:1
≤74	76.3	51.6	94.5	1.1:1
≤79	76.3	51.6	94.5	1.1:1
≤84	76.4	51.6	94.5	1.1:1
≤89	76.4	51.6	94.5	1.1:1
≤94	76.4	51.6	94.5	1.1:1
≤100	100.0	41.7	100.0	0.7:1

**Tables for  
the Third Quintile (60<sup>th</sup> percentile) Poverty Line**

**Table 4 (Third quintile (60<sup>th</sup> percentile) 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	98.8
15-19	95.0
20-24	89.9
25-29	86.2
30-34	74.3
35-39	63.4
40-44	49.7
45-49	36.1
50-54	20.8
55-59	17.4
60-64	17.4
65-69	17.4
70-74	17.4
75-79	17.4
80-84	17.4
85-89	17.4
90-94	17.4
95-100	17.4

**Table 6 (Third quintile (60<sup>th</sup> percentile) line): Average differences between estimated and true poverty likelihoods for households by score range, with confidence intervals, from 1,000 bootstraps of  $n = 16,384$ , scorecard applied to the validation sample**

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0–4	+36.6	25.4	32.5	37.0
5–9	+2.7	2.4	3.1	3.8
10–14	0.0	0.8	0.9	1.2
15–19	–2.5	1.7	1.8	1.9
20–24	–1.0	1.5	1.8	2.4
25–29	–3.6	2.4	2.6	2.8
30–34	–1.3	1.9	2.3	3.2
35–39	–3.0	2.5	2.6	3.0
40–44	–0.9	2.2	2.6	3.5
45–49	–0.8	3.1	3.7	4.9
50–54	–0.9	2.7	3.2	4.4
55–59	+11.7	1.5	1.8	2.4
60–64	+14.5	1.4	1.7	2.2
65–69	+16.2	1.5	1.7	2.1
70–74	+17.4	0.0	0.0	0.0
75–79	+16.1	2.2	2.7	4.9
80–84	+17.4	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	+4.4	1.0	1.2	1.6

**Table 7 (Third quintile (60<sup>th</sup> percentile) line): Average differences between estimated poverty rates and true values for a group at a point in time by sample size, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample**

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	-2.5	73.0	78.5	86.3
4	-0.3	33.3	41.3	55.1
8	0.0	23.5	29.5	42.0
16	+0.6	18.3	22.8	30.1
32	+0.6	13.6	15.7	20.3
64	+0.8	9.4	11.7	16.0
128	+0.9	6.7	7.7	10.6
256	+0.9	4.7	5.4	7.3
512	+0.9	3.2	3.9	5.1
1,024	+0.9	2.2	2.6	3.7
2,048	+0.9	1.6	1.9	2.6
4,096	+0.9	1.1	1.3	1.8
8,192	+0.9	0.8	1.0	1.2
16,384	+0.9	0.6	0.7	0.9

**Table 10 (Third quintile (60<sup>th</sup> percentile) line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.0	51.5	0.0	48.4	48.5	-99.8
≤9	0.5	51.0	0.0	48.4	48.9	-97.9
≤14	2.4	49.1	0.1	48.4	50.8	-90.4
≤19	6.9	44.7	0.2	48.2	55.1	-72.8
≤24	13.2	38.3	0.9	47.5	60.8	-46.8
≤29	21.7	29.8	2.2	46.3	68.0	-11.6
≤34	29.3	22.3	4.8	43.6	72.9	+22.9
≤39	38.3	13.3	9.7	38.7	77.0	+67.4
≤44	43.5	8.0	15.3	33.2	76.7	+70.4
≤49	46.0	5.5	20.4	28.0	74.0	+60.4
≤54	47.2	4.3	24.1	24.4	71.6	+53.3
≤59	47.5	4.0	26.9	21.5	69.0	+47.7
≤64	47.6	3.9	28.0	20.4	68.0	+45.7
≤69	47.6	3.9	28.4	20.0	67.6	+44.8
≤74	47.6	3.9	28.6	19.8	67.4	+44.5
≤79	47.6	3.9	28.7	19.7	67.4	+44.3
≤84	47.6	3.9	28.7	19.7	67.3	+44.3
≤89	47.6	3.9	28.7	19.7	67.3	+44.3
≤94	47.6	3.9	28.7	19.7	67.3	+44.3
≤100	51.5	0.0	48.4	0.0	51.5	+6.0

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

**Table 11 (Third quintile (60<sup>th</sup> percentile) line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample**

Targeting cut-off	% all HHs who are targeted	% targeted HHs who are poor	% poor HHs who are targeted	Poor HHs targeted per non-poor HH targeted
≤4	0.1	69.5	0.1	2.3:1
≤9	0.6	92.5	1.0	12.3:1
≤14	2.5	96.6	4.7	28.1:1
≤19	7.1	96.6	13.4	28.2:1
≤24	14.2	93.4	25.7	14.2:1
≤29	23.9	90.9	42.1	10.0:1
≤34	34.1	85.8	56.8	6.1:1
≤39	48.0	79.7	74.2	3.9:1
≤44	58.8	74.0	84.4	2.8:1
≤49	66.5	69.3	89.3	2.3:1
≤54	71.3	66.2	91.6	2.0:1
≤59	74.5	63.8	92.2	1.8:1
≤64	75.6	62.9	92.4	1.7:1
≤69	76.1	62.6	92.4	1.7:1
≤74	76.3	62.4	92.4	1.7:1
≤79	76.3	62.4	92.4	1.7:1
≤84	76.4	62.4	92.4	1.7:1
≤89	76.4	62.4	92.4	1.7:1
≤94	76.4	62.4	92.4	1.7:1
≤100	100.0	51.5	100.0	1.1:1

**Tables for  
the Fourth Quintile (80<sup>th</sup> percentile) Poverty Line**

**Table 4 (Fourth quintile (80<sup>th</sup> percentile) 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	99.7
15-19	98.4
20-24	97.8
25-29	96.6
30-34	93.5
35-39	87.3
40-44	82.4
45-49	68.3
50-54	54.4
55-59	47.7
60-64	40.4
65-69	40.4
70-74	40.4
75-79	40.4
80-84	40.4
85-89	40.4
90-94	40.4
95-100	40.4

**Table 6 (Fourth quintile (80<sup>th</sup> percentile) line): Average differences between estimated and true poverty likelihoods for households by score range, with confidence intervals, from 1,000 bootstraps of  $n = 16,384$ , scorecard applied to the validation sample**

Score	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
0–4	0.0	0.0	0.0	0.0
5–9	0.0	0.0	0.0	0.0
10–14	–0.1	0.3	0.3	0.4
15–19	–0.8	0.6	0.7	0.8
20–24	–1.0	0.7	0.7	0.8
25–29	–1.6	1.1	1.1	1.2
30–34	+0.2	1.1	1.3	1.8
35–39	–1.3	1.3	1.5	1.8
40–44	+2.4	1.7	2.0	2.9
45–49	+1.2	2.7	3.2	4.2
50–54	–14.4	8.8	9.1	9.5
55–59	+1.2	4.9	5.7	7.6
60–64	+7.6	6.2	7.3	9.9
65–69	+26.2	6.2	7.6	10.0
70–74	+39.7	1.2	1.4	2.0
75–79	+5.9	24.4	29.7	38.6
80–84	+40.4	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	+1.9	1.6	1.9	2.5

**Table 7 (Fourth quintile (80<sup>th</sup> percentile) line): Average differences between estimated poverty rates and true values for a group at a point in time by sample size, with confidence intervals, for 1,000 bootstraps of various sample sizes, scorecard applied to the validation sample**

Sample Size <i>n</i>	Difference between estimate and true value			
	Diff.	Confidence interval ( $\pm$ percentage points)		
		90-percent	95-percent	99-percent
1	-2.1	63.9	73.4	76.5
4	+0.4	36.9	41.8	52.7
8	-0.1	27.5	31.8	40.3
16	-0.1	20.2	23.3	31.8
32	+0.2	14.7	17.0	21.3
64	+0.2	9.9	11.7	15.7
128	+0.2	7.6	8.8	11.9
256	+0.1	5.2	6.2	8.2
512	+0.1	3.8	4.4	6.0
1,024	+0.2	2.7	3.2	4.2
2,048	+0.2	1.8	2.2	3.0
4,096	+0.2	1.3	1.6	2.0
8,192	+0.2	0.9	1.1	1.4
16,384	+0.2	0.7	0.8	1.0

**Table 10 (Fourth quintile (80<sup>th</sup> percentile) line): Percentages of households by cut-off score and targeting classification, along with the hit rate and BPAC, scorecard applied to the validation sample**

Score	<u>Inclusion:</u>	<u>Undercoverage:</u>	<u>Leakage:</u>	<u>Exclusion:</u>	<u>Hit rate</u>	<u>BPAC</u>
	< poverty line correctly targeted	< poverty line mistakenly non-targeted	≥ poverty line mistakenly targeted	≥ poverty line correctly non-targeted	Inclusion + Exclusion	See text
≤4	0.1	73.5	0.0	26.4	26.5	-99.8
≤9	0.6	73.0	0.0	26.4	27.0	-98.5
≤14	2.5	71.1	0.0	26.4	28.9	-93.2
≤19	7.1	66.5	0.1	26.4	33.4	-80.7
≤24	14.0	59.6	0.2	26.2	40.2	-61.7
≤29	23.5	50.1	0.4	26.0	49.4	-35.7
≤34	32.9	40.7	1.2	25.2	58.1	-8.9
≤39	45.1	28.5	2.9	23.5	68.6	+26.6
≤44	53.6	20.0	5.2	21.2	74.8	+52.8
≤49	58.7	14.9	7.8	18.6	77.3	+70.0
≤54	61.7	11.9	9.6	16.8	78.5	+80.8
≤59	63.1	10.5	11.4	15.0	78.0	+84.4
≤64	63.5	10.1	12.2	14.2	77.7	+83.5
≤69	63.5	10.0	12.5	13.9	77.4	+83.0
≤74	63.6	10.0	12.7	13.7	77.3	+82.7
≤79	63.6	10.0	12.8	13.7	77.2	+82.7
≤84	63.6	10.0	12.8	13.6	77.2	+82.6
≤89	63.6	10.0	12.8	13.6	77.2	+82.6
≤94	63.6	10.0	12.8	13.6	77.2	+82.6
≤100	73.6	0.0	26.4	0.0	73.6	+64.1

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

**Table 11 (Fourth quintile (80<sup>th</sup> percentile) line): Share of all households who are targeted (that is, score at or below a cut-off), the share of targeted households who are poor (that is, have consumption below the poverty line), the share of poor households who are targeted, and the number of poor households who are successfully targeted (inclusion) per non-poor household mistakenly targeted (leakage), scorecard applied to the validation sample**

<b>Targeting cut-off</b>	<b>% all HHs who are targeted</b>	<b>% targeted HHs who are poor</b>	<b>% poor HHs who are targeted</b>	<b>Poor HHs targeted per non-poor HH targeted</b>
≤4	0.1	100.0	0.1	Only poor targeted
≤9	0.6	100.0	0.8	Only poor targeted
≤14	2.5	99.7	3.4	322.7:1
≤19	7.1	99.3	9.6	139.1:1
≤24	14.2	98.7	19.0	74.3:1
≤29	23.9	98.2	31.9	55.2:1
≤34	34.1	96.5	44.7	27.5:1
≤39	48.0	93.9	61.3	15.4:1
≤44	58.8	91.2	72.9	10.3:1
≤49	66.5	88.3	79.7	7.5:1
≤54	71.3	86.5	83.8	6.4:1
≤59	74.5	84.6	85.7	5.5:1
≤64	75.6	83.9	86.2	5.2:1
≤69	76.1	83.5	86.4	5.1:1
≤74	76.3	83.3	86.4	5.0:1
≤79	76.3	83.3	86.4	5.0:1
≤84	76.4	83.3	86.4	5.0:1
≤89	76.4	83.3	86.4	5.0:1
≤94	76.4	83.3	86.4	5.0:1
≤100	100.0	73.6	100.0	2.8:1