Simple Poverty Scorecard® Tool
Paraguay

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The Scorocs Simple Poverty Scorecard-brand poverty-assessment tool is a low-cost, transparent way for pro-poor programs in Paraguay to get to know their participants better so as to prove and improve their social performance. Responses to the scorecard's 10 questions can be used to:

— Check poverty rates and numbers of poor people among in-coming participants
— Track changes in poverty among on-going participants
— Segment participants for differentiated treatment based on poverty

Version note
The new scorecard for Paraguay is based on data from 2019. It replaces the old scorecard in **Schreiner** (2012a) based on data from 2011. Paraguay changed its definition of *poverty* between 2011 and 2019, so estimates of changes should use a single scorecard at both baseline and follow-up, not the old scorecard at baseline and the new scorecard at follow-up.

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Scorocs® Simple Poverty Scorecard® Tool

Interview ID: _____	**Name**	**Identifier**
Interview date: _____	Direct participant: _____	_____
Country: PRY	Field agent: _____	_____
Scorecard: 002	Service point: _____	
Sampling weight: _____	Number of household members: _____	

Question	Response		Points
1. In which department does the household live?	A. Alto Paraná		0
	B. Itapúa, or Caaguazú		1
	C. Central, or Caazapá		2
	D. Amambay, Canindeyú, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, or Presidente Hayes (excludes Alto Paraguay and Boquerón)		3
	E. Asunción, or San Pedro		4
2. How many members does the household have? (*Based on the **Back-page Worksheet***)	A. Six or more		0
	B. Five		5
	C. Four		11
	D. Three		17
	E. Two		27
	F. One		37
3. In the last 7 days, how many household members 10-years-old or older did any type of work, be it as an employee, in self-employment, as a business owner with employees, or as an unremunerated worker in a family business? (*Based on the **Back-page Worksheet***)	A. None		0
	B. One		2
	C. Two		8
	D. Three or more		15
4. Among those household members who worked, how many were wage/salary workers or owners of a business with employees? (*Based on the **Back-page Worksheet***)	A. None		0
	B. One		7
	C. Two or more		14
5. What language does the female head (or spouse of the male head) usually speak at home?	A. Only Guaraní, or does not speak		0
	B. Guaraní and Spanish		2
	C. No female head nor spouse of male head		4
	D. Only Spanish, or other		5
6. What is the main material of the floor of the residence?	A. Dirt		0
	B. Cement (*lecherada*)		3
	C. Bricks, or wood		4
	D. Tile (ordinary, mosaic, or ceramic), polished stone, marble, granite, hardwoods, carpet, linoleum, or other		5
7. Where does human waste from the bathroom drain?	A. Simple pit latrine (*pozo seco*) of any kind, open pit, ditch, creek, river, on the ground, or other		0
	B. Closed pit latrine (*pozo ciego*) without septic tank		2
	C. Closed pit latrine (*pozo ciego*) with septic tank, or sanitary sewer system		4
8. What is the main cooking fuel used by the household?	A. Firewood, or charcoal		0
	B. LPG, electricity, kerosene, alcohol, other, or none (does not cook)		4
9. Does the household have a clothes-washing machine?	A. No		0
	B. Yes		3
10. Does the household have a motorcycle, automobile, truck, or pick-up?	A. No		0
	B. Only motorcycle		2
	C. Automobile, truck, or pick-up (regardless of motorcycle)		9

Copyright © 2023 Scorocs.   **Score:** _____

Back-page Worksheet

Members of the Household and Their Employment Status

Fill out the scorecard header first. Include the interview's unique identifier (if known), the interview date, and the sampling weight of the participating household (if known). Then record the full name and the unique identification number of the direct participant (who may differ from the respondent), of the direct participant's field agent (who may differ from you the enumerator), and of the service point that the direct participant uses (if any and if known). Circle the response to the first scorecard question based on the department in which the participating household lives.

Then read to the respondent: *Please tell me the first name (or nickname) and age of each household member, starting with the head of the household and his/her spouse (if any). A* household *is a group of people, regardless of blood or marital relationships, who usually live together and who together fulfill their basic needs and eat from a common pot.*

Write down the name of each member, beginning with the head and his/her spouse (if there is one). Mark the head and his/her spouse (if there is one). Record the number of household members in the scorecard header next to "Number of household members:". Then circle the response to the second scorecard question about the number of household members.

For each household member 10-years-old or older, ask: "In the past 7 days, did [NAME] do any type of work, be it as an employee, in self-employment, as a business owner with employees, or as an unremunerated worker in a family business?" Then for each member who worked, ask: "Was [NAME] a wage/salary worker or the owner of a business with employees?" When finished, circle the responses to the third scorecard question about the number of workers and to the fourth scorecard question about the number of wage/salary workers and employers.

Read the remaining six questions aloud. Always keep in mind and apply the detailed instructions in the **Interview Guide**.

First name or nickname?	Age	Head or spouse of head?	If [NAME} is at least 10-years-old, then in the past 7 days did he/she do any type of work, be it as an employee, in self-employment, as a business owner with employees, or as an unremunerated worker in a family business?			If [NAME] worked, then was he/she a wage/salary worker or the owner of a business with employees?		
1.		Head (male) Head (female)	<10	No	Yes	<10 or did not work	No	Yes
2.		Wife of male head Husband of female head Other	<10	No	Yes	<10 or did not work	No	Yes
3.		Other	<10	No	Yes	<10 or did not work	No	Yes
4.		Other	<10	No	Yes	<10 or did not work	No	Yes
5.		Other	<10	No	Yes	<10 or did not work	No	Yes
6.		Other	<10	No	Yes	<10 or did not work	No	Yes
7.		Other	<10	No	Yes	<10 or did not work	No	Yes
8.		Other	<10	No	Yes	<10 or did not work	No	Yes
9.		Other	<10	No	Yes	<10 or did not work	No	Yes
10.		Other	<10	No	Yes	<10 or did not work	No	Yes
# members:	—	—	**# workers**:			**# wage/salary workers or employers**:		

Figure 1: Conversion of scores to poverty likelihoods

| | Poverty likelihood (%) | | | | | | | | | | | | | |
| | National | | | Intl. 2011 PPP | | | | Percentile-based lines | | | | | | |
Score	100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
0–20	91.8	99.2	99.6	12.5	36.6	86.8	100.0	62.9	89.6	98.8	99.2	100.0	100.0	100.0
21–24	78.4	97.4	98.5	1.6	23.2	60.2	99.8	39.8	68.2	97.3	97.4	98.7	100.0	100.0
25–28	67.8	93.3	98.4	0.7	10.5	48.2	99.7	25.9	58.9	87.8	95.4	98.4	100.0	100.0
29–31	58.3	90.6	96.2	0.7	8.3	38.8	99.1	21.2	49.8	84.9	93.3	96.6	99.3	99.7
32–34	45.2	82.5	90.7	0.3	6.8	26.5	98.2	15.8	34.3	75.6	86.9	91.8	98.2	99.2
35–37	40.2	74.7	89.3	0.3	5.2	20.3	98.1	13.3	33.3	66.6	82.9	90.4	98.1	99.1
38–39	28.7	68.5	84.4	0.1	1.8	15.9	98.1	7.5	21.9	62.6	78.6	86.0	98.1	99.0
40–41	22.1	54.2	78.0	0.1	0.8	12.1	95.8	4.0	18.7	49.3	66.7	80.4	96.7	99.0
42–43	17.6	54.2	78.0	0.1	0.8	8.5	95.7	2.3	13.4	49.3	66.7	80.4	96.7	99.0
44–45	13.3	48.1	71.8	0.1	0.8	6.0	93.3	2.3	10.3	43.9	60.8	73.8	93.3	97.3
46–47	12.9	34.9	57.7	0.1	0.8	6.0	88.7	2.0	9.7	32.9	45.2	60.7	89.0	95.2
48–49	9.5	33.0	56.0	0.1	0.8	5.0	85.3	2.0	7.4	29.9	42.5	57.9	85.5	94.3
50–51	5.1	29.4	53.9	0.1	0.8	3.8	81.1	2.0	4.4	24.3	38.7	54.4	83.4	92.2
52–53	4.8	19.3	41.2	0.0	0.8	3.0	73.5	1.6	4.2	14.1	28.5	42.4	75.4	89.7
54–55	1.8	12.1	38.4	0.0	0.2	0.3	66.7	0.2	0.7	9.5	21.1	39.9	68.4	88.2
56–57	1.3	6.5	24.4	0.0	0.2	0.3	62.0	0.2	0.4	5.4	11.7	28.0	67.2	82.0
58–59	0.5	6.0	18.3	0.0	0.2	0.3	55.5	0.2	0.4	5.1	9.4	18.5	56.1	80.0
60–62	0.5	4.2	12.6	0.0	0.1	0.2	51.5	0.1	0.3	4.0	6.9	14.1	52.9	78.3
63–66	0.2	1.3	8.0	0.0	0.0	0.0	34.6	0.0	0.0	1.0	3.2	8.3	35.7	63.3
67–100	0.0	0.4	2.2	0.0	0.0	0.0	17.9	0.0	0.0	0.2	1.2	2.6	18.4	46.7

Figure 2: Errors in estimated snapshot head-count poverty rates in a single time period, along with margins of error and the α factor for finding margins of error and sample sizes

| | Poverty lines | | | | | | | | | | | | | |
| | National | | | Intl. 2011 PPP | | | | Percentile-based lines | | | | | | |
	100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
Estimation error	+2.1	+0.2	−2.1	+0.2	+0.5	+0.6	−3.3	−1.3	+1.7	+1.0	+0.4	−3.0	−2.9	−2.4
Margin of error	2.0	2.5	2.3	0.5	1.1	1.8	1.8	1.7	1.9	2.5	2.3	2.2	1.8	1.2
α factor	0.94	0.95	0.93	1.11	1.07	0.99	0.85	1.07	0.94	0.99	0.94	0.91	0.84	0.77

Estimation errors from the scorecard with 1,000 bootstrap samples of n = 16,384 households from the validation sample.
Estimation errors are average differences between estimates and observed values, in percentage points.
Margins of error are ± percentage points with 90-percent confidence for samples of n = 1,024.
α is an average across 1,000 bootstrap samples of n = 256, 512, 1,024, 2,048, 4,096, 8,192, and 16,384.

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Paraguay

1. Introduction

The Scorocs Simple Poverty Scorecard-brand poverty-assessment tool for Paraguay is a low-cost, transparent way for pro-poor programs to get know their participants better so as to prove and improve their social performance.

1.1 Questions addressed by the scorecard

To address the question of "How many poor people does our program attract?", the scorecard can take a snapshot in a single time period with a census or a sample of in-coming households to estimate both head-count poverty rates and the number of poor people.

To address the question of "How has poverty changed for on-going participants?", the scorecard can be applied across two time periods with samples from a given population of on-going participants to estimate both net annual changes in head-count poverty rates and net annual changes in the number of poor people.

The scorecard can also be used for targeting, that is, to segment participants for differentiated treatment based on poverty.

It is difficult and costly for pro-poor programs to address these questions with the traditional direct approach to poverty assessment via income surveys. A case in point is the 2019 Permanent, Continuous Household Survey (*Encuesta Permanente de Hogares Continua*, EPHC) by Paraguay's Dirección General de Estadística, Encuestas, y Censos (DGEEC). The 2019 EPHC has about 40 pages and asks more than 350 top-level questions, many of which have several follow-up questions or are repeated (for example, for each household member, source of income, parcel of land, or crop).[1]

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[1] The EPHC questionnaire states that the interview somehow lasts only 40 minutes. Enumerators are expected to complete 4 interviews per day.

1.2 How the scorecard works

The scorecard has 10 factual questions that are drawn from the exhaustive 2019 EPHC. Examples include: "What is the main cooking fuel used by the household?" and "Does the household have a clothes-washing machine?".

The 10 questions are selected to be:

- Inexpensive to collect, easy to answer quickly, and straightforward to verify
- Strongly and intuitively linked with poverty
- Liable to change over time as poverty changes
- Applicable in all departments of Paraguay[2]

Each question has multiple-choice response options, with points assigned to each possible response. The points are zeroes or positive whole numbers. The points are derived from the statistical links between responses and income-based poverty in the 2019 EPHC.

Adding up the points for a given household gives a *score* that ranges from 0 to 100. The lower the score, the poorer the household.

An enumerator can interview a household, record its responses on paper or with a **data-collection app**, and add up the household's score (if needed for on-the-spot segmentation) in about ten minutes.[3]

Back at the office or in the cloud, a household's score is converted into an estimated probability (the *poverty likelihood*) that the household is poor for a given poverty line. The links between scores and poverty likelihoods are based on EPHC data.

The average of poverty likelihoods across the members of sampled households is an estimate of the head-count poverty rate among people in the sampled population.

This estimated poverty rate may then be used to estimate:

- The number of poor people in in-coming households in a single time period
- The net number of poor people in households of on-going participants who rise above a poverty line across two time periods

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[2] Except Alto Paraguay and Boquerón, which are not included in the 2019 EPHC.

[3] Responses on paper are entered in a spreadsheet or database later at an office.

1.3 Targeting

The scorecard can also be used to segment participating households for differentiated services. Unlike some other targeting tools—such as the World Bank's "proxy-means tests"[4]—the scorecard is transparent, freely available,[5] and tailored to the capabilities and purposes not of national governments but rather of local pro-poor programs. The feasible poverty-assessment tools for such programs are typically blunt (such as rules based on land ownership or housing quality) or subjective and relative (such as community-based, participatory wealth ranking facilitated by skilled field workers). Poverty assessments based on these approaches may be costly, their accuracy is unknown, and they are not comparable across places, programs, nor time.

1.4 Income-based poverty

Paraguay's scorecard is a quantitative way to assess whether a program's participants have income below any of 14 poverty lines, for example:

- Paraguay's official national line of PGY20,324 per person per day, giving a country-wide head-count poverty rate of 23.5 percent in 2019
- The World Bank's "international upper-middle-income poverty line" of $5.50 per person per day 2011 PPP (PGY16,503), giving a poverty rate of 16.1 percent

A program uses only the poverty line(s) that fit its context and mission. For example, a program may report poverty estimates to funders based on a World-Bank international line while internally using a national line or percentile-based line.

1.5 Transparency

The scorecard's design aims to make its workings clear to program managers. The tool's adoption stems from the low cost of its short interviews and from the fact that managers can see for themselves how the scorecard works and that its approach makes sense. Similar tools have been around for decades, but pro-poor programs have rarely used them. This is not because these tools are inaccurate, but because *how* they work is unclear or hidden.

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[4] **Coady, Grosh, and Hoddinott**, 2004.
[5] Paraguay's scorecard is not in the public domain; it is copyright © 2023 Scorocs.

When scorecard projects fail, the cause is not usually inaccuracy but rather a program's failure to commit to the work-a-day project management needed to integrate the scorecard in the program's processes and to train and convince employees to use the tool properly.[6] For tool-based estimates of social outcomes such as poverty, data scientists have long known that there is almost no trade-off between the straightforward and transparent versus the complex and opaque.[7] Project risk is less technical and more human, not statistics but organizational-change management.

1.6 Assumptions and estimation errors

Like all predictive tools, the scorecard makes two fundamental assumptions:

- The scored sample is representative of the same population as that whose data was used to construct the scorecard
- The links between responses and poverty are the same in the scored sample as in the population whose data was used to construct the scorecard

Of course, the assumptions do not hold to some unknown degree.[8] In particular:

- A given program's participants will not be representative of all-Paraguay
- Over time, the links between responses and poverty drift or shift

Scorecard estimates have errors because the scorecard incorrectly acts as if the links between responses and poverty in all scored samples and in all time periods are the same as in the construction data from the 2019 EPHC. Reality diverges further from assumptions as:

- More time passes since the collection of construction data
- A program's participants differ from the country's general population
- Attrition has changed the composition of a cohort of on-going participants
- Change has been rapid (say, due to war, plague, or changes in the program itself)[9]

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[6] **Schreiner**, 2002.

[7] **Dupriez**, 2018; **Caire and Schreiner**, 2012; **Schreiner**, 2012b; **Hand**, 2006; **Lovie and Lovie**, 1986; **Kolesar and Showers**, 1985; **Stillwell, Barron, and Edwards**, 1983; **Dawes**, 1979; **Wainer**, 1976; **Myers and Forgy**, 1963.

[8] **Diamond** *et al.*, 2016; **Tarozzi and Deaton**, 2009.

[9] For example, the 2020 economic downturn due to COVID–19 changed the links between poverty and questions, but the Paraguay scorecard still uses 2019 links.

For any particular scorecard and scored sample, the estimation error due to migration away from the assumptions is unknown. It is known, however, that the scorecard's targeting is robust. That is, the extent to which assumptions diverge from reality is not strongly linked with the extent to which the scorecard gives lower scores to more-poor households and higher scores to less-poor households. It is also known that the scorecard's estimation errors are larger when estimating changes in poverty across two periods (or across two scorecards) than when estimating poverty in one period.

There are no rules nor formulas that automatically signal when estimation error is too large for estimates to be useful. Program managers must make their own judgments based on common sense and on what they know about their context and their participants from non-scorecard sources.

In practice, scorecard estimates often serve as a basic check on whether a pro-poor program is indeed *pro-poor*. The estimates address existential questions such as:

- "How many in-coming participants are below the national poverty line?"
- "Are in-coming participants poorer than the average person in the area where we work?"
- "Are our poor participants more likely to rise above a poverty line than the average poor person in the area where we work?"

For such existential checks on whether a program lives out its purported social mission, estimation errors will often be small enough to be immaterial.

1.7 Estimation errors when assumptions hold

If the scorecard's assumptions do hold, then the scorecard estimators are statistically *unbiased*. That is, the true value in the population matches the average of estimates from repeated samples.

The assumptions do hold when the scorecard is tested against households in the validation sample from the 2019 EPHC that is not used to construct the scorecard. Smaller errors in this ideal case imply smaller-than-otherwise errors in real-world use.

Even so, there are estimation errors on average in the validation sample because there is only one scorecard, and it is derived from one construction sample and applied to a single validation sample. **Figure 2** documents the error for snapshot estimates of poverty rates in one time period, allowing scorecard users to adjust for this error.

1.8 What is next?

After **Section 5**, the **Interview Guide** tells how to ask questions—and how to interpret responses—so as to mimic practice in Paraguay's 2019 EPHC as closely as possible. The **Interview Guide** (and the **Back-page Worksheet** are integral parts of the scorecard. Do not ignore them.

The annexes provide details for advanced users:

Details on cited **References** appear at the end.

2. How to convert responses to poverty likelihoods

This section tells how to:

- Collect a household's responses to scorecard questions
- Convert responses to points
- Add up points to get scores
- Convert scores to poverty likelihoods

The next section tells how to combine poverty likelihoods from a sample of households to estimate poverty.

2.1 Instructions for enumerators

An *enumerator* asks a scorecard's questions to a respondent and then records the responses. An enumerator may or may not be same as the program's field agent (if any) who is associated with a participating household.

Enumerators should interview a sampled household at the household's residence using a **data-collection app** or a paper scorecard along with the **Back-page Worksheet**. Following the **Interview Guide**, enumerators should:

- Record administrative information in the scorecard header:
  — Interview identifier (if known)
  — Interview date (required)
  — Country code ("PRY", pre-filled)
  — Scorecard code ("002", pre-filled)
  — Sampling weight assigned to the household by the survey design (if any and if known)
- Record names and identifiers (if known) in the scorecard header:
  — *Direct participant*. This is the household member who directly interacts with the pro-poor program. He/she may or may not be the same as the respondent who answers the scorecard questions. For example, a direct participant with a microfinance program is a borrower or a saver, and a direct participant with a child-health program is a child's parent or guardian
  — *Field agent* (if there is one). This is the direct participant's main, repeated point of contact with the program. The field agent may or may not be the same as the enumerator. For example, the field agent in a microfinance program is a loan officer or savings collector, and the field agent in a child-health program is a community health-care worker

- *Service point* (if there is one). This is the program office that is relevant to the direct participant. The service point is usually the base of operations of the direct participant's field agent (if there is one) or where the direct participant usually goes to do program business. For example, the service point for a microfinance program is a branch, and the service point for a child-health program is a health post
- Mark the response to the first scorecard question ("In what department does the household live?"). If the enumerator already knows the department, then the question does not need to asked directly of the respondent
- Complete the **Back-page Worksheet** with each household member's first name (or nickname) and age, marking the head and his/her spouse (if any)
- For each household member 10-years-old or older, record his/her work status in the last seven days
- For each household member who worked, record whether he/she was a wage/salary employee or a business owner with employees
- If using a paper scorecard, then use the **Back-page Worksheet** to record:
  - The number of household members in the header next to "Number of household members:"
  - The response to the second scorecard question ("How many members does the household have?")
  - The response to the third scorecard question ("In the last 7 days, how many household members 10-years-old or older did any type of work, be it as an employee, in self-employment, as a business owner with employees, or as an unremunerated worker in a family business?")
  - The response to the fourth scorecard question ("Among those household members who worked, how many were wage/salary workers or owners of a business with employees?")
- Read the remaining six questions aloud one-by-one and in order, marking the responses given by the respondent
- When marking a response on paper, write each point value in the far right-hand column. Then make single circle around the pre-printed response, the pre-printed points, and the hand-written points. The helps to reduce later data-entry mistakes
- Add up the points to get the score (if needed on-the-spot and if using a paper scorecard)
- Implement targeting policy (if any) based on the score
- Upload the data with a **data-collection app**, or deliver the filled-out paper scorecard to a central office for data entry, reporting, and analysis

2.2 Header, Back-page Worksheet, Interview Guide, and audits

Fill out the scorecard header as best you can; do not skip it. Scorecard estimates are more useful if they can be linked—via names or identifiers—to a program's existing data on direct participants, field agents, or service points. Record the types of identifiers that are used in the program's databases, be they program-specific or government-issued. Be sure to record the number of household members not only indirectly via the scorecard's second question but also directly in the header.

Do not leave fields in the header blank. If the data is unknown, does not exist, or is not applicable, then write "NONE", "UNKNOWN", "DOES NOT EXIST" or "NOT APPLICABLE" instead of leaving a blank space.

Likewise, do not skip the **Back-page Worksheet**. Take the time to read the definition of *household* to the respondent and to fill out the roster member-by-member. If you cut corners by only asking, "How many members does the household have?", many respondents will miscount or apply the wrong definition of *household*. Completing the **Back-page Worksheet** improves data quality because it mimics the practice of Paraguay's DGEEC in the 2019 EPHC. The accuracy of the scorecard's estimates depends on the quality of recorded responses, and especially strongly on the count of household members. Working through the **Back-page Worksheet** gives the best count.

Throughout the interview, apply the instructions in the **Interview Guide**. Enumerators must be thoroughly trained on the **Interview Guide** before they do any interviews, and they should carry a copy of the **Interview Guide** with them to each interview.[10] Even though the scorecard is less difficult than other poverty-assessment tools, training and explicit definitions of the scorecard's terms and concepts are still essential.[11] Enumerators must scrupulously study and follow the **Interview Guide**.

Finally, on-going quality-control audits are wise if a program or its field agents collect their own data and if they believe there is an incentive to exaggerate poverty estimates (for example, if they expect to be rewarded for higher poverty rates).[12]

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[10] The "**Interview Guide**" is the only source of guidance for enumerators. All other issues of interpretation should be left to the judgment of enumerators and respondents, as this seems to be what Paraguay's DGEEC did in the 2019 EPHC.

[11] Merely reading through the scorecard with enumerators is not adequate training.

[12] **Matul and Kline**, 2003. If a program does not want enumerators or respondents to know the scorecard's points, then it can use a **mobile data-collection app** or a paper version of the scorecard that omits the points, with scores computed later at an office. Even if points are hidden, however, enumerators and respondents can use common sense to guess how responses are linked with poverty.

Figure 3: First example household, filled-in scorecard

Interview ID:	**A123**		**Name**	**Identifier**
Interview date:	**13JUN2020**	Direct participant:	**ANNA JACKSON**	**1V0276FZ7**
Country:	PRY	Field agent:	**UNKNOWN**	**UNKNOWN**
Scorecard:	002	Service point:	**NORTHWEST CLINIC**	**NWC**
Sampling weight:	**UNKNOWN**		Number of household members:	**NINE**

Question	Response		Points
1. In which department does the household live?	A. Alto Paraná		0
	B. Itapúa, or Caaguazú		1
	C. Central, or Caazapá		2
	D. Amambay, Canindeyú, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, or Presidente Hayes (excludes Alto Paraguay and Boquerón)		3 **3**
	E. Asunción, or San Pedro		4
2. How many members does the household have? (*Based on **Back-page Worksheet***)	A. Six or more		0 **0**
	B. Five		5
	C. Four		11
	D. Three		17
	E. Two		27
	F. One		37
3. In the last 7 days, how many household members 10-years-old or older did any type of work, be it as an employee, in self-employment, as a business owner with employees, or as an unremunerated worker in a family business? (*Based on **Back-page Worksheet***)	A. None		0
	B. One		2 **2**
	C. Two		8
	D. Three or more		15
4. Among those household members who worked, how many were wage/salary workers or owners of a business with employees? (*Based on **Back-page Worksheet***)	A. None		0 **0**
	B. One		7
	C. Two or more		14
5. What language does the female head (or spouse of the male head) usually speak at home?	A. Only Guaraní, or does not speak		0
	B. Guaraní and Spanish		2 **2**
	C. No female head nor spouse of male head		4
	D. Only Spanish, or other		5
6. What is the main material of the floor of the residence?	A. Dirt		0
	B. Cement (*lecherada*)		3 **3**
	C. Bricks, or wood		4
	D. Tile (ordinary, mosaic, or ceramic), polished stone, marble, granite, hardwoods, carpet, linoleum, or other		5
7. Where does human waste from the bathroom drain?	A. Simple pit latrine (*pozo seco*) of any kind, open pit, ditch, creek, river, on the ground, or other		0
	B. Closed pit latrine (*pozo ciego*) without septic tank		2 **2**
	C. Closed pit latrine (*pozo ciego*) with septic tank, or sanitary sewer system		4
8. What is the main cooking fuel used by the household?	A. Firewood, or charcoal		0 **0**
	B. LPG, electricity, kerosene, alcohol, other, or none (does not cook)		4
9. Does the household have a clothes-washing machine?	A. No		0
	B. Yes		3 **3**
10. Does the household have a motorcycle, automobile, truck, or pick-up?	A. No		0
	B. Only motorcycle		2 **2**
	C. Automobile, truck, or pick-up (regardless of motorcycle)		9

scorocs.com   Score: **3 + 0 + 2 + 0 + 2 + 3 + 2 + 0 + 3 + 2 = 17**

Figure 4: First example household, filled-in Back-page Worksheet

First name or nickname?	Age	Head or spouse of head?		If [NAME} is at least 10-years-old, then in the past 7 days did he/she do any type of work, be it as an employee, in self-employment, as a business owner with employees, or as an unremunerated worker in a family business?			If [NAME] worked, then was he/she a wage/salary worker or the owner of a business with employees?		
1. **ANNA**	45	Head (male)		<10	**No**	Yes	**<10 or did not work**	No	Yes
		Head (female)							
2. **BILLY**	23	Wife of male head		<10	No	**Yes**	<10 or did not work	**No**	Yes
		Husband of female head							
		Other							
3. **CHARLES**	21	**Other**		<10	No	Yes	<10 or did not work	No	Yes
4. **DARLA**	18	**Other**		<10	No	Yes	**<10 or did not work**	No	Yes
5. **EUGENE**	15	**Other**		<10	**No**	Yes	**<10 or did not work**	No	Yes
6. **FREDA**	14	**Other**		<10	**No**	Yes	**<10 or did not work**	No	Yes
7. **GRETA**	12	**Other**		<10	**No**	Yes	**<10 or did not work**	No	Yes
8. **HANK**	10	**Other**		<10	**No**	Yes	**<10 or did not work**	No	Yes
9. **IRIS**	8	**Other**		**<10**	No	Yes	**<10 or did not work**	No	Yes
10. —		Other		<10	No	Yes	<10 or did not work	No	Yes
#: NINE	—	—		**Number of workers: ONE**			**# wage/salary workers or employers: NONE**		

2.3 First example household

The points for the first example household's responses add up to a score of 17 (**Figure 3** and **Figure 4**).

For a given poverty line, **Figure 1** lists poverty likelihoods by score range. A score of 17 falls in the first range of 0–20. For 150% of the national poverty line, the poverty likelihood for scores of 0–20 is 99.2 percent. That is, the scorecard estimates that 99.2 percent of households in Paraguay with a score of 0–20 have income below 150% of the national line.

Figure 5: The first example household's score of 17 implies a poverty likelihood of 99.2 percent for 150% of the national line (excerpted from Figure 1)

| | Poverty likelihood (%) | | |
| | National | | |
Score	100%	150%	200%
0–20	91.8	99.2	99.6
21–24	78.4	97.4	98.5
25–28	67.8	93.3	98.4
29–31	58.3	90.6	96.2
32–34	45.2	82.5	90.7
35–37	40.2	74.7	89.3
38–39	28.7	68.5	84.4
40–41	22.1	54.2	78.0
42–43	17.6	54.2	78.0
. . .	. . .	. . .	. . .

Figure 6: Second example household, filled-in scorecard

Interview ID:	**B456**	**Name**		**Identifier**
Interview date:	**30JUN2020**	Direct participant:	**JOHN BROWN**	**2W3120ZG8**
Country:	PYR	Field agent:	**UNKNOWN**	**UNKNOWN**
Scorecard:	002	Service point:	**NORTHWEST CLINIC**	**NWC**
Sampling weight:	**UNKNOWN**		Number of household members:	**FIVE**

Question	Response		Points	
1. In which department does the household live?	A. Alto Paraná		0	
	B. Itapúa, or Caaguazú		1	
	C. Central, or Caazapá		2	
	D. Amambay, Canindeyú, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, or Presidente Hayes (excludes Alto Paraguay and Boquerón)		3	**3**
	E. Asunción, or San Pedro		4	
2. How many members does the household have? (*Based on **Back-page Worksheet***)		A. Six or more	0	
		B. Five	5	**5**
		C. Four	11	
		D. Three	17	
		E. Two	27	
		F. One	37	
3. In the last 7 days, how many household members 10-years-old or older did any type of work, be it as an employee, in self-employment, as a business owner with employees, or as an unremunerated worker in a family business? (*Based on **Back-page Worksheet***)		A. None	0	
		B. One	2	
		C. Two	8	**8**
		D. Three or more	15	
4. Among those household members who worked, how many were wage/salary workers or owner of a business with employees? (*Based on **Back-page Worksheet***)		A. None	0	
		B. One	7	**7**
		C. Two or more	14	
5. What language does the female head (or spouse of the male head) usually speak at home?		A. Only Guaraní, or does not speak	0	
		B. Guaraní and Spanish	2	**2**
		C. No female head nor spouse of male head	4	
		D. Only Spanish, or other	5	
6. What is the main material of the floor of the residence?		A. Dirt	0	
		B. Cement (*lecherada*)	3	**3**
		C. Bricks, or wood	4	
		D. Tile (ordinary, mosaic, or ceramic), polished stone, marble, granite, hardwoods, carpet, linoleum, or other	5	
7. Where does human waste from the bathroom drain?		A. Simple pit latrine (*pozo seco*) of any kind, open pit, ditch, creek, river, on the ground, or other	0	
		B. Closed pit latrine (*pozo ciego*) without septic tank	2	**2**
		C. Closed pit latrine (*pozo ciego*) with septic tank, or sanitary sewer system	4	
8. What is the main cooking fuel used by the household?		A. Firewood, or charcoal	0	**0**
		B. LPG, electricity, kerosene, alcohol, other, or none (does not cook)	4	
9. Does the household have a clothes-washing machine?		A. No	0	
		B. Yes	3	**3**
10. Does the household have a motorcycle, automobile, truck, or pick-up?		A. No	0	**0**
		B. Only motorcycle	2	
		C. Automobile, truck, or pick-up (regardless of motorcycle)	9	

Score: 3 + 5 + 8 + 7 + 2 + 3 + 2 + 0 + 3 + 0 = 33

Figure 7: Second example household, filled-in Back-page Worksheet

First name or nickname?	Age	Head or spouse of head?	If [NAME} is at least 10-years-old, then in the past 7 days did he/she do any type of work, be it as an employee, in self-employment, as a business owner with employees, or as an unremunerated worker in a family business?			If [NAME] worked, then was he/she a wage/salary worker or the owner of a business with employees?		
1. JOHN	39	**Head (male)** / Head (female)	<10	No	**Yes**	<10 or did not work	**No**	Yes
2. MARY	37	**Wife of male head** / Husband of female head / Other	<10	No	**Yes**	<10 or did not work	No	**Yes**
3. SUE	17	**Other**	<10	**No**	Yes	<10 or did not work	No	Yes
4. KIM	9	**Other**	**<10**	No	Yes	**<10 or did not work**	No	Yes
5. MONICA	7	**Other**	**<10**	No	Yes	**<10 or did not work**	No	Yes
6. —		Other	<10	No	Yes	<10 or did not work	No	Yes
7. —		Other	<10	No	Yes	<10 or did not work	No	Yes
8. —		Other	<10	No	Yes	<10 or did not work	No	Yes
9. —		Other	<10	No	Yes	<10 or did not work	No	Yes
10. —		Other	<10	No	Yes	<10 or did not work	No	Yes
#: FIVE	—	—	Number of workers: TWO			# wage/salary workers or employers: ONE		

2.4 Second example household

The points for the second example household's responses add up to a score of 33 (**Figure 6** and **Figure 7**).

In **Figure 1**, a score of 33 falls in the range of 32–34. For 150% of the national poverty line, the poverty likelihood for scores of 32–34 is 82.5 percent. The scorecard estimates that 82.5 percent of households in Paraguay with a score of 32–34 have income below 150% of the national line.

Figure 8: The second example household's score of 33 implies a poverty likelihood of 82.5 percent for 150% of the national line (excerpt from Figure 1)

	Poverty likelihood (%)		
	National		
Score	100%	150%	200%
0–20	91.8	99.2	99.6
21–24	78.4	97.4	98.5
25–28	67.8	93.3	98.4
29–31	58.3	90.6	96.2
32–34	45.2	82.5	90.7
35–37	40.2	74.7	89.3
38–39	28.7	68.5	84.4
40–41	22.1	54.2	78.0
42–43	17.6	54.2	78.0
. . .	. . .	. . .	. . .

3. How to calculate scorecard estimates

This section tells how to estimate:

- Head-count poverty rates for a single time period for in-coming participants
- Net changes in poverty rates across two time periods for on-going participants

It also tells how to use these estimated poverty rates to estimate:

- Number of poor people in the households of in-coming participants
- Net number of poor people in the households of on-going participants who rose above a poverty line

3.1 Head-count poverty rates in a single time period

The *head-count poverty rate* is the share of people in participating households in which total household income (divided by the number of household members) is below a given poverty line.

The scorecard estimates head-count poverty rates as the household-size-weighted average of poverty likelihoods from a scored sample, adjusted for the scorecard's known estimation error.

To illustrate the calculation, suppose that a pro-poor program opens a new service point in urban Guairá in 2020. In that calendar year, it enrolls 1,000 in-coming households, from which it scores a simple random sample[13] of two households.[14]

The program judges that 150% of the national poverty line is the most-relevant line for its purposes. For that line and for snapshot estimates of poverty rates in one period, the scorecard's known estimation error is +0.2 percentage points (**Figure 2**).

The first example household has nine members and is interviewed on June 13, 2020 (**Figure 3** and **Figure 4**). With a score of 17, it has a poverty likelihood for 150% of the national line of 99.2 percent (**Figure 1**).

The second example household has five members and is interviewed on June 30, 2020 (**Figure 6** and **Figure 7**). Its score of 33 corresponds with a poverty likelihood of 82.5 percent.

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[13] In a *simple random sample*, all households in the population have the same selection probability. This paper does not discuss samples in which different households have different selection probabilities.

[14] Of course, estimates based on such an unrealistically small sample have wide margins of error, but a small sample facilitates the arithmetic in the examples.

The estimated head-count poverty rate for the population of in-coming households in the 2020 calendar-year cohort in urban Guairá is the household-size-weighted average of the estimated poverty likelihoods of the sampled households, less the known estimation error. Expressing poverty likelihoods and the estimation error as proportions between 0 and 1 rather than percentages between 0 and 100, this is:

$$\frac{9 \cdot 0.992 + 5 \cdot 0.825}{9 + 5} - (+0.002) \approx \frac{13.05}{14} - 0.002 \approx 0.930 = 93.0 \text{ percent.}$$

In the nine in the "$9 \cdot 0.992$" term in the numerator is the number of members (household size) in the first household, and 0.992 is the first household's estimated poverty likelihood.

In the same way, the five in the numerator's "$5 \cdot 0.825$" is the number of members in the second household, and 0.825 is the second household's estimated poverty likelihood.

The "9 + 5" in the denominator is the sum of the weights—that is, the number of household members—across the two sampled households.

The "+0.002" is the scorecard's estimation error for this poverty line (**Figure 2**). Because unadjusted estimates tend to be too high by 0.2 percentage points, they are adjusted downwards by subtracting 0.2. This is akin to how an archer whose arrows tend to miss a little to the right of the bulls-eye will adjust his/her aim to be a little to the left of the bulls-eye.

The estimated head-count poverty rate for the population is 93.0 percent. Again, this is the household-size-weighted average of the two sampled households' poverty likelihoods, adjusted for the known estimation error.[15]

For real-world samples with hundreds or thousands of interviewed households, the calculations would be done with the **ProveIt™-brand reporting and analysis tool** or in a spreadsheet (**Figure 9** below).

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[15] Be careful; the estimated poverty rate is *not* the single poverty likelihood associated with the household-size-weighted average score, which here is (9·17 + 5·33) ÷ (9 + 5) ≈ 23. This average score of 23 corresponds to a poverty likelihood of 97.4 percent (**Figure 1**), giving an error-adjusted poverty rate of 97.4 – (+0.2) = 97.2 percent. This differs from the 93.0 percent found as the household-size-weighted average of the two individual likelihoods associated with each of the two scores. Unlike likelihoods, scores are ordinal symbols, like colors in the spectrum or syllables in a solfège scale. Because scores are ordinal, they cannot be added up nor averaged. Only three operations are valid for scores: conversion to likelihoods, analysis of distributions, or comparison with a cut-off for segmentation (**Schreiner**, 2012b). In general, programs should analyze likelihoods, not scores.

Figure 9: Spreadsheet calculation to estimate the head-count poverty rate and number of poor people in a population of in-coming participants in a period

	A	B	C	D	E	F	G
1	Survey	Interview date	ID of direct participant	Number of household members	Score	Poverty likelihood (%)	Estimated number of poor household members
2	Baseline	13-Jun-20	1V0276FZ7	9	17	99.2	8.93 = (D2*F2)/100
3	Baseline	30-Jun-20	2W3120ZG8	5	33	82.5	4.13 = (D3*F3)/100
4			Sum:	14 = SUM(D2:D3)			13.05 = SUM(G2:G3)
5			Average:	7.0 = AVERAGE(D2:D3)			
6							
7		Estimated scorecard error for this poverty line (percentage points):					+0.2
8							
9		Estimated head-count poverty rate (%):					93.0 = (G4/D4)*100-G7
10							
11		Households in the population:					1,000
12							
13		People in households in the population:					7,000 = G11*D5
14							
15		Number of poor people in population:					6,513 = (G9/100)*G13
16	Rows of data are sorted by Round, then by Interview date, then by Direct participant ID.						

This snapshot estimate in a single time period tends to be more relevant for in-coming participants who joined in the current period than for on-going participants who joined in past periods. This is because fulfilling a pro-poor mission implies that some share of new participants be poor by some definition of *poverty*.[16] To be pro-poor, a bare-minimum standard is that the poverty rate of in-coming participants exceeds that of the country as a whole or that of the area where the program works.

To help with benchmarking poverty-rate estimates, **Figure 10** reports head-count poverty rates from the 2019 EPHC for all 14 poverty lines by urban/rural/all for Paraguay overall and for each of the eight "representative departments" defined by DGEEC for the EPHC. In the example of the group of departments that includes rural Guariá, the head-count poverty rate for 150% of the national line is 57.4 percent. Thus, the example program is pro-poor in the sense that its in-coming participants have an above-average poverty rate (93.0 percent).

The text that illustrates the calculation of the scorecard estimate of the number of poor people in a single time period follows after **Figure 10**, which stretches across the next three pages. **Figure 10** begins with all-Paraguay first and then is followed by the EPHC's "catch-all" catgory that includes the departments of Amambay, Canindeyú, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, and Presidente Hayes. This is followed by Asunción and the remaining seven departments, in alphabetical order. The EPHC does not cover Alto Paraguay and Boquerón.

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[16] The scorecard uses an income-based definition of *poverty*. Common non-income definitions include: being rural, agricultural, landless, or unemployed; living in a given region; having a head who is illiterate, female, or an ethnic minority; or having a member who is pregnant, handicapped, elderly, or young.

Figure 10: (All-Paraguay; Alto Paraguay, Amambay, Canindeyú, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, and Presidente Hayes; and Alto Paraná): Poverty lines and head-count poverty rates by urban/rural/all in 2019

Department/ Area	Line or Rate	n	National			Intl. 2011 PPP				Percentile-based lines						
			100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
Paraguay — Urban	Line	2,764	22,814	34,221	45,628	6,400	10,778	18,525	73,090	14,773	20,936	32,113	38,441	46,702	74,445	107,078
	Rate		17.5	37.0	52.5	0.6	2.9	11.4	75.7	6.6	14.6	33.4	43.6	53.7	76.8	88.4
Paraguay — Rural	Line	2,335	16,208	24,312	32,416	4,547	7,657	13,161	51,926	10,495	14,874	22,814	27,310	33,179	52,889	76,073
	Rate		33.4	54.6	68.5	1.1	7.2	23.8	85.0	15.7	28.8	50.9	60.5	70.4	85.3	92.7
Paraguay — All	Line	5,099	20,324	30,486	40,648	5,701	9,602	16,503	65,113	13,160	18,651	28,608	34,245	41,605	66,320	95,391
	Rate		23.5	43.7	58.5	0.8	4.5	16.1	79.2	10.0	20.0	40.0	50.0	60.0	80.0	90.0
Amambay et al. — Urban	Line	598	22,814	34,221	45,628	6,400	10,778	18,525	73,090	14,773	20,936	32,113	38,441	46,702	74,445	107,078
	Rate		24.1	42.3	59.2	0.7	6.4	15.6	80.4	9.6	19.7	38.1	50.1	61.0	80.5	92.4
Amambay et al. — Rural	Line	827	16,208	24,312	32,416	4,547	7,657	13,161	51,926	10,495	14,874	22,814	27,310	33,179	52,889	76,073
	Rate		34.5	57.4	70.5	1.3	8.3	25.6	86.5	17.6	30.6	53.5	62.3	72.1	86.9	94.0
Amambay et al. — All	Line	1,425	18,946	28,419	37,892	5,314	8,951	15,384	60,697	12,268	17,386	26,668	31,923	38,784	61,822	88,922
	Rate		30.2	51.2	65.8	1.1	7.5	21.4	84.0	14.3	26.1	47.1	57.2	67.5	84.2	93.4
Alto Paraná — Urban	Line	471	22,814	34,221	45,628	6,400	10,778	18,525	73,090	14,773	20,936	32,113	38,441	46,702	74,445	107,078
	Rate		19.6	41.4	55.1	1.4	3.6	13.3	77.6	7.0	18.3	37.5	45.2	57.4	78.5	88.3
Alto Paraná — Rural	Line	199	16,208	24,312	32,416	4,547	7,657	13,161	51,926	10,495	14,874	22,814	27,310	33,179	52,889	76,073
	Rate		27.2	48.8	60.8	0.0	2.9	17.9	79.4	8.7	22.5	41.8	52.0	64.4	79.4	85.2
Alto Paraná — All	Line	670	21,103	31,655	42,207	5,920	9,970	17,136	67,609	13,665	19,366	29,705	35,558	43,200	68,862	99,048
	Rate		21.6	43.3	56.6	1.0	3.4	14.5	78.0	7.5	19.4	38.6	47.0	59.2	78.8	87.5

Source: 2019 EPHC.

Poverty rates are percentages.

All poverty lines are PYG per-person per-day.

All poverty lines are PYG in prices in Paraguay as a whole on average during the 2019 EPHC fieldwork.

Figure 10: (Asunción, Caaguazú, and Caazapá): Poverty lines and head-count poverty rates by urban/rural/all in 2019

Department/ Area	Line or Rate	n	National			Intl. 2011 PPP				Percentile-based lines						
			100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
Asunción																
__Urban__	Line	367	22,814	34,221	45,628	6,400	10,778	18,525	73,090	14,773	20,936	32,113	38,441	46,702	74,445	107,078
	Rate		12.6	21.1	36.6	0.0	1.1	6.3	60.1	4.1	9.8	19.5	29.8	37.9	61.2	75.2
__Rural__	Line	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Rate		—	—	—	—	—	—	—	—	—	—	—	—	—	—
__All__	Line	367	22,814	34,221	45,628	6,400	10,778	18,525	73,090	14,773	20,936	32,113	38,441	46,702	74,445	107,078
	Rate		12.6	21.1	36.6	0.0	1.1	6.3	60.1	4.1	9.8	19.5	29.8	37.9	61.2	75.2
Caaguazú																
__Urban__	Line	176	22,814	34,221	45,628	6,400	10,778	18,525	73,090	14,773	20,936	32,113	38,441	46,702	74,445	107,078
	Rate		30.5	48.2	60.8	2.1	4.3	21.2	81.1	11.9	24.4	45.2	55.8	60.8	82.3	94.4
__Rural__	Line	248	16,208	24,312	32,416	4,547	7,657	13,161	51,926	10,495	14,874	22,814	27,310	33,179	52,889	76,073
	Rate		41.8	63.3	77.9	0.0	5.7	31.8	90.2	19.8	37.7	61.6	69.5	78.6	91.1	96.1
__All__	Line	424	19,297	28,946	38,594	5,413	9,117	15,669	61,822	12,495	17,708	27,162	32,515	39,503	62,968	90,570
	Rate		36.5	56.2	69.9	1.0	5.1	26.8	86.0	16.1	31.5	53.9	63.1	70.3	87.0	95.3
Caazapá																
__Urban__	Line	84	22,814	34,221	45,628	6,400	10,778	18,525	73,090	14,773	20,936	32,113	38,441	46,702	74,445	107,078
	Rate		20.2	34.8	51.4	0.0	3.4	10.4	75.3	5.9	19.3	32.3	41.0	51.5	75.3	86.6
__Rural__	Line	293	16,208	24,312	32,416	4,547	7,657	13,161	51,926	10,495	14,874	22,814	27,310	33,179	52,889	76,073
	Rate		41.8	67.6	75.7	1.5	10.8	31.3	87.5	21.2	37.1	64.6	71.2	76.2	87.7	94.8
__All__	Line	377	18,005	27,008	36,011	5,051	8,506	14,620	57,684	11,659	16,523	25,344	30,339	36,859	58,754	84,508
	Rate		35.9	58.7	69.0	1.1	8.8	25.6	84.2	17.0	32.3	55.8	62.9	69.5	84.3	92.5

Source: 2019 EPHC.

Poverty rates are percentages.

All poverty lines are PYG per-person per-day.

All poverty lines are PYG in prices in Paraguay as a whole on average during the 2019 EPHC fieldwork.

Figure 10: (Central, Itapúa, and San Pedro): Poverty lines and head-count poverty rates by urban/rural/all in 2019

Department/ Area	Line or Rate	n	National			Intl. 2011 PPP				Percentile-based lines						
			100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
Central — Urban	Line	723	22,814	34,221	45,628	6,400	10,778	18,525	73,090	14,773	20,936	32,113	38,441	46,702	74,445	107,078
	Rate		13.2	35.9	51.7	0.4	1.5	8.5	76.7	5.1	10.6	32.0	42.1	52.5	78.2	89.5
Central — Rural	Line	123	16,208	24,312	32,416	4,547	7,657	13,161	51,926	10,495	14,874	22,814	27,310	33,179	52,889	76,073
	Rate		11.8	28.2	44.1	0.0	0.6	5.7	73.2	3.6	5.7	23.9	35.8	49.5	73.4	89.9
Central — All	Line	846	21,917	32,876	43,835	6,148	10,355	17,797	70,217	14,192	20,113	30,851	36,930	44,867	71,519	102,869
	Rate		13.0	34.8	50.7	0.3	1.4	8.1	76.2	4.9	9.9	30.9	41.3	52.1	77.6	89.6
Itapúa — Urban	Line	229	22,814	34,221	45,628	6,400	10,778	18,525	73,090	14,773	20,936	32,113	38,441	46,702	74,445	107,078
	Rate		16.3	35.2	52.0	0.0	2.2	11.3	73.4	4.0	14.7	31.1	41.7	52.7	73.7	88.1
Itapúa — Rural	Line	296	16,208	24,312	32,416	4,547	7,657	13,161	51,926	10,495	14,874	22,814	27,310	33,179	52,889	76,073
	Rate		36.6	56.4	73.7	1.7	10.5	26.6	89.3	16.3	30.2	53.5	64.2	75.9	89.3	94.2
Itapúa — All	Line	525	19,171	28,756	38,342	5,378	9,057	15,567	61,418	12,414	17,593	26,985	32,302	39,245	62,557	89,979
	Rate		27.5	46.9	64.0	0.9	6.8	19.7	82.2	10.8	23.2	43.5	54.1	65.5	82.3	91.5
San Pedro — Urban	Line	116	22,814	34,221	45,628	6,400	10,778	18,525	73,090	14,773	20,936	32,113	38,441	46,702	74,445	107,078
	Rate		32.4	54.6	67.7	0.0	4.6	26.8	84.5	18.3	29.4	49.0	62.4	68.3	86.8	93.6
San Pedro — Rural	Line	349	16,208	24,312	32,416	4,547	7,657	13,161	51,926	10,495	14,874	22,814	27,310	33,179	52,889	76,073
	Rate		38.6	57.5	71.7	2.1	8.7	24.7	84.7	17.8	34.5	54.2	65.9	72.0	84.8	90.6
San Pedro — All	Line	465	17,569	26,353	35,138	4,928	8,300	14,266	56,285	11,376	16,122	24,730	29,603	35,965	57,329	82,459
	Rate		37.3	56.9	70.8	1.6	7.8	25.1	84.6	17.9	33.5	53.1	65.2	71.2	85.2	91.2

Source: 2019 EPHC.

Poverty rates are percentages.

All poverty lines are PYG per-person per-day.

All poverty lines are PYG in prices in Paraguay as a whole on average during the 2019 EPHC fieldwork.

3.2 Number of poor people in a single time period

Fulfilling a pro-poor mission depends not only on the *poverty rate* of in-coming participants but also on the *number* of poor in-coming participants. After all, a smaller program whose few participants have a higher poverty rate may serve fewer poor people than a larger program whose many participants have a lower poverty rate.[17]

The first step in estimating the number of poor people in one period is to estimate the number of household members in the population of in-coming households. In our two-household example with simple random sampling, this is the equal-weighted average of the number of people in the sampled households:

$$\frac{9+5}{1+1} = \frac{14}{2} = 7.0 \text{ people.}$$

The second step is to estimate the total number of people in the population of in-coming households. The example program has 1,000 in-coming households in its first year, each with an estimated 7.0 members. The estimated number of in-coming participants is then 1,000 · 7.0 = 7,000 people.

The third and final step is to multiply the estimated poverty rate (here, 93.0 percent, or 0.930) by the estimated number of people in in-coming households (here, 7,000). This gives 7,000 · 0.930 ≈ 6,513 people (**Figure 9**).

All else constant, the *number* of in-coming participants who are poor is more important than the *share* of in-coming participants who are poor. Both estimates are useful,[18] but increasing the share who are poor is only a means to the end of increasing the number who are poor.

In turn, increasing the number of in-coming participants who are poor is only a means to the end of increasing the net number of on-going participants who rise above a poverty line.

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[17] **Navajas *et al*.** (2000).
[18] **Schreiner** (2014) tells how to report and analyze scorecard estimates.

3.3 Net changes in poverty rates across two time periods for on-going participants

The estimated net change in a population's poverty rate is the difference between estimated poverty rates at follow-up versus baseline.

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

- *One sample scored twice*: Score the same sample that was scored at baseline
- *Two independent samples*: Score a new sample from the same population that was scored at baseline

Given the scorecard's assumptions, both approaches are unbiased, but scoring one sample twice has smaller margins of error than does scoring two independent samples.

3.3.1 Annual net change in poverty rates with one sample scored twice

When the follow-up sample is made up of the same households as the baseline sample,[19] then the estimated annual net change in the poverty rate of the population of on-going participants is the average-household-size-weighted average of the change in each scored household's poverty likelihood, divided by the household-size-weighted average of the years between each household's interviews.[20]

Continuing the earlier example, suppose that the first household at follow-up has eight members (rather than nine as at baseline) and is scored a second time on August 13, 2023, which is 1,156 days (about 3.17 years) after its first interview on June 13, 2020. Its score is now 22 (rather than 17), so its poverty likelihood for 150% of the national line has decreased from 99.2 to 97.4 percent (**Figure 1**).

Suppose also that the second household now has four members (rather than five as at baseline) and is scored a second time on May 15, 2023, which is 1,049 days (about 2.87 years) after its first interview on June 30, 2020. Its score is now 36 (rather than 33), so its poverty likelihood has decreased from 82.5 to 74.7 percent.

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[19] Or when the follow-up sample is a random sample of the baseline sample.

[20] Estimates of change do not directly adjust for the estimation error in snapshot estimates because—given the scorecard's assumptions—this error washes out when comparing follow-up with baseline. Error due to divergence from assumptions is unknown, and there is no direct way to adjust for it.

With poverty likelihoods expressed as proportions between 0 and 1, the average-household-size-weighted average of the change in each scored household's poverty likelihood is –3.9 percentage points:

$$\frac{\left(\frac{9+8}{2}\right) \cdot (0.974 - 0.992) + \left(\frac{5+4}{2}\right) \cdot (0.747 - 0.825)}{\left(\frac{9+8}{2}\right) + \left(\frac{5+4}{2}\right)} \approx \frac{-0.153 - 0.351}{13} \approx -0.039.$$

The head-count poverty rate decreased (improved) by 3.9 percentage points (not by 3.9 percent) between baseline and follow-up.

For clarity—and because the time between interviews varies across scored households—this estimate should be annualized by dividing it by the average-household-size-weighted average of years between the two interviews:

$$\frac{\left(\frac{9+8}{2}\right) \cdot 3.17 + \left(\frac{5+4}{2}\right) \cdot 2.87}{\left(\frac{9+8}{2}\right) + \left(\frac{5+4}{2}\right)} \approx \frac{26.95 + 12.92}{13} \approx 3.07 \text{ years.}$$

The annual, non-compounded rate of net change is then the percentage-point change in the poverty rate, divided by the average years between interviews: –3.9 ÷ 3.07 ≈ –1.3 percentage points per year.[21] The negative change means that poverty decreased.[22]

In practice, the calculations would be done with the **ProveIt™-brand reporting and analysis tool** or in spreadsheet (**Figure 11** below).

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[21] *Percentage points* are distinct from *percentages* (or *percents*). On the one hand, if the baseline poverty rate is 50.0 percent, and if there is a *10.0-percent* annual reduction in the poverty rate, then the poverty rate after one year is 0.50·(1 – 0.10) = 0.450 = 45.0 percent, and the poverty rate after two years is 0.45·(1 – 0.10) = 0.405 = 40.5 percent. On the other hand, if there is a *10.0-percentage-point* annual reduction in poverty, then the rate after one year is 0.50 – 0.10 = 0.40 = 40 percent, and the rate after two years is 0.40 – 0.10 = 0.30 = 30 percent.

[22] Of course, such a large annual reduction in poverty is unrealistic, but this is just an example to show how the scorecard can be used to estimate change.

Figure 11: Spreadsheet calculation of estimated annual net change in a head-count poverty rate and in the annual net number of poor people who rose above a poverty line with one sample scored twice

	A	B	C	D	E	F	G	H	I	J	K	L	M
		Interview date		Years between	Number of household members			Member-years	Score		Poverty likelihood (%)		Estimated net change in
1	ID of direct												
2	participant	Baseline	Follow-up	interviews	Baseline	Follow-up	Average	between	Baseline	Follow-up	Baseline	Follow-up	number of poor
3	1V0276FZ7	13-Jun-2020	13-Aug-2023	3.17 = (C3-B3)/365	9	8	8.50 = (E3+F3)/2	26.92 = D3*G3	17	22	99.2	97.4	-0.153 = G3*(L3-K3)/100
4	2W3120ZG8	30-Jun-2020	15-May-2023	2.87 = (C4-B4)/365	5	4	4.50 = (E4+F4)/2	12.93 = D4*G4	33	36	82.5	74.7	-0.351 = G4*(L4-K4)/100
5				Average:	7.0 = AVERAGE(E3:E4)	6.0 = AVERAGE(F3:F4)	Sum:	39.85 = SUM(H3:H4)					-0.504 = SUM(M3:M4)
6													
7							Estimated net change in head-count poverty rate (percentage points), follow-up versus baseline:						-3.9 = M5/(E5+F5)*100
8													
9							Household-size-weighted average years between interviews:						3.07 = H6/(E5+F5)
10													
11							Estimated annual net change in head-count poverty rate (percentage points):						-1.3 = M7/M9*100
12													
13							Participating households at baseline:						1,000
14							Participating households at follow-up:						700
15													
16							Estimated average number of on-going participating people:						5,600 = (E5*M13+F5*M14)/2
17													
18							Estimated annual net change in the number of poor people:						-71 = M16*M11/100
19	Rows of data are sorted by the ID of the direct participant.												

3.3.2 Annual net change in the number of poor people with one sample scored twice

For a pro-poor program, the bottom line is not the annual net change in the poverty rate but rather the annual net change in the number of poor participants who rise above a poverty line.

To calculate this, the first step is to estimate the average number of household members in the population of on-going households from baseline to follow-up, accounting for drop-out. In our example, the population of the in-coming households in the 2020 cohort in 2020 was 1,000. By the end of the follow-up period of calendar-year 2023, 300 had dropped out, leaving 700. If drop-out took place at a constant pace and was unrelated to changes in poverty,[23] then an estimate of the average number of on-going participating people is the equal-weighted average of the number of participating people among households

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[23] This assumption rarely holds. On the one hand, the households that benefit most from the program—and thus those for whom participation is most likely to cause a faster-than-otherwise decrease in poverty—may also be the least-likely to drop out, leading to too-high estimates of the reduction in poverty due to participation. On the other hand, households whose poverty decreases may be more likely to drop out if the benefits of continued participation fall as poverty decreases, leading to too-low estimates of impact. Unfortunately, there is no general way to adjust scorecard estimates to account for drop out that is related to changes in poverty. As in all decision-making, managers must use their experience and judgment to detect deviations from assumptions and then to adjust for them as best they can. This is true even though scorecard estimates are based on data and math. "Hard numbers" may not represent reality as accurately as they seem to, and only a manager's knowledge of context can detect and adjust for this. Managers should discount unreliable estimates when they have reasoned, explicit arguments to do so (**Schreiner**, 2016a). Of course, discretion also opens the door to abuse; faced with unexpectedly low estimates of poverty reduction, managers might quietly sweep them under the rug or attribute them to a slow economy (even though they would not attribute high estimates of poverty reduction to a roaring economy). Ironically and sadly, such attempts to make a program look good by hiding or excusing undesired results destroys the results' value as feedback, harming the program's ability to fulfill its mission. If a program's funders fail to act like owners, then its employees—not its participants—often become its *de facto* beneficiaries (**Schreiner**, 1997).

interviewed at baseline and follow-up. In a given round, the number of participating people is the average household size for that round's interviewed households (in the example, 7.0 at baseline and 6.0 at follow-up), multiplied by the number of participating households in the population in the given round (1,000 at baseline and 700 at follow-up), divided by the number of survey rounds (two). This is

$$\frac{7.0 \cdot 1,000 + 6.0 \cdot 700}{1+1} = 5,600 \text{ people.}$$

The second and last step is to multiply the estimated annual change in the poverty rate (here, –1.3 percentage points, or –0.013) by the estimated average number of on-going participants (here, 5,600). This gives an annual net change in the number of poor people by 150% of the national line of –0.013 · 5,600 ≈ –71 people.[24] This negative change is a reduction (improvement) in poverty; there are about 71 fewer poor people in participating households each year.

3.3.3 Estimating a program's impact

Estimating *change* is not the same as an estimating a program's *impact*. It stands to reason that program participation is a force that does cause some change (be it an increase or decrease) in the poverty of its participants. At the same time, it is equally logical to expect that a large share of any change is caused by the many non-program forces that affect participants' lives. On its own, the scorecard is like a bathroom scale; it can tell whether you lost weight in the past month, but not how much of the loss is due to eating right and exercising versus removing your coat and shoes.

This point is often forgotten, confused, or ignored, so it bears repeating: the scorecard estimates change, but it does not—on its own—identify the causes of change. In particular, estimating the impact of program participation requires knowledge or assumptions about what would have happened to participants if they had not been participants. This must come from beyond the scorecard.

What is a program manager to do? All decision-making hinges on forecasts of the expected impacts of possible choices, so a manager cannot pretend that merely estimating change is helpful without also inferring some impact. Yet there are diminishing returns to improving inferences of impact. At a minimum, a program should compare its estimated annual net change in the poverty rate of its on-going participants to third-party estimates for the country overall or for the area where the program works. A program can also look for signs that participants value (or

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[24] This is a net figure; some start above the line and end below it, and vice versa.

expect to value) its services. Is the number of in-coming participants high or increasing? Is the drop-out rate low or decreasing? Are drop-outs due to dissatisfaction or graduation? Is participation voluntary, without being a condition for some other linked benefit? Is the program the sole provider in its niche and region?

In short, decision-makers in pro-poor programs are called to do what good decision-makers must always do: triangulate and weigh data and knowledge from a number of perspectives and sources—including scorecard estimates, but not *only* scorecard estimates—to inform reasoned guesses as to more or less what share of observed changes are due to program participation. Of course, the inevitable need for human wisdom/art may be disingenuously invoked as a cover for decision processes that do not take a program's pro-poor mission to heart. This is why the "scientific method"—that is, being transparent about inputs and reasoning so as to facilitate the productive review and debate of a conclusion—makes sense even (or perhaps especially) for business problems.[25]

3.3.4 Annual net change in poverty rates with two independent samples

Instead of interviewing the same sample of households at both baseline and follow-up, a program could draw a second, independent sample of households from the same population as that from which the baseline sample was drawn.[26] The head-count poverty rate for on-going participants in this new follow-up sample is estimated in the same way as for the baseline sample.

Continuing the example, suppose that a third household and a fourth household are sampled at follow-up. The third household is interviewed on March 3, 2023. It has three members, a score of 27, and a poverty likelihood by 150% of the national line of 93.3 percent (**Figure 1**).

The fourth household is interviewed on April 4, 2023. It has seven members, a score of 39, and a poverty likelihood of 68.5 percent.

As at baseline, the estimated head-count poverty rate at follow-up is the household-size-weighted average of the poverty likelihoods of the sampled households: $\dfrac{3\cdot 0.933 + 7\cdot 0.685}{3+7} \approx \dfrac{2.80 + 4.80}{10} \approx 0.759 = 75.9$ percent.

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[25] **Schreiner** (2016a) and **Schreiner** (2014).

[26] By chance, some households may end up in both samples.

The estimated annual net change in the head-count poverty rate of on-going participants is then the difference between the poverty-rate estimates at follow-up (75.9 percent) versus at baseline (93.2 percent),[27] divided by the difference (in years) between the household-size-weighted average of follow-up interview dates (March 19, 2023) versus the household-size-weighted average of baseline interview dates (June 21, 2020). These two average dates differ by about 1,001 days or 2.74 years.

The estimated annual net change in the head-count poverty rate is the difference between the poverty-rate estimates at follow-up versus baseline, divided by the difference in the average years between interviews in the two rounds. For 150% percent of the national line, this is (75.9 – 93.2) ÷ 2.74 ≈ –6.3 percentage points per year.

In practice, the calculations would be done in the **ProveIt^{TM}-brand reporting and analysis tool** or in a spreadsheet (**Figure 12**).

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[27] With two independent samples, the estimation error in each of the two snapshot estimates washes out, so it is not explicitly included in the calculation.

Figure 12: Spreadsheet calculation of estimated annual net change in a head-count poverty rate and in the annual net number of poor people who rise above a poverty line with two independent samples

	A	B	C	D	E	F	G
1	Survey	ID of direct participant	Interview date	Number of household members	Score	Poverty likelihood (%)	Estimated number of poor household members
2	Baseline	1V0276FZ7	13-Jun-2020	9	17	99.2	8.93 = D2*F2/100
3	Baseline	2W3120ZG8	30-Jun-2020	5	33	82.5	4.13 = D3*F3/100
4	Follow-up	3XA76T21L	3-Mar-2023	3	27	93.3	2.80 = D4*F4/100
5	Follow-up	4Y8Y3EQS9	4-Apr-2023	7	39	68.5	4.80 = D5*F5/100
6	Sum baseline:			14 = SUM(D2:D3)			13.05 = SUM(G2:G3)
7	Sum follow-up:			10 = SUM(D4:D5)			7.59 = SUM(G4:G5)
8	Average baseline:		21-Jun-2020 = AVERAGE(C2:C3)	7.0 = AVERAGE(D2:D3)			
9	Average follow-up:		19-Mar-2023 = AVERAGE(C4:C5)	5.0 = AVERAGE(D4:D5)			
10							
11				Estimated baseline poverty rate (%):			93.2 = G6/D6*100
12				Estimated follow-up poverty rate (%):			75.9 = G7/D7*100
13							
14			Average years between follow-up and baseline interviews:				2.74 = (C9-C8)/365
15							
16			Estimated annual net change in head-count poverty rate (percentage points):				-6.3 = (G12-G11)/G14
17							
18				Participating households at baseline:			1,000
19				Participating households at follow-up:			700
20							
21			Estimated average number of on-going participating people:				5,250 = (D8*G18+D9*G19)/2
22							
23			Estimated annual net change in the number of poor people:				-331 = G21*G16/100
24	Rows of data are sorted by Round, then by Interview date, then by Direct participant ID.						

3.3.5 Annual net change in the number of poor people with two independent samples

For a pro-poor program, the bottom line is not the annual net change in the poverty rate but rather the annual net change in the number of poor participants who rise above a poverty line.

To calculate this, the first step is to estimate the average number of household members in the population of on-going households from baseline to follow-up, accounting for drop-out. In our example, the population of the baseline 2020 cohort in 2020 is 1,000 in-coming households. By the end of the follow-up period 2023, 300 households dropped out, leaving 700. If drop-out took place at a constant pace and was unrelated to changes in poverty, then an estimate of the average number of on-going participating people is the equal-weighted average of the number of participating people among households interviewed at baseline and follow-up. In a given round, the number of participating people is the average household size for that round's interviewed households (in our example, 7.0 at baseline and 5.0 at follow-up), multiplied by the number of participating households in the population in the given round (1,000 at baseline and 700 at follow-up), and divided by two (the number of rounds). This is

$$\frac{7.0 \cdot 1,000 + 5.0 \cdot 700}{1+1} = 5,250 \text{ people.}$$

The second and last step is to multiply the estimated annual net change in the head-count poverty rate (here, –6.3 percentage points, or –0.063) by the estimated number of on-going participants (here, 5,250). For 150% of the national line, this gives an annual net change in the number of poor people of –0.063 · 5,250 ≈ –331 people per year. This negative change is a (non-compounded) reduction in poverty; the number of poor people in participating households decreases (improves) by 331 each year.

Given the scorecard's assumptions, both approaches to estimating change over time—one sample scored twice, and two independent samples—are unbiased. In general, the two approaches give different estimates (as in this example) because they interview different households at different times. All else constant, scoring one sample twice has smaller margins of error, but there may be context-specific reasons (related to costs or non-sampling errors) to score two independent samples.

4. How to design scorecard surveys and samples

To design a scorecard survey and its sample, a program must decide:[28]

- Who will do interviews
- Where and how to do interviews
- How to record responses and scores
- How to calculate estimates and report/analyze them
- Which participating households to interview
- How many participating households to interview
- How frequently to do surveys
- Whether to track a population across multiple time periods
- Whether to interview the same participants twice

Decisions should follow from the program's goals, the business problems to be addressed, and the budget. The central goals of the design are to:

- Inform issues that matter to the program
- Make sure that the sample is representative of a well-defined population

4.1 Who will do interviews

The enumerators who interview participating households must be trained to follow the **Interview Guide**. Enumerators may be:

- Program employees
- Contractors

4.2 Where and how to do interviews

Interviews should be:

- In-person, and
- At the sampled household's residence, and
- With an enumerator trained to follow the **Interview Guide**

This is the only recommended way. It follows Paraguay's DGEEC in the 2019 EPHC, so it provides the most-accurate and most-consistent data (and thus the best estimates).

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[28] **IRIS Center** (2007) and **Toohig** (2008) also discuss this topic, covering sampling, budgeting, training, logistics, interviewing, piloting, and recording data.

Of course, it is possible to do interviews in non-recommended ways such as:

- Without an enumerator (such as by asking respondents to fill out paper or web forms on their own or to answer questions sent via e-mail, texts, or robo-calls)
- Away from home (such as a program's service point or a local meeting place)
- Not in-person (such as with an enumerator by phone)

While non-recommended methods may reduce costs, they also affect responses[29] and thus reduce the accuracy of estimates. This is why interviewing by a trained enumerator at the residence is recommended.

In some contexts—such as when a program's field agents do not already visit participants at their residences anyway as part of their normal work—a program might be willing to trade accuracy for a lower-cost, non-recommended approach. The business wisdom of this depends on context-specific factors that each program must judge for itself. To judge carefully, a program that is considering a non-recommended method should do a small test to see how responses differ versus with a trained enumerator at the residence. Furthermore, all reporting should discuss the possible consequences of using a non-recommended method.

4.3 How to record responses and scores

Responses and scores can be recorded by enumerators on:

- Paper, and then keyed into a database or spreadsheet at an office
- **Mobile devices**, and then uploaded to a database[30]

4.4 How to calculate estimates and report/analyze them

Analysts can calculate estimates by plugging data into spreadsheets (following the examples in **Section 3**) or with the **ProveIt™-brand reporting and analysis tool**. **Schreiner** (2014) describes how to report and analyze scorecard estimates.

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[29] **Schreiner**, 2015.

[30] **Scorocs** can help set up a system to collect data with **mobile devices** or to transfer data from paper forms into a database at the office. Support is also available for calculating estimates as well as for reporting and analysis.

4.5 Which participating households to interview

Given a population relevant for a particular business question, the participating households to be interviewed can be:

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

A census is rarely necessary, except for very small programs. Nevertheless, it may be less costly to interview all in-coming households as a standard part of in-take rather than managing who gets scored and who does not.

4.6 How many participating households to interview

If not determined by other factors, the number of participating households to interview can be derived from sample-size formulas to achieve a desired confidence level for a desired margin of error (**Annex 6**).

The focus of sample design, however, should be less on having enough interviews to achieve some arbitrary level of statistical significance and more on having a representative sample from a well-defined population that is relevant for informing business questions that matter to the program.

In practice, non-sampling errors in implementation and in the definition of the population often matter at least as much as errors due to smaller samples. Program managers are often very concerned about sample size, but as there is no point in deriving the ideal sample size unless proportional effort goes to mitigating other sources of error and then accounting for margins of error in the analysis stage. Of course, smaller samples produce less-reliable estimates. In practice, however, almost no one reports or considers margins of error (even though they should), and estimates derived from at least 1,000 interviews will rarely raise eyebrows (**Annex 6**).

4.7 How frequently to do surveys

The frequency of scorecard surveys can be:

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

4.8 Whether to track a population across periods

The scorecard can estimate changes in poverty across periods, but not all programs want to do this. Many programs want to assess poverty only for in-coming participants.

4.9 Whether to interview the same participants twice

If a scorecard is applied more than once in order to estimate changes in poverty, then it can be applied with:

- One sample of participants, all of whom are scored at both baseline and follow-up
- Two samples of participants from the same population, with the first sample scored at baseline and the second sample scored at follow-up.

Scoring one sample twice gives estimates with smaller margins of error. It may also be less costly at follow-up, given that the households have already been tracked down at home at baseline. Furthermore, the follow-up round could be based on a random sample of the households interviewed at baseline.

4.10 Example of survey design and implementation in Bangladesh

An example set of choices is illustrated by the microfinance arms of BRAC and ASA, two pro-poor titans in Bangladesh who each have about 7 million participating households and who made plans to apply the scorecard for Bangladesh[31] with a sample of about 25,000 participants each.

Their design is that all loan officers in a random sample of branches score all participants each time the loan officers visit a homestead (about once a year) as part of their standard due diligence prior to loan disbursement. The loan officers 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 for further analysis.

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[31] **Schreiner**, 2013.

5. How to use scores for targeting

When a program uses the scorecard for segmenting (*targeting*) participants for differentiated treatment based on poverty, people in households with scores at or below a cut-off are labeled *targeted* and given one type of treatment. People in households with scores above a cut-off are labeled *non-targeted* and given another type of treatment.[32]

Households that score at or below a given cut-off should be labeled as *targeted*,[33] not as *poor*.[34]

Targeting is successful to the extent to which people truly below a poverty line are targeted (*inclusion*) or people truly above a poverty line are not targeted (*exclusion*). Of course, no poverty-assessment tool is perfect, and targeting is unsuccessful to the extent to which people truly below a poverty line are not targeted (*undercoverage*) or people truly above a poverty line are targeted (*leakage*).

Figure 13 below depicts these four possible targeting outcomes. Targeting accuracy varies by the cut-off score. A higher cut-off has better inclusion and better undercoverage (but worse exclusion and worse leakage). In contrast, a lower cut-off has worse inclusion and worse undercoverage (but better exclusion and better leakage).

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[32] *Targeting status* (having a score at or below a targeting cut-off) is not the same concept as *poverty status* (having income below a poverty line). Poverty status is a fact that is defined by whether income is below a poverty line as directly measured by a survey. In contrast, targeting status is a program's policy choice that depends on a cut-off and on an indirect estimate from a scorecard.

[33] Other labels can be meaningful as long as they describe the segment and do not confuse targeting status (having a score below a program-selected cut-off) with poverty status (having income below an externally-defined poverty line). Examples include: *Groups A, B, and C*; *People with scores of 29 or less, 30 to 69, or 70 or more*; and *People who qualify for reduced fees, or who do not qualify*.

[34] After all, unless all targeted households have poverty likelihoods of 100 percent, it is likely that some of them are non-poor (their income is above a given poverty line). In the context of the scorecard, the terms *poor* and *non-poor* have specific, income-based definitions. Using these same terms for targeting status is incorrect and misleading.

Figure 13: Possible targeting outcomes

		Targeting segment	
		Targeted	**Non-targeted**
Observed poverty status	**Poor**	**Inclusion** Poor correctly targeted	**Undercoverage** Poor mistakenly not targeted
	Non-poor	**Leakage** Non-poor mistakenly targeted	**Exclusion** Non-poor correctly not targeted

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 the sum of net benefits.[35]

The five tables below show the scorecard's targeting outcomes by poverty line and by score cut-off for people in Paraguay:

- **Figure 14: Inclusion (% people who are poor and correctly targeted)**
- **Figure 15: Undercoverage (% people who are poor but mistakenly not targeted)**
- **Figure 16: Leakage (% people who are not poor but mistakenly targeted)**
- **Figure 17: Exclusion (% people who are not poor and correctly not targeted)**
- **Figure 18: Hit rate (% people correctly targeted, that is, inclusion plus exclusion)**

For a given score cut-off, each of the five figures below also show the share of all people who are targeted.

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[35] Adams and Hand, 2000; Hoadley and Oliver, 1998.

Figure 14: Inclusion (% people who are poor and correctly targeted)

Targeting cut-off	% all people who are targeted	National			Intl. 2011 PPP				Percentile-based lines						
		100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
<=20	5.1	4.5	5.0	5.1	0.2	1.7	3.8	5.1	3.1	4.1	5.0	5.0	5.1	5.1	5.1
<=24	9.5	8.1	9.3	9.5	0.4	3.2	7.2	9.5	5.9	7.7	9.2	9.5	9.5	9.5	9.6
<=28	14.6	11.6	14.1	14.4	0.5	3.7	9.4	14.6	7.7	10.7	13.8	14.4	14.4	14.6	14.6
<=31	18.6	14.0	17.7	18.4	0.5	3.8	11.2	18.6	8.7	12.6	17.2	18.3	18.4	18.6	18.6
<=34	23.7	16.0	21.5	23.3	0.6	4.0	12.3	23.7	9.2	14.3	20.4	22.5	23.3	23.7	23.7
<=37	29.7	17.8	25.5	28.3	0.6	4.1	13.1	29.4	9.7	15.6	24.0	26.7	28.5	29.4	29.7
<=39	33.9	18.9	28.5	31.9	0.6	4.1	13.4	33.5	9.8	16.4	26.8	29.9	32.1	33.5	33.8
<=41	39.4	20.3	31.1	35.8	0.7	4.1	14.4	38.4	10.0	17.7	29.4	32.9	36.0	38.5	39.2
<=43	44.4	20.9	33.8	39.5	0.7	4.2	14.7	43.1	10.0	18.1	31.5	36.1	39.9	43.1	44.2
<=45	48.7	21.8	35.9	42.5	0.7	4.2	15.2	47.1	10.2	18.9	33.4	38.4	43.0	47.1	48.3
<=47	54.6	22.3	38.1	46.1	0.7	4.3	15.4	52.3	10.3	19.4	35.4	41.1	46.9	52.3	54.0
<=49	59.2	22.7	39.6	48.3	0.7	4.3	15.5	56.0	10.3	19.5	36.6	43.1	49.3	56.1	58.1
<=51	63.8	23.0	40.8	50.9	0.8	4.4	15.7	59.9	10.5	19.7	37.5	44.7	52.1	60.0	62.4
<=53	67.6	23.0	41.9	53.1	0.8	4.4	15.8	63.5	10.5	19.7	38.4	46.4	54.4	63.6	66.2
<=55	71.2	23.1	42.2	54.7	0.8	4.4	15.8	66.3	10.5	19.7	38.7	47.2	56.2	66.5	69.6
<=57	76.6	23.2	42.8	56.2	0.8	4.4	15.8	70.0	10.5	19.8	39.2	48.1	57.9	70.3	74.1
<=59	81.7	23.2	43.4	57.0	0.8	4.4	15.8	73.0	10.5	19.8	39.7	48.7	58.7	73.5	78.4
<=62	87.4	23.2	43.5	57.7	0.8	4.4	15.8	75.6	10.5	19.8	39.8	49.0	59.4	76.1	82.5
<=66	93.3	23.2	43.6	58.5	0.8	4.4	15.8	78.0	10.5	19.8	39.8	49.4	60.1	78.5	86.7
<=100	100.0	23.2	43.6	58.6	0.8	4.4	15.8	79.1	10.5	19.8	39.8	49.4	60.3	79.8	90.0

Scorecard applied to the validation sample.

Figure 15: Undercoverage (% people who are poor but mistakenly not targeted)

Targeting cut-off	% all people who are targeted	National			Intl. 2011 PPP				Percentile-based lines						
		100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
<=20	5.1	18.8	38.6	53.6	0.6	2.7	12.0	74.0	7.4	15.7	34.8	44.4	55.3	74.7	84.9
<=24	9.5	15.1	34.4	49.1	0.4	1.2	8.7	69.6	4.6	12.1	30.6	40.0	50.8	70.2	80.4
<=28	14.6	11.6	29.6	44.2	0.3	0.7	6.4	64.5	2.8	9.2	26.0	35.0	45.9	65.2	75.4
<=31	18.6	9.2	26.0	40.3	0.3	0.5	4.7	60.5	1.8	7.2	22.6	31.2	42.0	61.2	71.4
<=34	23.7	7.2	22.2	35.4	0.2	0.4	3.6	55.4	1.3	5.5	19.4	27.0	37.1	56.1	66.3
<=37	29.7	5.5	18.1	30.3	0.2	0.3	2.8	49.7	0.8	4.2	15.8	22.7	31.8	50.4	60.3
<=39	33.9	4.3	15.2	26.8	0.2	0.3	2.5	45.6	0.7	3.4	13.1	19.5	28.3	46.3	56.2
<=41	39.4	2.9	12.5	22.9	0.1	0.2	1.4	40.7	0.5	2.2	10.5	16.6	24.3	41.3	50.8
<=43	44.4	2.3	9.9	19.2	0.1	0.2	1.1	36.0	0.5	1.7	8.3	13.4	20.4	36.7	45.8
<=45	48.7	1.4	7.8	16.2	0.1	0.1	0.6	32.0	0.3	0.9	6.4	11.0	17.3	32.7	41.7
<=47	54.6	0.9	5.5	12.5	0.1	0.1	0.4	26.8	0.2	0.5	4.5	8.4	13.5	27.4	36.0
<=49	59.2	0.5	4.0	10.3	0.1	0.1	0.3	23.1	0.2	0.3	3.2	6.4	11.0	23.7	31.9
<=51	63.8	0.2	2.9	7.7	0.0	0.0	0.1	19.2	0.0	0.1	2.3	4.7	8.2	19.8	27.6
<=53	67.6	0.2	1.8	5.5	0.0	0.0	0.1	15.6	0.0	0.1	1.5	3.0	5.9	16.2	23.7
<=55	71.2	0.2	1.4	4.0	0.0	0.0	0.1	12.8	0.0	0.1	1.2	2.3	4.1	13.3	20.4
<=57	76.6	0.0	0.8	2.4	0.0	0.0	0.0	9.1	0.0	0.0	0.6	1.3	2.5	9.5	15.9
<=59	81.7	0.0	0.3	1.6	0.0	0.0	0.0	6.1	0.0	0.0	0.1	0.7	1.6	6.3	11.6
<=62	87.4	0.0	0.1	0.9	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.5	1.0	3.7	7.5
<=66	93.3	0.0	0.0	0.2	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.1	0.2	1.3	3.3
<=100	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Scorecard applied to the validation sample.

Figure 16: Leakage (% people who are not poor but mistakenly targeted)

Targeting cut-off	% all people who are targeted	Leakage (%)													
		National			Intl. 2011 PPP				Percentile-based lines						
		100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
<=20	5.1	0.6	0.0	0.0	4.9	3.4	1.3	0.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0
<=24	9.5	1.4	0.3	0.0	9.2	6.4	2.4	0.0	3.7	1.8	0.3	0.1	0.0	0.0	0.0
<=28	14.6	3.0	0.5	0.1	14.1	10.9	5.2	0.0	6.9	3.9	0.8	0.2	0.1	0.0	0.0
<=31	18.6	4.6	1.0	0.2	18.1	14.8	7.5	0.0	9.9	6.0	1.4	0.4	0.2	0.0	0.0
<=34	23.7	7.6	2.2	0.4	23.1	19.7	11.4	0.0	14.5	9.4	3.2	1.2	0.4	0.0	0.0
<=37	29.7	12.0	4.2	1.4	29.1	25.6	16.6	0.3	20.0	14.1	5.7	3.0	1.2	0.3	0.1
<=39	33.9	14.9	5.4	2.0	33.3	29.8	20.5	0.4	24.1	17.4	7.1	3.9	1.8	0.4	0.1
<=41	39.4	19.0	8.2	3.6	38.7	35.2	24.9	0.9	29.4	21.7	10.0	6.5	3.4	0.9	0.2
<=43	44.4	23.5	10.6	4.9	43.7	40.2	29.7	1.3	34.4	26.2	12.8	8.3	4.5	1.3	0.2
<=45	48.7	26.9	12.9	6.3	48.0	44.5	33.5	1.6	38.5	29.8	15.4	10.3	5.7	1.6	0.5
<=47	54.6	32.3	16.5	8.5	53.9	50.4	39.2	2.3	44.3	35.3	19.3	13.6	7.8	2.3	0.7
<=49	59.2	36.5	19.5	10.8	58.5	54.9	43.6	3.2	48.8	39.6	22.5	16.1	9.8	3.1	1.1
<=51	63.8	40.8	23.0	12.8	63.0	59.4	48.0	3.9	53.3	44.0	26.2	19.0	11.6	3.8	1.4
<=53	67.6	44.6	25.8	14.5	66.9	63.3	51.9	4.1	57.2	47.9	29.3	21.2	13.2	4.1	1.4
<=55	71.2	48.2	29.0	16.6	70.5	66.9	55.5	4.9	60.8	51.5	32.6	24.1	15.0	4.8	1.7
<=57	76.6	53.4	33.7	20.4	75.8	72.2	60.8	6.6	66.1	56.8	37.4	28.5	18.7	6.3	2.6
<=59	81.7	58.5	38.3	24.6	80.9	77.3	65.8	8.6	71.2	61.8	41.9	32.9	23.0	8.2	3.3
<=62	87.4	64.2	43.9	29.7	86.6	83.0	71.6	11.8	76.9	67.6	47.6	38.4	28.0	11.3	4.9
<=66	93.3	70.1	49.7	34.8	92.5	88.9	77.4	15.3	82.8	73.5	53.5	43.9	33.1	14.7	6.6
<=100	100.0	76.8	56.4	41.4	99.2	95.6	84.2	20.9	89.5	80.2	60.2	50.6	39.7	20.2	10.0

Scorecard applied to the validation sample.

Figure 17: Exclusion (% people who are not poor and correctly not targeted)

Targeting cut-off	% all people who are targeted	National			Intl. 2011 PPP				Percentile-based lines						
		100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
<=20	5.1	76.2	56.3	41.4	94.4	92.2	82.9	20.9	87.5	79.2	60.1	50.5	39.7	20.2	10.0
<=24	9.5	75.4	56.1	41.3	90.1	89.2	81.8	20.9	85.8	78.4	59.9	50.5	39.6	20.2	10.0
<=28	14.6	73.8	55.8	41.2	85.1	84.7	79.0	20.9	82.6	76.2	59.4	50.4	39.5	20.2	10.0
<=31	18.6	72.2	55.4	41.1	81.1	80.8	76.7	20.9	79.6	74.2	58.8	50.2	39.4	20.2	10.0
<=34	23.7	69.1	54.1	41.0	76.2	75.9	72.8	20.9	75.1	70.8	56.9	49.4	39.3	20.2	10.0
<=37	29.7	64.8	52.1	39.9	70.1	70.0	67.5	20.6	69.5	66.1	54.5	47.6	38.5	19.9	10.0
<=39	33.9	61.8	51.0	39.4	66.0	65.9	63.7	20.5	65.4	62.8	53.1	46.6	37.9	19.8	9.9
<=41	39.4	57.7	48.1	37.8	60.5	60.4	59.2	20.0	60.1	58.5	50.2	44.1	36.3	19.3	9.9
<=43	44.4	53.3	45.8	36.5	55.6	55.4	54.5	19.6	55.1	54.0	47.3	42.2	35.2	18.9	9.8
<=45	48.7	49.8	43.5	35.1	51.2	51.1	50.6	19.3	51.0	50.4	44.8	40.2	34.0	18.6	9.5
<=47	54.6	44.5	39.8	32.8	45.3	45.3	44.9	18.6	45.2	44.9	40.9	37.0	31.9	17.9	9.3
<=49	59.2	40.3	36.8	30.5	40.8	40.8	40.6	17.7	40.7	40.5	37.6	34.5	29.9	17.1	8.9
<=51	63.8	36.0	33.4	28.5	36.2	36.2	36.1	17.0	36.2	36.2	33.9	31.5	28.0	16.4	8.6
<=53	67.6	32.1	30.6	26.9	32.4	32.4	32.3	16.8	32.4	32.3	30.9	29.3	26.5	16.1	8.6
<=55	71.2	28.6	27.3	24.8	28.8	28.8	28.7	16.0	28.8	28.7	27.6	26.5	24.7	15.4	8.3
<=57	76.6	23.4	22.6	21.0	23.4	23.4	23.4	14.3	23.4	23.4	22.8	22.1	20.9	13.9	7.4
<=59	81.7	18.3	18.1	16.7	18.3	18.3	18.3	12.3	18.3	18.3	18.2	17.6	16.7	12.0	6.7
<=62	87.4	12.6	12.5	11.7	12.6	12.6	12.6	9.1	12.6	12.6	12.6	12.1	11.6	8.9	5.1
<=66	93.3	6.7	6.7	6.5	6.7	6.7	6.7	5.6	6.7	6.7	6.7	6.6	6.5	5.5	3.4
<=100	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Scorecard applied to the validation sample.

Figure 18: Hit rate (% people correctly targeted, that is, inclusion plus exclusion)

Targeting cut-off	% all people who are targeted	Hit rate (= Inclusion + Exclusion) (%)													
		National			Intl. 2011 PPP				Percentile-based lines						
		100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
<=20	5.1	80.6	61.3	46.4	94.5	93.9	86.7	26.0	90.6	83.3	65.2	55.6	44.7	25.3	15.1
<=24	9.5	83.5	65.4	50.8	90.5	92.4	88.9	30.4	91.7	86.1	69.1	59.9	49.1	29.8	19.6
<=28	14.6	85.5	69.9	55.6	85.6	88.4	88.4	35.5	90.3	86.9	73.2	64.8	54.0	34.8	24.6
<=31	18.6	86.2	73.0	59.5	81.6	84.7	87.9	39.5	88.3	86.7	76.0	68.5	57.8	38.8	28.6
<=34	23.7	85.1	75.6	64.3	76.8	79.9	85.0	44.6	84.3	85.1	77.4	71.8	62.6	43.9	33.7
<=37	29.7	82.6	77.7	68.3	70.7	74.1	80.6	50.0	79.2	81.8	78.5	74.3	67.0	49.3	39.7
<=39	33.9	80.7	79.5	71.2	66.6	69.9	77.0	54.0	75.2	79.2	79.9	76.6	70.0	53.3	43.7
<=41	39.4	78.0	79.3	73.5	61.2	64.6	73.7	58.4	70.1	76.2	79.5	77.0	72.3	57.7	49.1
<=43	44.4	74.3	79.5	76.0	56.3	59.6	69.2	62.7	65.1	72.1	78.9	78.3	75.1	62.0	53.9
<=45	48.7	71.6	79.4	77.6	51.9	55.3	65.8	66.3	61.2	69.3	78.2	78.7	77.0	65.7	57.8
<=47	54.6	66.8	77.9	78.9	46.0	49.6	60.3	70.9	55.5	64.3	76.3	78.1	78.7	70.2	63.3
<=49	59.2	63.0	76.5	78.9	41.5	45.0	56.1	73.7	51.0	60.0	74.3	77.6	79.2	73.2	66.9
<=51	63.8	59.0	74.1	79.5	37.0	40.6	51.9	76.9	46.7	55.9	71.4	76.3	80.1	76.4	71.0
<=53	67.6	55.1	72.5	80.0	33.1	36.7	48.0	80.3	42.8	52.0	69.3	75.8	80.9	79.7	74.8
<=55	71.2	51.7	69.5	79.5	29.5	33.1	44.5	82.4	39.2	48.4	66.2	73.6	80.9	81.9	77.9
<=57	76.6	46.5	65.5	77.2	24.2	27.8	39.2	84.4	33.9	43.2	62.0	70.2	78.8	84.2	81.5
<=59	81.7	41.5	61.4	73.8	19.1	22.7	34.2	85.3	28.8	38.2	58.0	66.3	75.4	85.5	85.1
<=62	87.4	35.8	56.0	69.4	13.4	17.0	28.4	84.6	23.1	32.4	52.4	61.1	71.0	85.0	87.7
<=66	93.3	29.9	50.3	65.0	7.5	11.1	22.6	83.5	17.2	26.5	46.5	56.0	66.7	84.0	90.1
<=100	100.0	23.2	43.6	58.6	0.8	4.4	15.8	79.1	10.5	19.8	39.8	49.4	60.3	79.8	90.0

Scorecard applied to the validation sample.

For an example cut-off of 34 or less and referring to the previous figures, 23.7 percent of all people are targeted, and outcomes for 150% of the national line in the validation sample are:

- Inclusion: 21.5 percent are below the line and correctly targeted
- Undercoverage: 22.2 percent are below the line and mistakenly not targeted
- Leakage: 2.2 percent are above the line and mistakenly targeted
- Exclusion: 54.1 percent are above the line and correctly not targeted

Increasing the cut-off to 37 or less changes the share of of all people targeted to 29.7 percent. Raising the cut-off improves inclusion and undercoverage but worsens leakage and exclusion:

- Inclusion: 25.5 percent are below the line and correctly targeted
- Undercoverage: 18.1 percent are below the line and mistakenly not targeted
- Leakage: 4.2 percent are above the line and mistakenly targeted
- Exclusion: 52.1 percent are above the line and correctly not targeted

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

Benefit per person correctly included   x   People correctly included   –
Cost per person mistakenly not covered   x   People mistakenly not covered –
Cost per person mistakenly leaked   x   People mistakenly leaked   +
Benefit per person correctly excluded   x   People 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 the figures above for a chosen 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 pro-poor program that uses targeting—with or without the scorecard—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 targeting outcomes are valued.

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

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

Figure 18 shows the scorecard's hit rate for all cut-offs and poverty lines. For the example of 150% of the national line in the validation sample, total net benefit under the hit rate for a cut-off of 34 or less is 75.6 percent. Among the 23.7 percent of all Paraguayans targeted, about three in four are correctly classified.

The hit rate weighs successful inclusion of people below a poverty line the same as successful exclusion of people 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 x people correctly included) + (1 x people correctly excluded).

As an alternative to assigning benefits and costs to targeting outcomes and then setting a score cut-off to maximize net benefits, a pro-poor program could set cut-offs based on aspects of targeting accuracy from the three figures below:

- **Figure 19: Share of targeted people who are poor**
- **Figure 20: Poor people correctly targeted per non-poor person mistakenly targeted**
- **Figure 21: Share of poor people who are targeted**

Figure 19: Share of targeted people who are poor

Targeting cut-off	% all people who are targeted	National			Intl. 2011 PPP				Percentile-based lines						
		100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
<=20	5.1	87.7	99.2	100.0	3.7	32.8	75.0	100.0	60.2	80.8	99.2	99.2	100.0	100.0	100.0
<=24	9.5	85.3	97.4	99.6	4.1	33.1	75.0	100.0	61.4	81.0	96.9	99.2	99.6	100.0	100.0
<=28	14.6	79.8	96.5	99.0	3.2	25.0	64.7	100.0	52.7	73.0	94.5	98.7	99.0	100.0	100.0
<=31	18.6	75.2	94.8	98.7	2.5	20.5	59.9	100.0	46.8	67.6	92.6	98.1	98.7	100.0	100.0
<=34	23.7	67.7	90.7	98.4	2.5	16.8	51.9	100.0	38.9	60.4	86.4	94.9	98.4	100.0	100.0
<=37	29.7	59.8	85.8	95.3	2.0	13.7	44.0	98.9	32.6	52.7	80.9	89.9	96.0	98.9	99.8
<=39	33.9	55.8	84.1	94.1	1.8	12.0	39.5	98.9	28.8	48.5	79.1	88.4	94.7	98.9	99.7
<=41	39.4	51.6	79.1	90.9	1.7	10.5	36.7	97.7	25.3	44.9	74.6	83.5	91.5	97.7	99.6
<=43	44.4	47.2	76.1	89.0	1.6	9.4	33.2	97.1	22.5	40.9	71.1	81.3	90.0	97.1	99.5
<=45	48.7	44.7	73.6	87.2	1.4	8.7	31.2	96.6	21.0	38.8	68.5	78.8	88.3	96.6	99.0
<=47	54.6	40.8	69.7	84.4	1.3	7.8	28.2	95.8	18.8	35.4	64.7	75.2	85.8	95.8	98.7
<=49	59.2	38.4	67.0	81.7	1.2	7.2	26.3	94.6	17.4	33.0	61.9	72.8	83.4	94.7	98.1
<=51	63.8	36.1	63.9	79.9	1.2	6.8	24.7	93.9	16.4	30.9	58.8	70.1	81.8	94.0	97.8
<=53	67.6	34.0	61.9	78.6	1.1	6.5	23.3	93.9	15.5	29.2	56.7	68.6	80.5	94.0	97.9
<=55	71.2	32.4	59.3	76.7	1.1	6.1	22.2	93.1	14.7	27.7	54.3	66.2	79.0	93.3	97.6
<=57	76.6	30.3	55.9	73.4	1.0	5.7	20.7	91.4	13.7	25.8	51.2	62.8	75.6	91.8	96.6
<=59	81.7	28.4	53.1	69.8	0.9	5.3	19.4	89.4	12.8	24.3	48.6	59.7	71.9	90.0	96.0
<=62	87.4	26.6	49.8	66.0	0.9	5.0	18.1	86.4	12.0	22.7	45.5	56.0	67.9	87.0	94.4
<=66	93.3	24.9	46.7	62.7	0.8	4.7	17.0	83.6	11.2	21.2	42.7	52.9	64.5	84.2	93.0
<=100	100.0	23.2	43.6	58.6	0.8	4.4	15.8	79.1	10.5	19.8	39.8	49.4	60.3	79.8	90.0

Scorecard applied to the validation sample.

Figure 20: Poor people correctly targeted per non-poor person mistakenly targeted

Targeting cut-off	% all people who are targeted	National			Intl. 2011 PPP				Percentile-based lines						
		100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
<=20	5.1	7.1:1	121.4:1	All poor	0.0:1	0.5:1	3.0:1	All poor	1.5:1	4.2:1	121.4:1	121.4:1	All poor	All poor	All poor
<=24	9.5	5.8:1	37.0:1	250.5:1	0.0:1	0.5:1	3.0:1	All poor	1.6:1	4.3:1	30.8:1	119.1:1	250.5:1	All poor	All poor
<=28	14.6	3.9:1	27.9:1	96.8:1	0.0:1	0.3:1	1.8:1	All poor	1.1:1	2.7:1	17.2:1	75.5:1	96.8:1	All poor	All poor
<=31	18.6	3.0:1	18.3:1	73.6:1	0.0:1	0.3:1	1.5:1	All poor	0.9:1	2.1:1	12.5:1	52.1:1	73.6:1	All poor	All poor
<=34	23.7	2.1:1	9.7:1	60.8:1	0.0:1	0.2:1	1.1:1	All poor	0.6:1	1.5:1	6.3:1	18.7:1	60.8:1	All poor	All poor
<=37	29.7	1.5:1	6.1:1	20.1:1	0.0:1	0.2:1	0.8:1	93.5:1	0.5:1	1.1:1	4.2:1	8.9:1	23.9:1	93.5:1	593.3:1
<=39	33.9	1.3:1	5.3:1	15.9:1	0.0:1	0.1:1	0.7:1	89.4:1	0.4:1	0.9:1	3.8:1	7.6:1	18.0:1	89.4:1	306.9:1
<=41	39.4	1.1:1	3.8:1	10.0:1	0.0:1	0.1:1	0.6:1	41.6:1	0.3:1	0.8:1	2.9:1	5.1:1	10.7:1	41.6:1	247.6:1
<=43	44.4	0.9:1	3.2:1	8.1:1	0.0:1	0.1:1	0.5:1	33.2:1	0.3:1	0.7:1	2.5:1	4.3:1	9.0:1	33.2:1	182.3:1
<=45	48.7	0.8:1	2.8:1	6.8:1	0.0:1	0.1:1	0.5:1	28.6:1	0.3:1	0.6:1	2.2:1	3.7:1	7.5:1	28.6:1	98.9:1
<=47	54.6	0.7:1	2.3:1	5.4:1	0.0:1	0.1:1	0.4:1	22.6:1	0.2:1	0.5:1	1.8:1	3.0:1	6.0:1	22.6:1	76.9:1
<=49	59.2	0.6:1	2.0:1	4.5:1	0.0:1	0.1:1	0.4:1	17.6:1	0.2:1	0.5:1	1.6:1	2.7:1	5.0:1	18.0:1	51.1:1
<=51	63.8	0.6:1	1.8:1	4.0:1	0.0:1	0.1:1	0.3:1	15.5:1	0.2:1	0.4:1	1.4:1	2.3:1	4.5:1	15.8:1	44.4:1
<=53	67.6	0.5:1	1.6:1	3.7:1	0.0:1	0.1:1	0.3:1	15.3:1	0.2:1	0.4:1	1.3:1	2.2:1	4.1:1	15.6:1	46.1:1
<=55	71.2	0.5:1	1.5:1	3.3:1	0.0:1	0.1:1	0.3:1	13.5:1	0.2:1	0.4:1	1.2:1	2.0:1	3.8:1	13.8:1	40.4:1
<=57	76.6	0.4:1	1.3:1	2.8:1	0.0:1	0.1:1	0.3:1	10.7:1	0.2:1	0.3:1	1.0:1	1.7:1	3.1:1	11.2:1	28.6:1
<=59	81.7	0.4:1	1.1:1	2.3:1	0.0:1	0.1:1	0.2:1	8.5:1	0.1:1	0.3:1	0.9:1	1.5:1	2.6:1	9.0:1	23.7:1
<=62	87.4	0.4:1	1.0:1	1.9:1	0.0:1	0.1:1	0.2:1	6.4:1	0.1:1	0.3:1	0.8:1	1.3:1	2.1:1	6.7:1	16.9:1
<=66	93.3	0.3:1	0.9:1	1.7:1	0.0:1	0.0:1	0.2:1	5.1:1	0.1:1	0.3:1	0.7:1	1.1:1	1.8:1	5.3:1	13.2:1
<=100	100.0	0.3:1	0.8:1	1.4:1	0.0:1	0.0:1	0.2:1	3.8:1	0.1:1	0.2:1	0.7:1	1.0:1	1.5:1	3.9:1	9.0:1

Scorecard applied to the validation sample. "All poor" means "Only poor targeted".

Figure 21: Share of poor people who are targeted

Targeting cut-off	% all people who are targeted	National			Intl. 2011 PPP				Percentile-based lines						
		100%	150%	200%	$1.90	$3.20	$5.50	$21.70	10th	20th	40th	50th	60th	80th	90th
<=20	5.1	19.2	11.5	8.7	24.8	38.2	24.0	6.4	29.2	20.7	12.7	10.2	8.4	6.4	5.6
<=24	9.5	35.1	21.3	16.2	51.9	72.3	45.2	12.1	55.9	39.0	23.2	19.1	15.8	12.0	10.6
<=28	14.6	50.1	32.3	24.6	61.7	83.8	59.6	18.4	73.3	53.8	34.6	29.1	23.9	18.3	16.2
<=31	18.6	60.3	40.4	31.3	61.7	87.5	70.4	23.5	83.2	63.5	43.3	36.9	30.4	23.3	20.7
<=34	23.7	69.0	49.2	39.7	77.4	91.0	77.5	29.9	87.8	72.0	51.3	45.4	38.6	29.7	26.3
<=37	29.7	76.5	58.4	48.3	80.0	93.4	82.6	37.2	92.5	78.9	60.4	54.1	47.3	36.9	33.0
<=39	33.9	81.4	65.3	54.3	80.0	93.4	84.3	42.3	93.1	82.8	67.2	60.6	53.2	42.0	37.5
<=41	39.4	87.5	71.3	61.0	88.2	94.9	91.2	48.6	95.1	89.1	73.7	66.5	59.7	48.2	43.6
<=43	44.4	90.1	77.4	67.3	92.3	95.7	92.9	54.5	95.4	91.6	79.2	73.0	66.2	54.0	49.1
<=45	48.7	93.8	82.2	72.4	92.3	96.8	96.0	59.5	97.5	95.5	83.8	77.7	71.3	59.0	53.6
<=47	54.6	96.1	87.3	78.6	92.3	98.1	97.2	66.2	98.2	97.7	88.8	83.1	77.6	65.6	60.0
<=49	59.2	97.7	90.8	82.4	92.3	98.1	98.1	70.8	98.4	98.4	91.9	87.1	81.8	70.3	64.5
<=51	63.8	99.0	93.4	86.9	100.0	100.0	99.4	75.7	99.8	99.5	94.2	90.5	86.4	75.2	69.3
<=53	67.6	99.0	95.9	90.6	100.0	100.0	99.5	80.3	99.9	99.5	96.3	93.9	90.2	79.7	73.6
<=55	71.2	99.3	96.7	93.2	100.0	100.0	99.6	83.9	99.9	99.6	97.1	95.4	93.2	83.3	77.3
<=57	76.6	99.8	98.2	95.9	100.0	100.0	99.9	88.5	100.0	99.9	98.5	97.3	95.9	88.1	82.3
<=59	81.7	99.9	99.3	97.2	100.0	100.0	100.0	92.3	100.0	100.0	99.7	98.5	97.3	92.1	87.1
<=62	87.4	100.0	99.7	98.4	100.0	100.0	100.0	95.5	100.0	100.0	100.0	99.1	98.4	95.3	91.7
<=66	93.3	100.0	99.9	99.7	100.0	100.0	100.0	98.6	100.0	100.0	100.0	99.8	99.7	98.4	96.4
<=100	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Scorecard applied to the validation sample.

For example, a pro-poor program could set a score cut-off to achieve a desired poverty rate—say, 80 percent—among targeted people. For 150% of the national line, targeting Paraguayans who score 41 or less would target 39.4 percent of people in Paraguay and give a head-count poverty rate among those targeted of 79.1 percent (**Figure 19**).

Figure 20 is a different way of looking at this same aspect of targeting accuracy. It shows the number of poor people correctly targeted (included) for each non-poor person mistakenly included (leakage). For 150% of the national line and a score cut-off of 41 or less, 3.8 poor people are successfully targeted for every one non-poor person mistakenly targeted.

Alternatively, a pro-poor program might seek to target a desired share—such as half—of poor Paraguayans. **Figure 21** shows that a score cut-off of 34 or less would target 23.7 percent of all Paraguayans, a group in which 49.2 percent are poor by 150% of the national line.

Interview Guide

The excerpts quoted here are from:

Dirección General de Estadística, Encuestas, y Censos (2019) *Manual del Encuestador: Encuesta Permanente de Hogares Continua, EPHC 2019 4to. Trimestre*, [the *Manual*].

G1. Basic interview instructions

The scorecard can be filled out on paper in the field, with responses entered later in a spreadsheet or in your own database. Alternatively, Scorocs' cloud-based **data-collection tool** works in a web browser or as an app on Android phones, allowing data entry in the field or in the office. If there is no connection, then data is stored on the phone until it can be uploaded.

The scorecard should be administered by an enumerator trained to follow this **Interview Guide**.

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

In the scorecard header, fill in the number of household members in the space "Number of household members:" based on the list that you the enumerator made as part of the **Back-page Worksheet**.

Do not directly ask the first scorecard question ("In which department does the household live?"). Instead, fill in the response based on your knowledge of the department in which the household lives.

In the same way, do not directly ask the second scorecard question ("How many members does the household have?"). Instead, mark the answer based on the number of household members that you listed on the **Back-page Worksheet**.

Likewise, do not directly ask the third scorecard question ("In the last 7 days, how many household members 10-years-old or older did any type of work, be it as an employee, in self-employment, as a business owner with employees, or as an unremunerated worker in a family business?"). Instead, mark the response based on the number of household members listed as having worked on the **Back-page Worksheet**.

Finally, do not directly ask the fourth scorecard question ("Among those household members who worked, how many were wage/salary workers or owners of a business with employees?"). Instead, mark the response based on the number of household members with these occupational statuses based on the **Back-page Worksheet**.

Ask all of the six remaining questions directly of the respondent.

Study this **Interview Guide** carefully, and carry it with you while you work. Follow its instructions (including this one).

Remember that the respondent for the interview need not be the household member who is the direct participant with your program.

Likewise, the field agent to be recorded in the scorecard header is not necessarily the same as you the enumerator who does the interview. Rather, the field agent is the employee of the pro-poor program with whom the direct participant has an on-going relationship. If there is no such field agent, then write "NONE" in those spaces in the scorecard header.

In general, do not leave spaces in the header blank. If the requested information is unknown, does not exist, or is not applicable, then write "NONE", "UNKNOWN", "DOES NOT EXIST", or "NOT APPLICABLE" in the blanks. This shows that you the enumerator tried to obtain the data and thus may help avoid the need to return to the household to try to get the data later.

Read each question aloud word-for-word, in the order presented in the scorecard.

When you mark a response to a scorecard question, write the point value in the "Score" column and then circle the spelled-out response option, the pre-printed point value, and the hand-written points, like this:

5. What language does the female head (or spouse of the male head) usually speak at home?	A. Only Guaraní, or does not speak	0	
	B. Guaraní and Spanish	2	**4**
	C. No female head nor spouse of male head	4	
	D. Only Spanish, or other	5	

When an issue comes up that is not addressed in this **Interview Guide**, its resolution should be left to the unaided judgment of the enumerator and the respondent, as that apparently was the practice of Paraguay's DGEEC in the 2019 EPHC. That is, a program should not promulgate any definitions or rules (other than those in this **Interview Guide**) to be used by all its enumerators. Anything not explicitly addressed in this **Interview Guide** is to be left to the unaided judgment of each individual enumerator and the respondent.

Do not read the response options to the respondent. Instead, 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 this **Interview Guide** 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 this **Interview Guide**.

While responses to questions in the scorecard are verifiable, in most cases you do not need to verify responses. You should verify only if something suggests to you that a response may be inaccurate 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, confused, or uncertain. Likewise, verification may be called for if a child in the interviewed household or if a neighbor says something that does not square with a respondent's response. Verification may also be a good idea if you can see something yourself that suggests that a response may be inaccurate, such as a consumer durable that the respondent claims not to possess, or a child eating in the room who has not been counted as a member of the household.

In general, the application of the scorecard should mimic as closely as possible the application of the 2019 EPHC by Paraguay's DGEEC. For example, interviews should done in-person by a trained enumerator at the residence of the participating household because that is what DGEEC did in the 2019 EPHC.

G2. Translation

The scorecard itself, the **Back-page Worksheet**, and this **Interview Guide** are available in **English**, **Spanish**, and **Guaraní**.

G3. General interview guidance from the *Manual*

According to pp. 3–5 of the *Manual*, "Your work as an enumerator calls for interpersonal skills such as friendliness and adaptability to the range of situations that you will see while interviewing, and, of course, a deep sense of responsibility. You must also be discreet and maintain confidentiality, as you will have access to private information that you cannot divulge."

"Your responsibilities as an enumerator include:

- "Study and follow the instructions in this [**Interview Guide**, including this one]
- Never ask for (nor accept) gifts, offerings, nor any other form of remuneration from respondents
- To ensure the validity and confidentiality of the data, do the interview yourself. Do not bring anyone along with you to an interview who has no business being there
- Use the interview only to obtain the data requested in the survey. Do not take advantage of being in the respondent's residence to do unrelated things such as buying, selling, advertising, asking questions for some other survey, and so on"

G3.1 How to conduct an interview

The following interviewing guidelines come from pp. 7–9 of the *Manual*.

"The key to gaining the respondent's good-faith cooperation—and thus high-quality data—is the first impression that you make via your first actions and words. Keep in mind the following guidelines.

"*Introduce yourself appropriately*. After giving your name, establish your legitimacy by showing your credentials with the name of your program. Inform the respondent of the goals of the survey before you start asking questions.

"To make a good first impression and to establish a healthy rapport with the respondent, use a prepared statement (such as the one below) or some other statement that invites acceptance, such as 'I would like to ask you a few questions, and I appreciate your cooperation.' Do not start with feeble questions that only invite rejection such as 'Are you very busy?', or 'Could you spare me a few minutes?', or 'Can I ask you a few questions?'

"An effective introduction might go like this. 'Good morning. I am an enumerator with [your program]. We are surveying our participants to gather data about how they live. I would like to ask you a few questions, and I trust that you will be so kind as to give me your cooperation.'

"If your supervisor or anyone else from your program is accompanying you to observe the interview, then you should introduce him/her to the respondent right from the start. Clarity and openness go a long way towards building the good faith needed to encourage careful responses to your questions.

"*Establish privacy and confidentiality*: The interview with the participating household must be done in private. If third parties—such as neighbors or visitors—are present, then they may interfere and thus increase the risk of low-quality data.

"Before asking any questions, inform the respondent that his/her responses will be kept strictly confidential. Explain that no identifying information will be published that could link the responses with the respondent.

"*Be neutral*. The [scorecard] has been carefully designed to avoid suggesting responses to the respondent. Therefore, you must read each question completely and exactly as it is written.

"*Be discreet*. Never suggest—be it by your facial expression or by your tone of voice—that the respondent has given an inappropriate response.

"*Be ready to deal with refusal to respond*. If the respondent does not want to respond to a question, then continue normally with the next question as if nothing unusual has happened. Once you have asked all the questions, then go back and politely try to get responses any that were skipped.

"*Be in control*. As the enumerator, you are in charge of the interview; do not let the respondent wrest control from you. If the respondent talks about things that do not pertain to the survey, then refrain from brusquely interrupting. As soon as you can, however, tactfully nudge the discussion back on track. Of course, you must always be cordial. If the respondent sees you as a nice, friendly, respectable person, then he/she will be more likely to respond willingly.

"*Be ready to deal with evasive responses*. Respondents sometimes give vague or imprecise responses or carelessly say, 'I do not know', 'Just put down whatever seems good to you', or 'It is what it is'. When this happens, explain that the respondent's responses are valued by your program. This should bolster his/her confidence and feelings of importance.

"*Read the questions exactly as they are written in the questionnaire*. Read them word-for-word, in the order in which they appear. If you change the wording or order, then the meaning or interpretation of the question might change, harming its ability to elicit the desired information. If the respondent does not understand the question, then you should repeat it slowly and clearly.

"*Probe when responses are incomplete or unsatisfactory*. Sometimes, responses are inadequate because they do not correspond with the intent of the question. For example, a response may be incomplete or off-topic, or the respondent may simply not know the response. To get a better response, use follow-up questions. This process of digging deeper is called *probing*. When you probe, use neutral words so as not to suggest specific responses.

"*Do not assume responses*. Regardless of the socio-economic or other characteristics of the respondent or the location/quality of the residence, do not assume that you know the responses to any questions without actually asking the respondent. Do not let yourself form preconceived notions of what the responses should be. [Of course, it is not necessary to ask the respondent for a response to the first question ('In which department does the household live?') as long as you the enumerator already know where you are.]

"*Do not rush*. Ask questions slowly and carefully. To encourage understanding, give the respondent time to think. Otherwise, the response may be incomplete or inaccurate. If you suspect that the respondent is giving careless or frivolous answers to get the interview over with, then explain that there is no hurry and that his/her responses are valued by your program.

"*End well*. When all questions have been asked, check the questionnaire carefully for omitted questions or incomplete responses. If needed, complete the job by asking questions again. Before leaving the residence, thank the respondent for his/her cooperation and say good-bye, mentioning that, in the future, someone from your program may come to visit again to check your work."

G3.2   Who should be the respondent?

Remember that the respondent does not need to be the household member who is the direct participant with your program (although the respondent may be the direct participant).

According to page 21 of the *Manual*, the preferred respondent is "the head of the household or the spouse of the head of the household. If neither of these two people are available, then seek a substitute among those household members who are 15-years-old or older and who are able to respond on behalf of all household members."

According to p. 31 of the *Manual*, "The respondent cannot be anyone who is not a household member or who—despite being a household member—does not know much about the household. For example, the respondent cannot be a domestic servant, guest, neighbor, or visitor."

G3.3   Who is the head of the household?

Note that the head of the household may or may not be the household member who is the direct participant with your program (although the head may be the direct participant).

According to p. 21 of the *Manual*, the *head of the household* is "the member of the household who is recognized as the head by the other members of the household. The head may be a male or a female.

"If in doubt, then count as the head that household member who is has final economic responsibility for the household. As a last resort, count the oldest member of the household as the head."

G4. Guidelines for each question in the scorecard

G4.1 In which department does the household live?
A. Alto Paraná
B. Itapúa, or Caaguazú
C. Central, or Caazapá
D. Amambay, Canindeyú, Concepción, Cordillera, Guairá, Misiones, Ñeembucú, Paraguarí, or Presidente Hayes (excludes Alto Paraguay and Boquerón)
E. Asunción, or San Pedro

Unless you have to, do not directly ask this question of the respondent. Instead, fill in the response based on your knowledge of the department in which the household lives.

G4.2 How many members does the household have?

    A. Six or more
    B. Five
    C. Four
    D. Three
    E. Two
    F. One

Do not directly ask this question of the respondent. Instead, mark the response based on the number of household members that you listed on the **Back-page Worksheet**.

According to p. 21 of the *Manual*, a *household* is "one person or a group of people, regardless of blood or marital relationships, who usually live in a particular residence, occupying it wholly or partly, and who together fulfill their basic needs and eat from a common pot."

According to pp. 23–25 of the *Manual*, a *member of the interviewed household* is "anyone who usually lives with the household (eats, sleeps, and takes shelter in their residence) or who lives with the household now and intends to continue to do so indefinitely.

"Domestic servants who return to their own residences each night to sleep are not considered to be members of the interviewed household, nor are lodgers.

"The following count as usual residents and therefore as *members of the interviewed household*:

- People who usually live in the residence of the household and who eat, sleep, and take shelter there
- People who currently live with the household in its residence and who plan to continue living there indefinitely, regardless of how much time has passed since they came to live there
- People who do not usually live elsewhere such as peddlers, truck drivers, riverine sailors, and so on. (*Riverine sailors* serve on ships that ply the river between ports inside and outside of Paraguay without ever being on the ocean.)
- Members of the armed forces or the police who return to their own residences to sleep
- Those who are considered as the heads of the interviewed households who nevertheless live in collective arrangements (such as barracks or work hostels) elsewhere

- Those who usually live in the residence with the interviewed household but who happen to be temporarily absent on the day of the interview due to a business trip, vacation, illness, school attendance, truck driving, and so on, as long as the total expected duration of the absence is six months or less
- Domestic servants (even if those servants are related with their employers by blood or marriage) who sleep in the residence of their employers, that is, servants who do not return to their own residences each night to sleep
- Those who cross the border out of Paraguay and into a neighboring country every day and who return that same day to sleep in the their own residences
- New-born babies who are still in the hospital
- Foreigners, their families, and their domestic servants who live in Paraguay or who intend to stay
- Foreign contractors or consultants who work for the government of Paraguay or for private Paraguayan companies

"The following people do not count as usual residents and so are not considered as members of the interviewed household:

- Vistors of the interviewed household on the day of the interview who usually eat and sleep elsewhere
- People who live in the residence of the interviewed household but who spend most of their time (at least four days a week) somewhere else due to work. Examples include ocean-going sailors, teachers, nurses, and security guards
- Domestic servants who return each night to their own residences to sleep
- People who have left the residence to live somewhere else—whether for school, work, or for some other reason—for an actual or expected total duration of more than six months
- People who used to live with the interviewed household but who currently live (without a definite return date) in mental institutions, retirement homes, penitentaries, and the like
- People who are hospitalized, if the actual or expected total duration of their absence is more than six months
- People who happen to be temporarily in Paraguay and for whom the expected total duration of their stay is six months or less
- Contractors or consultants from foreign countries who are working for foriegn governments or international organizations
- Foreign diplomats, their families, and their servants who are in Paraguay as embassadors, consuls, business facilitators, and so on, regardless of how long they have lived (or expect to live) in Paraguay

"If a person has two or more residences, then count him/her as a resident of the place where he/she spends most of the week. For example, suppose that the parents of a youth live in Zaguazú County in the rural area of Yaguarón. The youth, however, lives with an aunt in a nearby town in order to attend high school there. The youth regularly returns to the parents' home on weekends to visit. If the parents' household is being interviewed, then the youth is not counted as a member of the interviewed household. In contrast, if the aunt's household is being interviewed, then the youth is counted as a member of the interviewed household because the youth spends most of the time each week there."

G4.3 **In the last 7 days, how many household members 10-years-old or older did any type of work, be it as an employee, in self-employment, as a business owner with employees, or as an unremunerated worker in a family business?**

A. None
B. One
C. Two
D. Three or more

According to p. 71 of the *Manual*, a person qualifies as a 'worker' according to the number of hours that he/she worked in the last seven days. Someone is a 'worker' if he/she worked at least:

- One hour in a non-agricultural economic activity
- Seven hours in an agricultural economic activity
- Seven hours as an unremunerated worker in a family-owned business"

According to p. 70 of the *Manual*, an *economic activity* is one "done by household members in the residence or outside of the residence during the reference period."

According to p. 71 of the *Manual*, *economic activity* does not include "unpaid community-service work nor volunteer work. These non-economic activities are unpaid, voluntary acts by which a person transfers goods or services to other people, organizations, or communities. They have the following characteristics:

- Unremunerated
- Voluntary and uncoerced
- Done for the benefit of other people, organizations, or communities

"In addition, work for the benefit of the household that is done by a household member (chores at home, for example, or the unremunerated labor put in by housewives to keep a home) are not considered to be economic activities.

"This non-economic *household work* (that is, work done by a household member for the sole benefit of the household) is distinct from any commercial or professional economic activity that a person may do from his/her residence in exchange for remuneration and for the benefit of people outside the household.

"Paid domestic service performed in the residence of someone else's household, whether done part-time or full-time, does count as an economic activity."

According to pp. 72–73 of the *Manual*, "Salaried employees are considered to have worked in the last seven days even if they did not actually work as long as they continue to have a formal attachment to their job. The criteria for determining whether there is a formal attachment are:

- Uninterrupted payment of wages or salaries
- Assurance of being able to return to employment once the reason for the current absence expires or as of a date set by previous agreement
- Having the right, under certain circumstances and according to the length of absence, to be compensated without being obliged to accept other work

"Self-employed workers who have a business in manufacturing, retail or wholesale trade, agriculture, or the provision of services are considered to have worked in the last seven days even if they did not actually work *if* they did not work due to a lack of demand, bad weather, lack of availability of materials, or for any other reason as long as they did indeed work in the last 30 days and as long as their business has a physical infrastructure and fixed assets such as machines and so on. Examples include beauticians, carpenters, mechanics, iron-workers, shoemakers, and so on.

"Self-employed people who did not work in the last seven days are not considered to have worked if they are bricklayers/masons, plumbers, gardeners, electricians, pastry cooks, or occasional workers such as shoe-shiners in the street or itinerant vendors of newspapers, ice cream, and so on, as long as they do not have work in progress. It is assumed that the businesses of these workers do not continue to exist once the owners have not worked for seven days."

G4.4 Among those household members who worked, how many were wage/salary workers or owners of a business with employees?

A. None
B. One
C. Two or more

According to p. 81 of the *Manual*, a *wage/salary worker* is "someone who works in exchange for a wage, salary, or commission for a private business/company or for a public/governmental entity.

"An *owner of a business with employees* is someone who runs his/her own business or who has his/her own professional office and who employs and pays at least one wage/salary worker (not counting any domestic servants).

G4.5 **What language does the female head (or spouse of the male head) usually speak at home?**

    A. Only Guaraní, or does not speak

    B. Guaraní and Spanish

    C. No female head nor spouse of male head

    D. Only Spanish, or other

According to pp. 51–52 of the *Manual*, "Record the language that the female head (or the female spouse of the male head) usually speaks at home.

"The idea of the language that the female head (or the spouse of the male head) 'usually speaks' means the language that she speaks [most frequently].

"Be sure that you the enumerator do not in any way indicate what you think the response should be. Do not make assumptions; just wait for the respondent to respond.

"The option 'other' encompasses indigenous languages and foreign languages. Examples are Portuguese, German, and the indigenous languages spoken by a large number of people, especially in rural areas.

"The option 'does not speak' applies to mute people."

Remember that you already know the name of the female head (or the spouse of the male head) (and whether she exists) from the notes that you took for your own use while compiling the **Back-page Worksheet**. Thus, if there is a female head (or spouse of the male head), do not mechanically ask, "What language does the female head (or spouse of the male head) usually speak at home?". Instead, use the actual name of the female head (or spouse of the male head), for example: "What language does doña María usually speak at home?"

If there is no female head (and no spouse of the male head), then mark "C. No female head nor spouse of male head" and go on to the next question without asking anything of the respondent.

For the purposes of the scorecard, the *female head (or the spouse of the male head)* is defined as:

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

Note that the head of the household may or may not be the household member who is the direct participant with your program (although the head may be the direct participant).

According to p. 21 of the *Manual*, the *head of the household* is "the member of the household who is recognized as the head by the other members of the household. The head may be a man or a woman.

"If in doubt, then count as the head the household that member who has final economic responsibility for the household. As a last resort, count the oldest member of the household as the head. [Every household has a head, and every household has only one head.]"

G4.6 **What is the main material of the floor of the residence?**

    A. Dirt

    B. Cement (*lecherada*)

    C. Bricks, or wood

    D. Tile (ordinary, mosaic, or ceramic), polished stone, marble, granite, hardwoods, carpet, linoleum, or other

According to pp. 33–34 of the *Manual*, "This question refers to the main flooring material, that is, the material that accounts for the largest share of floor area. If there is a tie between two or more types of materials, then record the highest-quality or highest-value material. [In the scorecard, this is the material with the highest point value.] For example, if a residence has 50 m^2 of bricks, and 50 m^2 of mosaic tile, then count the response as mosaic tile, as it is the highest-value material."

G4.7 Where does human waste from the bathroom drain?

    A. Simple pit latrine (*pozo seco*) of any kind, open pit, ditch, creek, river, on the ground, or other

    B. Closed pit latrine (*pozo ciego*) without septic tank

    C. Closed pit latrine (*pozo ciego*) with septic tank, or sanitary sewer system

According to pp. 39–40 of the *Manual*, "If the interviewed household disposes of its sewage in more than one way, then record the response that corresponds to the most modern, cleanest, or highest-value system. [In the scorecard, this is the system with the highest point value.]

"For residences in which two or more tenant households share a toilet arrangement, record the type of the shared arrangement.

"Definitions of sewage-disposal systems:

*"Simple pit latrine (*hoyo seco*)*: A hole in the ground into which human waste is deposited directly. The hole is not water-tight. The concept of 'simple pit latrine' encompasses all disposal systems that use a non-water-tight hole in the ground, regardless of whether they have:

    — Squatting platforms or seats
    — Roof, walls, or doors
    — Ventilation tubes

"*Open pit, ditch, creek, river, or on the ground*: Waste flows via pipes to an open pit (that is not sealed/water-tight), ditch, creek, river, or straight onto the ground.

"*Closed pit latrine* (pozo ciego) *without septic tank*: A water-tight hole in the ground into which human waste is deposited directly. It does not connect with a septic tank.

"*Closed pit latrine* (pozo ciego) *with septic tank*: A water-tight hole in the ground into which human waste is deposited directly and that connects with a septic tank. A *septic tank* collects waste in a water-proof sedimentation tank. The tank is buried some distance from the residence/toilet. Liquid in the tank seeps into the sub-soil via perforated pipes.
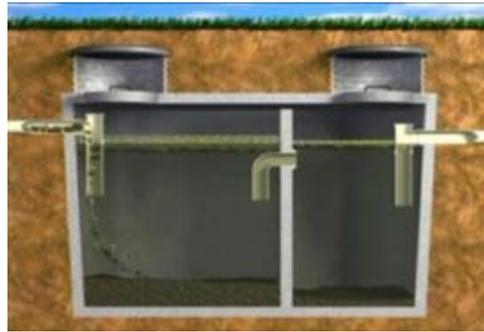
"*Sanitary sewer system*: A system of pipes designed to collect human waste and other household wastewater and carry it away from residential areas. The system collects the waste, pumps it, treats it, and disposes of it.

G4.8 What is the main cooking fuel used by the household?

    A. Firewood, or charcoal

    B. LPG, electricity, kerosene, alcohol, other, or none (does not cook)

According to p. 41 of the *Manual*, "Record the type of fuel that the household usually uses for cooking. Some households may use more than type of fuel (for example, both LPG and charcoal). In these cases, ask which one is used most. If the household says that all are used equally, then record the most modern type of fuel that is used. [In the scorecard, this is the source of energy with the highest point value.]"

G4.9 Does the household have a clothes-washing machine?

    A. No

    B. Yes

According to pp. 45–47 of the *Manual*, "Record whether the household has a clothes-washing machine in its possession and available for its use.

"A *clothes-washing machine* is an electric appliance that cleans clothes, whether automatically or semi-automatically.

"Count a clothes-washing machine if it is used by the interviewed household, regardless of whether it was purchased with cash or credit, received as a gift or as payment, rented, provided as part of a furnished apartment, or provided by an employer.

"Do not count clothes-washing machines used mostly for a business or for a household's economic activities. For example, count a clothes-washing machine used to clean the laundry of household members, but not a clothes-washing machine used to wash the work uniforms of employees who work in a business owned by the household.

"If a clothes-washing machine is shared between household and business uses, then count it only if it is used by the household at least half of the time. For example, if a clothes-washing machine is used 70 percent of the time for business and 30 percent of the time for the household, then do not count it.

"Clothes-washing machines that are not in good working order are counted only if it is possible that they will be repaired soon. If a clothes-washing machine has not been in good working order for more than one year, then do not count it."

According to p. 70 of the *Manual*, an *economic activity* is one "done by household members in the residence or outside of the residence during the reference period, excluding unpaid domestic housework and voluntary services to the community."

G4.10 Does the household have a motorcycle, automobile, truck, or pick-up?

    A. No
    B. Only motorcycle
    C. Automobile, truck, or pick-up (regardless of motorcycle)

"A *motorcycle* is a motorized vehicle with two or more wheels powered by a source of energy.

"An *automobile, truck, or pick-up* is a motorized vehicle with four wheels powered by a source of energy."

Ask this question in two parts:

- Does the household have a motorcycle? (No/Yes)
- Does the household have an automobile, truck, or pick-up? (No/Yes)

Mark the response according to the combination the two responses to these two questions:

Motorcycle?	Automobile, truck, or pick-up?	Response
No	No	A
Yes	No	B
No	Yes	C
Yes	Yes	C

According to pp. 45–47 of the *Manual*, "Record whether the household has a motorcycle, automobile, truck, or pick-up in its possession and available for its use.

"Count a motorcycle, automobile, truck, or pick-up if it is used by the interviewed household, regardless of whether it was purchased with cash or credit, received as a gift or as payment, rented, provided as part of furnished accomodation, or provided by an employer.

"Do not count motorcycles, automobiles, trucks, nor pick-ups used mostly for a business or for a household's economic activities. For example, count a pick-up that is mostly used to transport household members, but do not count a pick-up that is mostly used to transport sacks of grain in a commercial trading business owned by the household.

"If a motorcycle, automobile, truck, or pick-up is shared between household and business uses, count it only if it is used by the household at least half of the time. For example, if a pick-up is used 70 percent of the time for business and 30 percent of the time for the household, then do not count it.

"Motorcycles, automobiles, trucks, or pick-ups that are not in good working order are counted only if it is possible that they will be repaired soon. If a motorcycle, automobile, truck, or pick-up has not been in good working order for more than one year, then do not count it."

According to p. 70 of the *Manual*, an *economic activity* is one "done by household members in the residence or outside of the residence during the reference period, excluding unpaid domestic housework and voluntary services to the community."

Technical Annexes: Overview

The technical annexes cover aspects of the scorecard for advanced users or specialists. While program managers can skip the annexes and still benefit from using the scorecard, understanding the details will increase the usefulness of scorecard estimates and improve implementation, interpretation, and analysis.

Annex 1 Data used for construction and validation

Paraguay's Dirección General de Estadística, Encuestas, y Censos (DGEEC) fielded the 2019 Encuesta Permanente de Hogares Continua (EPHC, the Permanent, Continuous Household Survey) with 5,099 households in the fourth quarter of 2019. The 2019 EPHC is Paraguay's most-recent national household income survey.

Questions and points for the scorecard are selected (*constructed*) based on data from a random three-fifths of the 5,099 households in the 2019 EPHC. These same three-fifths of households are also used to associate (*calibrate*) scores with poverty likelihoods for all poverty lines.

Data from the other two-fifths of households from the 2019 EPHC is used to test (*validate*) the scorecard's accuracy for one-period, snapshot estimates of poverty rates *out-of-sample*, that is, with data that is not used in construction nor calibration. Data from those same two-fifths of households are also used for out-of-sample validations of targeting accuracy.

Annex 2 Definitions of *poverty* and of poverty lines

A household's *poverty status* as poor or non-poor depends on whether its income (PYG per person per day) is below a given poverty line. Thus, a definition of *poverty* is a poverty line together with a measure of income.

DGEEC (2005) documents Paraguay's definition of *income*.

Because pro-poor programs in Paraguay may want to use different or various poverty lines, the scorecard supports 14 lines:

- 100% of the national line
- 150% of the national line
- 200% of the national line
- $1.90/day 2011 PPP
- $3.20/day 2011 PPP
- $5.50/day 2011 PPP
- $21.70/day 2011 PPP
- First-decile (10th-percentile) line
- First-quintile (20th-percentile) line
- Second-quintile (40th-percentile) line
- Median (50th-percentile) line
- Third-quintile (60th-percentile) line
- Fourth-quintile (80th-percentile) line
- Tenth-decile (90th-percentile) line

A2.1 National poverty lines

Paraguay's old scorecard (**Schreiner**, 2012a) uses the definition of *poverty* and national poverty line in **DGEEC** (2009). The new scorecard here uses an improved definition that Paraguay later adopted (**DGEEC**, 2016). Estimates of poverty based on the two definitions are not comparable. For example, the old definition gives a head-count poverty rate for 100% of the national line with the 2015 EPHC of 22.2 percent, versus 26.6 percent for the new definition (**DGEEC**, 2016, p. 45). This non-comparability means that scorecard-based estimates of changes in poverty cannot use a baseline from the old scorecard and a follow-up from the new scorecard. Instead, a single scorecard must be used at both baseline and follow-up.

The new-definition national poverty line ("100% of the national line") is defined separately for two regions (urban and rural) with the cost-of-basic-needs method (**Ravallion**, 1998). A food line is defined in each region as the cost of a food basket (in which items' shares match those of people in the 5th to 30th percentiles of consumption expenditure in the 2011/12 *Encuesta de Ingresos y Gastos y de Condiciones de Vida*) that has 2,117 Calories (urban) or 2,291 Calories (rural). The average food line during the 2019 EPHC field work is PYG8,414 per person per day.

100% of the national poverty line is defined as the food line, plus a minimum non-food standard. This non-food standard in a given region is the food line, divided by food's share in total consumption in the 2011/12 EIGyCV for people whose food consumption is within ±10 percent of the food line. The average all-Paraguay food-plus-non-food line is PYG20,324 per person per day, giving a head-count poverty rate of 23.5 percent (**Figure 10**).[36]

DGEEC (2016) derived 100% of the national line in prices in the fourth quarter of 2012. These are updated to the fourth quarter of 2019 based on the consumer price index for metropolitan Asunción.

Two other poverty lines (150% of the national line, and 200% of the national line) are derived as multiples of 100% of the national line.

A2.2 International 2011 PPP poverty lines

The World Bank tracks world-wide poverty with four poverty lines:[37]

- $1.90/day   Low-income countries (the international "extreme poverty" line)
- $3.20/day   Lower-middle income countries
- $5.50/day   Upper-middle income countries
- $21.70/day   High-income countries

Paraguay is classified as an upper-middle income country, so the most relevant international line is $5.50/day.

These PPP lines control for differences in purchasing power across countries due to the fact that non-tradable goods and services are usually less costly in poorer countries while tradables are more costly. PPP adjustments increase the comparability of poverty estimates across countries.

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[36] This rate matches **DGEEC** (2020, p. 3), suggesting that this paper uses the same data and calculations as DGEEC did.
[37] **Jolliffe and Prydz**, 2016; **Ferreira *et al.***, 2016.

International 2011 PPP lines for Paraguay are derived from:

- 2011 PPP (revised) exchange rate for Paraguay for "individual consumption expenditure by households":[38] PYG2,242.10 per $1.00
- Average all-Paraguay Consumer Price Index[39] (CPI):
  — Calendar-year 2011: 108.25
  — Fourth quarter of 2019: 144.87
- Average all-Paraguay spatial price deflator in 2019Q4: 1.000000
- Household-level spatial price deflators derived from 100% of the national line:
  — Urban: 1.225160
  — Rural: 0.797482

Given this, the $5.50/day 2011 PPP line for a given household in a given urban/rural region is:

$$\$5.50 \cdot 2011\ \text{PPP factor} \cdot \frac{\text{Deflator}_{\text{Region}}}{\text{Ave. deflator}_{\text{Paraguay}}} \cdot \frac{\text{CPI}_{2019Q4}}{\text{CPI}_{2011}}.$$

For the example of rural Paraguay and in average prices for the whole country in the fourth quarter of 2019, the $5.50/day 2011 PPP line is:

$$\$5.50 \cdot 2,242.10 \cdot \frac{0.797482}{1.000000} \cdot \frac{144.87}{108.25} = \text{PGY13,161}.$$

The corresponding head-count poverty rate for rural Paraguay is 23.8 percent (**Figure 10**).

For Paraguay overall, the $5.50/day 2011 PPP line is PGY16,503 per person per day, with a head-count poverty rate of 16.1 percent.

The 2011 PPP poverty lines for $1.90/day, $3.20/day, and $21.70/day are multiples of the $5.50/day line.

The 2011 PPP lines and rates here are not comparable with those from the World Bank's PovcalNet because PovcalNet does not report 2011 PPP estimates for the 2019 EPHC.[40]

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[38] **World Bank**, 2020, Table E.3, column 13, p. 134.

[39] Base = 100 in calendar-year 2010, **link**.

[40] For the 2018 EPHC, **PovcalNet** reports a $5.50/day line of PGY16,091 and a head-count poverty rate of 15.9 percent.

A2.3 Percentile-based poverty lines

The scorecard also supports percentile-based poverty lines.[41] This facilitates a number of types of analyses. For example, the second-quintile (40th-percentile) line might be used to help track Paraguay's 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.

The four quintile lines (or all seven percentile lines), analyzed together, can also be used to look at the relationship of income with health outcomes (or anything else related with the distribution of income). The scorecard thus offers an alternative for health-equity analyses that typically have used an asset index (such as that supplied with the data from the Demographic and Health Surveys) to compare an estimate of socio-economic status with health outcomes.[42]

Of course, relative-wealth analyses are also possible with scores from the scorecard. But support for relative income lines allows for a more straightforward use of a single tool to analyze any or all of:

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

Unlike the scorecard, asset indexes serve only to analyze relative wealth. Furthermore, the scorecard—unlike asset indexes based on Principal Component Analysis or similar approaches—uses a straightforward, well-understood standard for socio-economic status whose definition is external to the tool itself (income relative to a poverty line defined in monetary units).

In contrast, an asset index defines *poverty* in terms of its own questions and points, without reference to an external standard. This means that two asset indexes with different questions or different points—even if derived from the same data for a given country—imply two distinct definitions of *poverty*. In the same set-up, two scorecards would provide comparable estimates under a single definition of *poverty*.

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[41] Percentiles are defined in terms of all people in Paraguay. For example, the all-Paraguay head-count poverty rate for the first-quintile (20th-percentile) poverty line is 20.0 percent (**Figure 10**).
[42] **Rutstein and Johnson**, 2004.

Annex 3 Scorecard construction

For Paraguay, about 80 candidate questions are prepared in these areas:

- Household composition (such as the number of household members)
- Education (such as the highest level completed by the female head (or spouse of the male head))
- Employment (such as the number of household members who work)
- Housing (such as the main material of the floor)
- Ownership of consumer durables (such as clothes-washing machines or motorcycles)
- Location of residence (such as the department)

To facilitate the estimation of change over time, preference is given to questions that are more sensitive to changes in poverty. For example, the ownership of a motorcycle is probably more responsive to changes in poverty than is the age of the male head (or the spouse of the female head).

The scorecard itself is built using 150% of the national poverty line and Logit regression on the construction sub-sample. Questions are selected based on both judgment and statistics.

The first step is to use Logit to build a draft scorecard for each candidate question. The power of each one-question draft scorecard to rank households by poverty status is assessed via the concentration index.[43]

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[43] **Ravallion**, 2009.

One of the one-question draft scorecards is then selected based on:[44]

- Improvement in accuracy
- Likelihood of acceptance by users as judged by:
  — Simplicity
  — Cost of collection
  — Concordance with:
    ■ Experience
    ■ Theory
    ■ Common sense
- Sensitivity to changes in income
- Variety among types of questions
- Applicability across departments
- Tendency to have a slow-changing relationship with poverty
- Relevance for distinguishing among people at the poorer end of the distribution of income
- Verifiability

A series of two-question draft scorecards are then built, each adding a second question to the one-question scorecard selected from the first stage. The best two-question draft scorecard is then selected, again using judgment to balance statistical accuracy with non-statistical criteria. These steps are repeated until the scorecard has 10 questions that work well together.

The last step is to transform the Logit coefficients into non-negative integers such that scores range from 0 to 100, with lower scores corresponding with greater poverty.

This algorithm is similar to common R^2-based stepwise least-squares regression. It differs from naïve stepwise in that the selection of questions considers both statistical[45] and non-statistical criteria. The use of non-statistical criteria can improve robustness through time and across non-nationally representative groups. It also helps to ensure that questions are straightforward, common-sense, inexpensive-to-collect, and acceptable to users.

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[44] **Schreiner _et al._**, 2014; **Zeller**, 2004.
[45] The statistical criterion is not the _p_ values of coefficients but rather a question's contribution to the ranking of households by poverty status in the context of a scorecard with nine other questions.

The single scorecard here applies to all of Paraguay. Customizing poverty-assessment tools by urban/rural does not improve targeting accuracy much.[46] Segment-specific tools may improve the accuracy of estimates of poverty rates,[47] but:

- They run a greater risk of overfitting[48]
- Most of their benefit can be had in a single scorecard with a question that identifies the segment (such as, in the case of Paraguay, the department of residence)[49]

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[46] **Brown, Ravallion, and van de Walle**, 2018; **World Bank**, 2012; **Sharif**, 2009; **Schreiner**, 2006; **Schreiner**, 2005; **Narayan and Yoshida**, 2005; and **Grosh and Baker**, 1995.

[47] **Diamond *et al.***, 2016; **Tarozzi and Deaton**, 2009.

[48] **Haslett**, 2012.

[49] **Schreiner**, 2016b.

Annex 4 Estimates of poverty likelihoods

This annex tells how scores are converted into estimated poverty likelihoods.

Scores are on an ordinal scale from 0 to 100. Higher scores signal less poverty, but not how much less. The ordered symbols used to represent scores are numbers, but those symbols are not the normal cardinal numbers that you can do math on. For example, a score of 20 plus a score of 10 is not 30 of anything, just as the letter "A" plus the letter "B" is not the letter "C" (nor anything else).

To get cardinal units, a look-up table is used to convert scores to *poverty likelihoods*, that is, probabilities of being below a poverty line. For the example of 150% of the national line, scores of 32–34 correspond with a poverty likelihood of 82.5 percent, and scores of 35–37 correspond with a poverty likelihood of 74.7 percent (**Figure 1**).

The poverty likelihood associated with a score varies by poverty line. For example, scores of 32–34 are associated with a likelihood of 82.5 percent for 150% of the national line but with a likelihood of 90.7 percent for the 200% of the national line.

A4.1 Calibrating scores with poverty likelihoods

A given score is associated ("calibrated") with an estimated poverty likelihood that is defined as the share of people in the construction sub-sample who have the score and who live in households with per-capita income below a given poverty line.

For the example of 150% of the national line and a score of 32–34 (**Figure 22** below), there are 4,095 (normalized) households in the construction sample. Of these, 3,378 (normalized) are below the poverty line. The estimated poverty likelihood associated with a score of 32–34 is then 82.5 percent, because 3,378 ÷ 4,095 ≈ 0.825 = 82.5 percent.

The same method is used to calibrate all scores with poverty likelihoods for all 14 poverty lines.[50]

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[50] To ensure that likelihoods never increase as scores increase, likelihoods across adjacent scores may be non-parametrically smoothed before grouping scores into ranges. This preserves unbiasedness while preventing higher scores being associated with higher likelihoods.

Figure 22: Estimation of poverty likelihoods (150% of national line)

Score	Households in range and < poverty line		All households in range		Poverty likelihood (%)
0–20	3,162	÷	3,187	=	99.2
21–24	2,258	÷	2,318	=	97.4
25–28	3,918	÷	4,200	=	93.3
29–31	3,117	÷	3,441	=	90.6
32–34	3,378	÷	4,095	=	82.5
35–37	3,585	÷	4,802	=	74.7
38–39	2,434	÷	3,554	=	68.5
40–41	2,478	÷	4,574	=	54.2
42–43	2,512	÷	4,636	=	54.2
44–45	1,993	÷	4,146	=	48.1
46–47	2,127	÷	6,094	=	34.9
48–49	1,729	÷	5,238	=	33.0
50–51	1,402	÷	4,772	=	29.4
52–53	937	÷	4,857	=	19.3
54–55	693	÷	5,746	=	12.1
56–57	334	÷	5,127	=	6.5
58–59	302	÷	4,998	=	6.0
60–62	274	÷	6,473	=	4.2
63–66	81	÷	6,335	=	1.3
67–100	48	÷	11,403	=	0.4

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

A4.2 Objectivity of estimates of poverty likelihoods

Even though scorecard questions are selected partly based on judgment related to non-statistical criteria, the calibration process produces estimates of poverty likelihoods that are objective, that is, derived from monetary poverty lines and from survey data on income.[51] The fact that some choices in scorecard construction are informed by judgment in no way impugns the objectivity of the estimated likelihoods; their objectivity depends on using data in score calibration, not on using data (and nothing else) in scorecard construction.

A4.3 Why not use the Logit formula?

The scorecard is based on a Logit regression (**Annex 3**). This means that poverty likelihoods could be estimated not with a calibrated look-up table (**Figure 1**) but rather with the Logit formula of $2.718281828^{\beta X} \times (1 + 2.718281828^{\beta X})^{-1}$, where β are the Logit coefficients and X is a household's responses.

The scorecard uses the calibration approach is because the Logit formula looks scary. Program managers can understand poverty likelihoods defined as the share of people with a given score in the construction sample from Paraguay's 2019 EPHC who are below a poverty line. A calibrated look-up table also allows program analysts to convert scores to likelihoods without any arithmetic at all. This calibration approach can also improve accuracy, especially with large samples.

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[51] The calibrated likelihoods would be objective even if scorecard construction did not use any data at all. In fact, objective scorecards of proven accuracy are often constructed using only expert judgment (**Caire**, 2004; **Schreiner *et al.***, 2014).

Annex 5 Error and margins of error

This annex reports the scorecard's estimation error for head-count poverty rates in a single time period. It also discusses margins of error.

A5.1 Estimation errors

A5.1.1 What is estimation error?

Estimation error is the distance and direction by which a scorecard's estimate tends to miss the true value in the population.

For example, the estimation error of Paraguay's scorecard for snapshot estimates of head-count poverty rates in a single time period by 150% of the national poverty line is +0.2 percentage points (**Figure 2**).

An unadjusted estimate can usually be improved—that is, moved closer to the true value—by subtracting off the known estimation error. For example, if the unadjusted estimate is 93.2 percent and the error is +0.2 percentage points, then an improved estimate is 93.2 – (+0.2) = 90.0 percent.

A5.1.2 What estimation errors are reported here?

Estimation errors are reported for snapshot estimates of head-count poverty rates in a single time period for all 14 poverty lines.

Errors are derived *out-of-sample*; the scorecard (made from the construction sample from the 2019 EPHC, **Annex 1**) is tested with repeated sub-samples from the validation sample that were not used to construct the scorecard. The estimation error is the average of the differences between scorecard estimates and observed poverty rates across these repeated sub-samples.

There is no data today on income-based poverty in the future, so it is impossible to report estimation error for annual net changes in head-count poverty rates across two time periods. The scorecard cannot be not tested *out-of-time* because it is both constructed and validated with data from a single time period (2019).

In practice, the scorecard—like all poverty-assessment tools—is always applied both out-of-sample and out-of-time. Being out-of-sample violates the assumption that the scorecard is applied to a sample from the same population whose data was used to construct the scorecard. Being out-of-time violates the assumption that the relationships between poverty and scorecard questions are the same as in the population whose data was used to construct the scorecard.

The unknown degree of these inevitable violations of the scorecard's assumptions means that actual estimation errors will differ from those reported here in unknowable ways.[52] Still, the errors (and margins of error) reported here are the best available, and it makes sense to account for them.

A5.1.3 How to estimate estimation errors

Given the scorecard's standard assumptions, an unbiased estimator of *estimation error* is the average of differences between scorecard estimates and observed values in repeated sub-samples from the validation sample.[53]

It is possible to compare estimated and observed poverty rates because the validation sample from the 2019 EPHC records actual (not estimated) income-based poverty status. The observed poverty likelihood in the 2019 EPHC is 100 percent for poor households and 0 percent for non-poor households. For a given poverty line, the observed (not estimated) head-count poverty rate is the household-size-weighted average of observed poverty likelihoods.

The scorecard can also be applied to the same validation sub-sample (ignoring that actual poverty status is observed) to estimate the poverty rate as the household-size-weighted average of estimated poverty likelihoods (**Section 3**).

The scorecard's estimation error in a given validation sub-sample is then the difference between the scorecard estimate versus the observed value.

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[52] Estimation errors due to being out-of-time can be measured with post-2019 data (say, from the 2020 EPHC). Of course, 2020 EPHC data will not be available until after 2020, so there will still be some unknown out-of-time error (and out-of-sample error will still be completely unknown).

[53] This is the *bootstrap approach*. The average of the values in repeated samples from the validation sample is an unbiased estimator of the true value in the population of Paraguay as a whole. The population's true value is taken as the value in the 2019 EPHC (even though the EPHC is itself only a sample).

Different sub-samples from the validation sample result in different errors. The estimate of the scorecard's general *estimation error* is the average of these errors across many sub-samples.[54] In turn, the scorecard estimate's margin of error reflects the extent of the spread of the distribution of all the sub-samples' errors around their average.[55]

A5.1.4 Errors for snapshot estimates of poverty rates in one time period

The first line in **Figure 2** ("Estimation error") presents errors for snapshot estimates of poverty rates in one time period for Paraguay's 14 poverty lines.

The average of the absolute value of each error across all poverty lines is about 1.6 percentage points. The largest absolute error is 3.3 percentage points. The error for 150% of the national line is +0.2 percentage points.

A5.2 Margins of error

A5.2.1 What are margins of error?

Like any statistic, a scorecard estimate depends on a particular sample from a population. Because samples are drawn at random, each sample is different, and different samples give different scorecard estimates. Scorecard estimates are unbiased—under the standard assumptions—because the average estimate across repeated samples is the same as the single true value in the population.

Unusual luck in any single sample, however, may push an estimate for that sample far from the true value in the population. Larger samples provide more chances for luck to even out, so large errors are less likely in larger samples.[56]

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[54] Households in a sub-sample are drawn *with replacement*; each draw comes from the full pool, including households that have already been drawn. Thus, a given household may appear in a given sub-sample once, more than once, or not at all.
[55] **Schreiner** (2020) discusses the derivation of errors.
[56] When flipping a fair (unbiased) coin, the true probability of "heads" is 50 percent. *Unbiasedness* means that the average of the share of "heads" in many samples will be close to 50 percent. In a single sample of 10 tosses, however, the chances of at least six "heads" (60 percent of tosses, with an error of at least 10 percentage points) is about 37 percent. In a single sample of 100 tosses, the chances of such a large error is smaller (about 3 percent). Larger samples reduce the risk that estimates will be far from true values.

For a given estimate, sample size, and confidence level, the *margin of error* is the range of true population values that is consistent with the estimate.

A margin of error has two parts:

- The margin of error itself (such as ±2.0 percentage points). The margin is centered on the estimate
- A confidence level (such as 90 percent) that the true value falls within the margin of error

All else constant, narrower margins of error or higher confidence levels mean that is more likely that the sample-based estimate is closer to the true population value.

To illustrate, suppose that the adjusted estimate of the head-count poverty rate for 150% of the national line is 93.0 percent and that the sample size is n = 1,024. Given 90-percent confidence, the margin of error is then ±2.5 percentage points (**Figure 2**).[57] Absent other sources of error and given the scorecard's standard assumptions, this means that there is a 90-percent chance that the true population value is in the range of 93.0 – 2.5 = 90.5 percent to 93.0 + 2.5 = 95.5 percent, with the most-likely true value being the center of the range (the 93.0-percent estimate).

Said another way, "With 90-percent confidence, the estimate has a margin of error from 90.5 to 95.5 percent." This means that the true population value has a:

- 5-percent chance of being less than 90.5 percent
- 90-percent chance of being between 90.5 and 95.5 percent
- 5-percent chance of being greater than 95.5 percent

A5.2.2 Why do margins of error matter?

Managers should put less weight on estimates with wider margins of error.

As a hypothetical example, a pro-poor program in Paraguay probably is indeed pro-poor if the scorecard estimate of the poverty rate for in-coming participants by 150% of the national poverty line with 80-percent confidence is 55.0 percent with a margin of error of ±5.0 percentage points, that is, from 50.0 to 60.0 percent. The estimate and its margin of error suggest that the true poverty rate of in-coming participants is unlikely to be less than or about the same as the all-Paraguay rate for this line of 43.7 percent from **Figure 10**.

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[57] Most real-world decisions are made with much less than 90-percent confidence.

If, however, the margin of error were ±15.0 percentage points (that is, from 40.0 to 70.0 percent), then there would be a non-negligible chance that the poverty rate of in-coming participants is less than or about the same as that of the average Paraguayan (43.7 percent) and thus that the program may not actually be pro-poor.

To date, almost all analyses of scorecard estimates have ignored margins of error. This deficient practice increases the risk of bad decisions. Do not make this same mistake.

A5.2.3 Margins of error for snapshot estimates of poverty rates in one time period for the Paraguay scorecard

For sample sizes of n = 1,024 and 90-percent confidence and across all supported poverty lines, the margins of error for snapshot estimates of head-count poverty rates in a single time period are ±2.5 percentage points or smaller (**Figure 2**). Given the scorecard's standard assumptions, this means that in 90 of 100 samples of this size, the true population value is within ±2.5 percentage points or less of the error-adjusted estimate.

A5.2.4 How to calculate margins of error

The **ProveIt^{TM}-brand reporting and analysis tool** calculates margins of error for all scorecard estimates discussed here. Analysts may also use the formulas that follow.[58]

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[58] **Schreiner** (2020) discusses the derivation of the formulas.

A5.2.5 Formula for margins of error for snapshot estimates of head-count poverty rates in a single time period

All formulas for margins of error involve the following elements:

$\pm c$ is the margin of error as a proportion (*e.g.*, ±0.020 for ±2.0 percentage points),

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

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

$\hat{p}$ is the estimated poverty rate as a proportion,

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

N is the population size in terms of households (not members of households),

n is the sample size (in terms of interviewed households, not members of interviewed households), and

α is an adjustment factor specific to the scorecard, estimator, and poverty line.

Given a confidence level that corresponds with z, a sample-based estimate $\hat{p}$, a population N, a sample n, and an adjustment factor α for a specific poverty line from **Figure 2**, the formula[59] for the margin of error ±c is $\pm z \cdot \alpha \cdot \sqrt{\dfrac{\hat{p} \cdot (1-\hat{p})}{n}} \cdot \sqrt{\dfrac{N-n}{N-1}}$.

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[59] This formula ignores how sampling variability affects the derivation of the scorecard. It also ignores that household size varies and that larger households are

To illustrate, Paraguay's 2019 EPHC gives a direct-measure head-count poverty rate for 150% of the national line of $\hat{p}$ = 43.7 percent (**Figure 10**). The adjustment factor α is 1.00 by definition because $\hat{p}$ is a direct-measure estimate, not an indirect-scorecard estimate. Paraguay in 2019 had a population of households (not people) of N = 1,863,684, and the EPHC sample size was n = 5,099. Given a desired confidence level of 90 percent, z is 1.64. The margin of error ±c is then about ±1.1 percentage points:

$$\pm z \cdot \alpha \cdot \sqrt{\frac{\hat{p} \cdot (1-\hat{p})}{n}} \cdot \sqrt{\frac{N-n}{N-1}} = \pm 1.64 \cdot 1.00 \cdot \sqrt{\frac{0.437 \cdot (1-0.437)}{5,099}} \cdot \sqrt{\frac{1,863,684 - 5,099}{1,863,684 - 1}} \ .$$

This implies a 90-percent chance that Paraguay's true head-count poverty rate for 150% of the national line in 2019 is in the range of 43.7 – 1.1 = 42.6 percent to 43.7 + 1.1 = 44.8 percent.

A5.2.6 Margins of error for snapshot estimates of numbers of poor people in a single time period

The lower (upper) limit of the margin of error for a snapshot estimate of numbers of poor people is the number of people in participating households, multiplied by the lower (upper) limit of the margin of error of the poverty-rate estimate.

To illustrate, the baseline example in **Section 3** has an estimated snapshot poverty rate of 93.0 percent. With 70-percent confidence, the margin of error is about ±17.8 percentage points,[60] or from 93.0 – 17.8 = 75.2 percent to 93.0 + 17.8 = 110.8 percent ≈ 100 percent (because a poverty rate cannot exceed 100 percent). The margin of error is huge because the sample size of n = 2 interviewed households is exceedingly small.[61]

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more likely to have higher poverty likelihoods. This leads to an understatement of the margin of error.

[60] The example in Section 3 has N = 1,000, n = 2, and α = 0.95. For 70-percent confidence, z = 1.04. The margin of error ±c for the head-count poverty-rate estimate is then ±0.178 ≈ $\pm 1.04 \cdot 0.95 \cdot \sqrt{\frac{0.930 \cdot (1-0.930)}{2}} \cdot \sqrt{\frac{1,000 - 2}{1,000 - 1}}$.

[61] Yet the formulas for margin of error still apply, and the estimator is still unbiased.

The estimated number of people in participating households in the example in **Section 3** is 7,000,[62] so the lower limit of the 70-percent margin of error for the estimated number of poor people is 7,000 · 0.752 = 5,264. The upper limit is 7,000 · 1.00 = 7,000.

A5.2.7 Margins of error for estimates of the annual net change in head-count poverty rates across two periods for one sample, scored twice

In this case, the formula for the margin of error ±c is:

$$\pm \frac{z \cdot \alpha}{y} \cdot \sqrt{\frac{\hat{p}_{up} \cdot (1 - \hat{p}_{up}) + \hat{p}_{down} \cdot (1 - \hat{p}_{down}) + 2 \cdot \hat{p}_{up} \cdot \hat{p}_{down}}{n}} \cdot \sqrt{\frac{N - n}{N - 1}},$$

where:

- z, α, N, and n are defined as above
- $\hat{p}_{up}$ is the share of members of sampled households that rise above the poverty line from below
- $\hat{p}_{down}$ is the share of members of sampled households that fall below the poverty line from above
- y is the household-size-weighted average of years between interviews

Illustrating with the earlier example of one sample scored twice (**Section 3.3.1**), $\hat{p}_{up}$ is the proportion of household members estimated to rise above a poverty line from below. This is the absolute value of the sum of the estimated *negative* changes in the number of members in poor households (from column M in **Figure 11**, here |−0.153 + (−0.351)| = +0.504), divided by the sum across all sampled households of each household's average household size across baseline and follow-up of 7.0 + 6.0 = 13.0 (from columns E and F). Thus, $\hat{p}_{up}$ = 0.504 ÷ 13 ≈ 0.039.

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[62] The formula for margin of error for the estimated number of poor people ignores that the estimated number of people in participating households has its own margin of error.

In turn, $\hat{p}_{down}$ is the share of household members estimated to fall below a poverty line from above. This is the sum of the estimated *positive* net changes in the number of members in poor households (from column M in **Figure 11)**, which is zero in this example because there are no positive changes. Dividing this by the sum across all sampled households of each household's average household size across baseline and follow-up (7.0 + 6.0 = 13.0) gives $\hat{p}_{down}$ = 0 ÷ 13 = 0.000.[63]

The household-size-weighted average of the number of years between interviews *y* is 3.07.

With sample size *n* = 2 interviewed households, population *N* of 1,000 households, confidence level of 70 percent (*z* = 1.04), and the α adjustment factor for this estimator (regardless of poverty line) of 1.14,[64] the margin of error ±*c* is about

$$\pm 0.053 \approx \pm \frac{1.04 \cdot 1.14}{3.07} \cdot \sqrt{\frac{0.039 \cdot (1-0.039) + 0 \cdot (1-0) + 2 \cdot 0.039 \cdot 0}{2}} \cdot \sqrt{\frac{1{,}000 - 2}{1{,}000 - 1}}.$$

The example's estimated net annual poverty-rate change is –1.3 percentage points (**Figure 11**), so the 70-percent margin of error is –1.3 – 5.3 = –6.6 to –1.3 + 5.3 = +4.0 percentage points. The estimate from this tiny sample of *n* = 2 is uninformative; the true net change could easily be negative, close to zero, or positive.

This example shows why margins of error are useful. Without them, program managers might believe that there was evidence that poverty rates fell by 1.3 percentage points per year even though the data in this sample is also consistent with widely different rates and directions of change.

A5.2.8 Margins of error for estimates of the annual net change in the number of poor people across two periods for one sample, scored twice

The lower (upper) limit of the margin of error for an estimate of annual net change in the number of poor people for one sample, scored twice is the average number of people in participating households from baseline to follow-up, multiplied by the lower (upper) limit of the margin of error of the estimated annual net change in the poverty rate.

To illustrate with the example in **Section 3.3.2** for one sample scored twice, the estimated annual net change in the poverty rate is –1.3 percentage points. As just

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[63] $\hat{p}_{down} - \hat{p}_{up}$ is the estimated net poverty-rate change. In this particular example, $\hat{p}_{down}$ happens to be zero, so $-\hat{p}_{up}$ equals the estimated net poverty-rate change.
[64] **Schreiner**, 2020.

shown, the tiny sample size of n = 2 means that the 70-percent margin of error runs from –6.6 to +4.0 percentage points.

The estimated average number of on-going participating people is 5,600.[65] Thus, the lower limit of the 70-percent margin of error for the estimated annual net change in the number of poor people is 5,600 · (–0.066) ≈ –370 (a net decrease in poor people), and the upper limit is 5,600·(+0.040) ≈ +224 (a net increase in poor people).

A5.2.9 Margins of error for estimates of the annual net change in head-count poverty rates across two periods for two independent samples

The formula for the margin of error ±c is $\pm \dfrac{z \cdot \alpha}{y} \cdot \sqrt{\dfrac{2 \cdot \hat{p} \cdot (1 - \hat{p})}{n}} \cdot \sqrt{\dfrac{N - n}{N - 1}}$,

where z, α, y, $\hat{p}$ and N are defined as above, and n is the sample size of interviewed households at both baseline and follow-up.

Illustrating with the example for two independent samples in **Section 3**:

- z = 1.04, assuming a desired confidence level is 70 percent
- α = 1.10, the adjustment factor (regardless of poverty line) for this estimator[66]
- y = 2.74, the years between the average interview at baseline and follow-up
- $\hat{p}$ = 0.932, the (unadjusted) estimate of the poverty rate at baseline
- N = 850, the average number of households across baseline (1,000) and follow-up (700)
- n = 2, the sample size in both baseline and follow-up

The margin of error ±c is ±0.105 ≈ $\pm \dfrac{1.04 \cdot 1.10}{2.74} \cdot \sqrt{\dfrac{2 \cdot 0.932 \cdot (1 - 0.932)}{2}} \cdot \sqrt{\dfrac{850 - 2}{850 - 1}}$.

The example's estimated net annual poverty-rate change is –6.3 percentage points (**Figure 12**). Thus, the 70-percent margin of error is –6.3 – 10.5 = –16.8 percentage points to –6.3 + 10.5 = +4.2 percentage points. The tiny sample is again consistent with a true value in the population that is negative, close to zero, or positive. This shows why margins of error matter.

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[65] The formula for margin of error for the estimated number of poor people ignores that the estimated number of people in participating households has its own margin of error.

[66] **Schreiner**, 2020.

A5.2.10 Margins of error for estimates of the annual net change in the number of poor people across two periods for two independent samples

The lower (upper) limit of the margin of error for an estimate of annual net change in the number of poor people for two independent samples is the average number of people in participating households from baseline to follow-up, multiplied by the lower (upper) limit of the margin of error of the estimated annual net change in the poverty rate.

To illustrate, the example in **Section 3** for two independent samples estimates the annual net change in the poverty rate as –6.3 percentage points. As just shown, the 70-percent margin of error runs from –16.8 to +4.2 percentage points.

The estimated average number of on-going participating people is 5,250.[67] Thus, the lower limit of the 70-percent margin of error for the estimated annual net change in the number of poor people per year is 5,250 · (–0.168) ≈ –882 (a net decrease in poor people), and the upper limit is 5,250 · (+0.042) ≈ +221 (a net increase in poor people).

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[67] The formula for margin of error for the estimated number of poor people ignores that the estimated number of people in participating households has its own margin of error.

Annex 6 Formulas for sample size

Before drawing a sample of households to interview, the formulas here can be used to calculate the sample size that corresponds to a program's:

- Desired margin of error for the eventual scorecard estimate, and
- Desired confidence level for the margin of error, and
- Pre-estimation guess of the true population value to be estimated

These formulas may or may not be useful, for several reasons.

First, programs often collect scorecard data but then fail to report and analyze it. In such cases, the entire project is a waste, so there is no point in worrying about sample size. A solution is to plan and budget for reporting and analysis. If the remaining budget will not cover at least 1,000 interviews, then ignore the formulas and do as many interviews as the budget allows.

Second, both psychological sample size and statistical sample size matter. On the one hand, samples smaller than $n = 300$ often seem too small. On the other hand, samples of at least $n = 1,000$ usually seem large enough.

Third, calculating an optimal sample size makes sense only if a program:

- Has reason to desire a particular margin of error or level of confidence[68]
- Plans to report and analyze margins of error

If margins of error are not understood or will not be reported and analyzed, then just interview as many participating households as the budget allows.

Fourth, sample-size calculations are sometimes unneeded. For example, using the scorecard for segmenting requires interviewing all relevant participants. Likewise, doing a basic check on the fulfillment of a pro-poor mission may be less costly if all in-coming participants are scored as a routine step of the in-take process rather than repeatedly deciding at the moment whether to score a given enrollee.

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[68] Academic conventions for levels of confidence, applied to business, often imply unnecessarily large samples.

In sum, go ahead with the formulas below if you:

- Reserve resources for reporting and analysis
- Understand margins of error and will report and analyze them
- Plan to estimate net changes in poverty over time, and
- Have enough budget for at least 1,000 interviews at both baseline and follow-up

Otherwise:

- If checking a pro-poor mission, then score all in-coming participants at in-take
- If segmenting by poverty, then score all relevant participants
- If estimating changes in poverty, then score as many participants as the budget allows

A6.1 Sample-size formula for snapshot estimates of head-count-poverty rates in a single time period

In this case, the formula for the sample size n (the number of participating households to be interviewed) is $n = N \cdot \left(\dfrac{z^2 \cdot \alpha^2 \cdot \tilde{p} \cdot (1 - \tilde{p})}{z^2 \cdot \alpha^2 \cdot \tilde{p} \cdot (1 - \tilde{p}) + c^2 \cdot (N - 1)} \right)$,

where n, c, z, α, and N are defined as in **Annex 5**, and $\tilde{p}$ is a before-estimation guess for the poverty rate to be estimated.[69]

The illustration below of the calculation of the sample size n uses these values:

- The population of participating households is N = 10,000
- The desired confidence level for the margin of error is 80 percent, so z = 1.28
- The poverty line is 150% of the national line, so α = 0.95 (**Figure 2**)
- The pre-estimation expected poverty rate is the all-Paraguay rate for 150% of the national line in 2019, so $\tilde{p}$ = 43.7 percent = 0.437 (**Figure 10**)
- The desired margin of error $\pm c$ = ±3.0 percentage points = ±0.030

Given these hypothetical values,

$$n = 10{,}000 \cdot \left(\frac{1.28^2 \cdot 0.95^2 \cdot 0.437 \cdot (1 - 0.437)}{1.28^2 \cdot 0.95^2 \cdot 0.437 \cdot (1 - 0.437) + 0.03^2 \cdot (10{,}000 - 1)} \right) \approx 389.$$

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[69] If the population N is "large" relative to the expected sample size n, then the formula can be taken as $n = \left(\dfrac{\alpha \cdot z}{c} \right)^2 \cdot \tilde{p} \cdot (1 - \tilde{p})$.

A6.2 Sample-size formula for estimates of annual net changes in head-count-poverty rates across two time periods with one sample scored twice

The formula for the number of households to interview at both baseline and follow-up n is:[70]

$$2 \cdot \left(\frac{z \cdot \alpha}{c} \right)^2 \cdot [-0.01 + 0.016 \cdot y + 0.56 \cdot p_{\text{pre-baseline}} \cdot (1 - p_{\text{pre-baseline}})] \cdot \sqrt{\frac{N-n}{N-1}},$$

where n, α, z, c, and N are defined as above, y is the number of years between baseline and follow-up, and $p_{\text{pre-baseline}}$ is the population's expected head-count poverty rate prior to the baseline interviews.

The illustration below for this formula uses the following values:

- The poverty line is 150% of the national line
- The desired confidence level for the margin of error is 80 percent, so z = 1.28
- α = 1.14 (regardless of the scorecard or poverty line, **Schreiner**, 2020)
- The desired margin of error $\pm c$ = ±3.0 percentage points = ±0.030
- The number of years between baseline and follow-up is y = 3
- The pre-estimation expected pre-baseline poverty rate is the all-Paraguay rate for 150% of the national line: $p_{\text{pre-baseline}}$ = 43.7 percent = 0.437 (**Figure 1**)
- The population of participating households is N = 10,000

Assuming N is large relative to n so that $\sqrt{\frac{N-n}{N-1}} \approx 1$, the baseline sample size n is

$$2 \cdot \left(\frac{1.28 \cdot 1.14}{0.03} \right)^2 \cdot [-0.01 + 0.016 \cdot 3 + 0.56 \cdot 0.437 \cdot (1 - 0.437)] \cdot 1 \approx 832.$$

The follow-up sample size is also 832.

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[70] **Schreiner**, 2020.

A6.3 Sample-size formula for estimates of annual net changes in head-count-poverty rates across two time periods with two independent samples

This formula is two (2), multiplied by the formula for sample size for a snapshot estimate at a point in time. If n and $\tilde{p}$ are the same at both baseline and follow-up,

then $n = 2 \cdot N \cdot \left(\dfrac{z^2 \cdot \alpha^2 \cdot \tilde{p} \cdot (1-\tilde{p})}{z^2 \cdot \alpha^2 \cdot \tilde{p} \cdot (1-\tilde{p}) + c^2 \cdot (N-1)} \right).$[71]

There are n interviews at baseline, and n interviews at follow-up. For this estimator and regardless of the scorecard or poverty line, $\alpha = 1.10$.[72]

To illustrate with the same hypothetical values as in the example just above (except that $\alpha = 1.10$), the sample size at baseline n is:

$$2 \cdot 10{,}000 \cdot \left(\frac{1.28^2 \cdot 1.10^2 \cdot 0.437 \cdot (1-0.437)}{1.28^2 \cdot 1.10^2 \cdot 0.437 \cdot (1-0.437) + 0.03^2 \cdot (10{,}000 - 1)} \right) \approx 1{,}029.$$

The sample size at follow-up is also $n = 1{,}029$.

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[71] If the N is large relative to n, then the formula is about $n = 2 \cdot \left(\dfrac{\alpha \cdot z}{c} \right)^2 \cdot \tilde{p} \cdot (1-\tilde{p})$.

[72] **Schreiner**, 2020.

References

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

Brown, Caitlin; Ravallion, Martin; and Dominique van de Walle. (2018) "A Poor Means Test? Econometric Targeting in Africa", *Journal of Development Economics*, Vol. 134, pp. 109–124, **link**.

Caire, Dean. (2004) "Building Credit Scorecards for Small-Business Lending in Developing Markets", **link**.

____; and Mark Schreiner. (2012) "Cross-Tab Weighting for Credit Scorecards in Developing Markets", **link**.

Coady, David; Grosh, Margaret; and John Hoddinott. (2004) *Targeting of Transfers in Developing Countries*, **link**.

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

Diamond, Alexis; Gill, Michael; Rebolledo Dellepiane, Miguel Angel; Skoufias, Emmanuel; Vinha, Katja; and Yiqing Xu. (2016) "Estimating Poverty Rates in Target Populations: An Assessment of the Simple Poverty Scorecard and Alternative Approaches", World Bank Policy Research Working Paper No. 7793, **link**.

Dirección General de Estadística, Encuestas, y Censos. (2020) "Principales Resultados de Pobreza Monetaria y Distribución de Ingresos: EPHC 2019", **link**.

____. (2016) "Metodología para la Estimación de las Líneas de Pobreza", **link**.

____. (2009) "Mejora de la Metodología de Medición de Pobreza en Paraguay: Resultados 1997–2008", **request**.

____. (2005) "Determinación del Gasto Familiar e Ingreso Familiar, Canasta Básica de Alimentos y Líneas de Pobreza, Paraguay", **request**.

Dupriez, Olivier. (2018) "An Empirical Comparison of Machine-Learning Classification Algorithms", **link**.

Ferreira, Francisco H.G.; Chen, Shaohua; Dabalen, Andrew L.; Dikhanov, Yuri; Hamadeh, Nada; Jolliffe, Dean; Narayan, Ambar; Prydz, Espen Beer; Revenga, Ana; Sangraula, Prem; Serajuddin, Umar; and Nobuo Yoshida. (2016) "A Global Count of the Extreme Poor in 2012: Data Issues, Methodology, and Initial Results", *Journal of Economic Inequality*, Vol. 14, pp. 141–172, **request**.

Grosh, Margaret; and Judy L. Baker. (1995) "Proxy-Means Tests for Targeting Social Programs: Simulations and Speculation", World Bank LSMS Working Paper No. 118, **link**.

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

Haslett, Stephen. (2012) "Practical Guidelines for the Design and Analysis of Sample Surveys for Small-Area Estimation", *Journal of the Indian Society of Agricultural Statistics*, Vol. 66, No. 1, pp. 203–212, **request**.

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

IRIS Center. (2007) "Manual for the Implementation of USAID Poverty-Assessment Tools", **link**.

Jolliffe, Dean; and Espen Beer Prydz. (2016) "Estimating International Poverty Lines from Comparable National Thresholds", *Journal of Economic Inequality*, Vol. 14, pp. 185–198, **request**.

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

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

Matul, Michal; and Sean Kline. (2003) "Scoring Change: Prizma's Approach to Assessing Poverty", MFC Spotlight Note No. 4, **link**.

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

Narayan, Ambar; and Nobuo Yoshida. (2005) "Proxy-Means Tests for Targeting Welfare Benefits in Sri Lanka", World Bank Report No. SASPR–7, **link**.

Navajas, Sergio; Schreiner, Mark; Meyer, Richard L.; Gonzalez-Vega, Claudio; and Jorge Rodriguez-Meza. (2000) "Microfinance and the Poorest of the Poor: Theory and Evidence from Bolivia", *World Development*, Vol. 28, No. 2, pp. 333–346, **link**.

Ravallion, Martin. (2009) "How Relevant Is Targeting to the Success of an Anti-Poverty Program?", *World Bank Research Observer*, Vol. 24, No. 2, pp. 205–231, **request**.

_____. (1998) "Poverty Lines in Theory and Practice", World Bank LSMS Working Paper No. 133, **link**.

Rutstein, Shea Oscar; and Kiersten Johnson. (2004) "The DHS Wealth Index", DHS Comparative Reports No. 6, **link**.

Schreiner, Mark. (2020) "Scorocs Simple Poverty Scorecard Tool: Uganda", **link**.

_____. (2016a) "Popular Science", **link**.

_____. (2016b) "Simple Poverty Scorecard Tool: Indonesia (Jawa Timur and Nusa Tengarra Timur)", **request**.

_____. (2015) "There's No Place Like Home? How the Interview Method Affects Results with the Progress out of Poverty Index®", **link**.

_____. (2014) "The Process of Poverty-Scoring Analysis", **link**.

_____. (2013) "Scorocs Simple Poverty Scorecard Tool: Bangladesh", **link**.

_____. (2012a) "Scorocs Simple Poverty Scorecard Tool: Paraguay", **link**.

_____. (2012b) "An Expert-Based Poverty Scorecard for Rural China", **link**.

_____. (2006) "Is One Simple Poverty Scorecard Enough for India?", **link**.

_____. (2005) "La Herramienta del Índice de Calificación de la Pobreza™ de Scorocs: México", **link**.

_____. (2002) *Scoring: The Next Breakthrough in Microfinance?* CGAP Occasional Paper No. 7, **link**.

_____. (1997) *A Framework for the Analysis of the Performance and Sustainability of Subsidized Microfinance Organizations with Application to BancoSol of Bolivia and the Grameen Bank of Bangladesh*, **link**.

_____; Matul, Michal; Pawlak, Ewa; and Sean Kline. (2014) "Poverty Scoring: Lessons from a Microlender in Bosnia-Herzegovina", *Poverty and Public Policy*, Vol. 6, No. 4, pp. 407–428, **link**.

Sharif, Iffath Anwar. (2009) "Building a Targeting System for Bangladesh Based on Proxy-Means Testing", World Bank Social Protection Discussion Paper No. 0914, **link**.

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

Tarozzi, Alessandro; and Angus Deaton. (2009) "Using Census and Survey Data to Estimate Poverty and Inequality for Small Areas", *Review of Economics and Statistics*, Vol. 91, No. 4, pp. 773–792, **link**.

Toohig, Jeff. (2008) "PPI® Pilot Training Guide", **link**.

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

World Bank. (2020) *Purchasing Power Parities and the Size of World Economies: Results from the 2017 International Comparison Program*, **link**.

_____. (2013) "Shared Prosperity: A New Goal for a Changing World", **link**.

_____. (2012) *Targeting Poor and Vulnerable Households in Indonesia*, **link**.

Zeller, Manfred. (2004) "Review of Poverty Assessment Tools", **link**.