

**Poverty Assessment Tool Accuracy Submission: Addendum for New Poverty Lines
USAID/IRIS Tool for Azerbaijan
Submitted: September 12, 2011**

In order to improve the functionality of the existing PAT for Azerbaijan, the IRIS Center has updated the tool with the following features:

- Re-ran the models at the median poverty line, which is the line delineating the poorest 50 percent of those living below the national poverty line
- Calibrated the model to also allow predictions at the national poverty line
- Revised the paper questionnaire to reflect best practice in survey design

The data source used for the PAT in Azerbaijan remains the same as when the tool was originally submitted for certification, as has the general tool construction process, aside from a more rigorous screening process to ensure that the variables are in line with the project's current best practices on practical indicators. Because of these similarities, this document should be viewed as an addendum to the original tool's certification document. The document proceeds by detailing how the new median line was applied and the results at the median line and national poverty lines. Accompanying this document are the revised questionnaire and screenshots of the Epi Info data entry template and output.

Updating the poverty line

The legislation governing the development of USAID tools defines the "very poor" as either the bottom (poorest) 50 percent of those living below the poverty line established by the national government or those living on the local equivalent of less than the international poverty line (\$1.25/day in 2005 PPP terms)¹. The applicable poverty line for USAID tool development is the one that yields the higher household poverty rate for a given country.

In Azerbaijan the applicable threshold is the median poverty line in 2002. The value of this line at the time of the survey is 149,349.31 Manat per capita per year in 2002. This line identifies 19.8% of households as "very poor." The national poverty line is 175,000 Manat per capita per year in 2002 prices.

Results for median poverty line model

Table 1 summarizes the accuracy results achieved by four estimation methods in predicting household poverty relative to the median poverty line. We use four estimation methods, rather than the eight methods used originally, for two reasons: 1) fewer methods reduces analysis time; 2) the 1-step Quantile was shown to be as accurate as 2-step methods in the original data analysis. For Azerbaijan, the 1-step Quantile was selected as

¹ The congressional legislation specifies the international poverty line as the "equivalent of \$1 per day (as calculated using the purchasing power parity (PPP) exchange rate method)." USAID and IRIS interpret this to mean the international poverty line used by the World Bank to track global progress toward the Millennium Development Goal of cutting the prevalence of extreme poverty in half by 2015. This poverty line has recently been recalculated by the Bank to accompany new, improved estimates of PPP.

the best model with the highest BPAC value, taking into consideration both accuracy and practicality. Table 2 presents a 2x2 matrix of the poverty status predicted by the model versus the true poverty status according to the expenditure benchmark. Table 3 provides the regression results from the median poverty line model.

Table 1: In-sample Accuracy Results for Prediction at the Legislative Poverty

| Azerbaijan Median line* Share of “very poor”: 19.8% | Total Accuracy | Poverty Accuracy | Under-coverage | Leakage | PIE | BPAC |
|--|-----------------------|-------------------------|-----------------------|----------------|-------------|--------------|
| Single-step methods | | | | | | |
| OLS | 80.16 | 12.05 | 87.94 | 11.56 | -15.22 | -64.31 |
| Quantile regression (estimation point: 32) | 74.84 | 37.28 | 62.71 | 63.33 | 0.12 | 36.66 |
| Linear Probability | 80.33 | 3.01 | 96.99 | 1.64 | -19.01 | -92.34 |
| Probit | 80.47 | 5.61 | 94.39 | 3.58 | -18.1 | -85.19 |
| * The median poverty line is 149,349.31 Manat per capita per year in 2002. | | | | | | |

Table 2: Poverty Status of Sample Households, as Estimated by Model and Revealed by the Benchmark Survey

| | Number of households identified as very poor by the tool | Number of households identified as not very-poor by the tool |
|--|---|---|
| Number of “true” very poor households (as determined by benchmark survey) | 456 (7.4%) | 768 (12.5%) |
| Number of “true” not very-poor households (as determined by benchmark survey) | 775 (12.6%) | 4,132 (67.5%) |

Table 3: Regression Estimates using 1-step Quantile Method for Prediction at the Median Poverty Line

.32 Quantile regression

Min sum of deviations 1,168.276

Number of obs = 6,131

Pseudo R2 = 0.1344

| Indicator | Coeff. | Std. Err. | T | P> t | [95% Conf. | Interval] |
|---|---------|-----------|--------|-------|------------|-----------|
| Household size | -0.1870 | 0.0108 | -17.19 | 0 | -0.2083 | -0.1656 |
| Household size squared | 0.0113 | 0.0011 | 9.64 | 0 | 0.0090 | 0.0136 |
| Household head age | 0.0013 | 0.0022 | 0.6 | 0.548 | -0.0030 | 0.0057 |
| Household head age squared | -0.0000 | 0.0000 | -1.03 | 0.301 | -0.0000 | 0.0000 |
| Household lives in rural area | 0.05789 | 0.0132 | 4.36 | 0 | 0.0318 | 0.0839 |
| Household lives in Nakh Aut | -0.1146 | 0.0232 | -4.92 | 0 | -0.1603 | -0.0690 |
| Household lives in Abs Gub | -0.0181 | 0.0168 | -1.08 | 0.28 | -0.0511 | 0.0148 |
| Household lives in Mug Sal | -0.0678 | 0.0198 | -3.42 | 0.001 | -0.1067 | -0.0289 |
| Household lives in Gan Gaz | -0.0631 | 0.0172 | -3.67 | 0 | -0.0968 | -0.0293 |
| Household lives in Region Shak Zag | -0.0260 | 0.0203 | -1.28 | 0.2 | -0.0660 | 0.0138 |
| Household lives in Lan Ast | -0.0593 | 0.0215 | -2.75 | 0.006 | -0.1015 | -0.0171 |
| Household lives in Shirv | -0.0393 | 0.0208 | -1.89 | 0.059 | -0.0801 | 0.0015 |
| Household lives in Kar Mil | -0.0632 | 0.0178 | -3.55 | 0 | -0.0981 | -0.0283 |
| Household head is female | -0.0267 | 0.0115 | -2.31 | 0.021 | -0.0494 | -0.0040 |
| Household head's education level is magister | 0.0665 | 0.0131 | 5.05 | 0 | 0.0407 | 0.0924 |
| Household head's education level is college | 0.0344 | 0.0130 | 2.64 | 0.008 | 0.0089 | 0.0599 |
| Household head's education level is basic education | -0.0286 | 0.0190 | -1.51 | 0.132 | -0.0659 | 0.0086 |
| Share of household members with basic education | -0.0107 | 0.0380 | -0.28 | 0.778 | -0.0853 | 0.0638 |
| Share of household members with college education | 0.0195 | 0.0398 | 0.49 | 0.624 | -0.0585 | 0.0976 |
| Share of household members with secondary education | 0.0761 | 0.0233 | 3.26 | 0.001 | 0.0303 | 0.1219 |
| Source of household's drinking water is well in yard | -0.0434 | 0.0209 | -2.07 | 0.038 | -0.0844 | -0.0023 |
| Source of household's drinking water is local community tap | 0.0310 | 0.0189 | 1.63 | 0.102 | -0.0062 | 0.0682 |
| Source of household's drinking water is public well | -0.0168 | 0.0239 | -0.7 | 0.482 | -0.0639 | 0.0301 |
| Source of household's drinking water is a spring, river, lake | 0.0085 | 0.0166 | 0.51 | 0.61 | -0.0242 | 0.0412 |
| Household has a TV | 0.1213 | 0.0473 | 2.56 | 0.01 | 0.0285 | 0.2142 |
| Household has a car | 0.0750 | 0.0131 | 5.71 | 0 | 0.0492 | 0.1007 |
| Household has a sewing machine or | 0.0453 | 0.0103 | 4.37 | 0 | 0.0250 | 0.0656 |

| | | | | | | |
|---|---------|--------|--------|---|---------|---------|
| knitting machine | | | | | | |
| Number of geese and ducks household has | 0.0087 | 0.0013 | 6.41 | 0 | 0.0061 | 0.0114 |
| Intercept | 12.4437 | 0.0737 | 168.62 | 0 | 12.2991 | 12.5884 |

Results for national poverty model

Table 4 summarizes the predictive accuracy results for the national poverty line. The indicators are the same as those in the model for the median line, but the percentile of estimation and the coefficients of the model were allowed to change (compare Tables 3 and 6). This methodology allows the content and length of the questionnaire to remain the same, but permits greater accuracy in predicting at the national poverty line. Table 5 presents a 2x2 matrix of the poverty status predicted by the model versus the true poverty status according to the expenditure benchmark. Table 6 provides the regression results from the national poverty line model.

Table 4: Accuracy Results Obtained for Prediction at the national Poverty Line

| Azerbaijan National Line Share of Poor: 39.7% | Total Accuracy | Poverty Accuracy | Under-coverage | Leakage | PIE | BPAC |
|--|-----------------------|-------------------------|-----------------------|----------------|------------|-------------|
| Single-step methods | | | | | | |
| Quantile regression (estimation point: 45) | 68.11 | 60.56 | 39.43 | 40.40 | 0.39 | 59.60 |

Table 5: Poverty Status of Sample Households, as Estimated by Model and Revealed by the Benchmark Survey, at National Poverty Line

| | Number of households identified as poor by the tool | Number of households identified as not poor by the tool |
|--|---|---|
| Number of “true” poor households (as determined by benchmark survey) | 1,483 (24.2%) | 966 (15.8%) |
| Number of “true” not poor households (as determined by benchmark survey) | 989 (16.3%) | 2,693 (43.7%) |

Table 6: Regression Estimates using 1-step Quantile Method for Prediction at the National Poverty Line

.45 Quantile regression

Min sum of deviations 1290.828

Number of obs = 6,131

Pseudo R2 = 0.1563

| Indicator | Coef. | Std. Err. | t | P> t | [95% Conf. | Interval] |
|--|---------|-----------|-------|-------|------------|-----------|
| Household size | -0.2019 | 0.0092 | -21.8 | 0 | -0.2200 | -0.1837 |
| Household size squared | 0.0125 | 0.0009 | 12.77 | 0 | 0.0106 | 0.0145 |
| Household head age | 0.0009 | 0.0020 | 0.47 | 0.642 | -0.0030 | 0.0048 |
| Household head age squared | -0.0000 | 0.0000 | -0.86 | 0.388 | -0.0000 | 0.0000 |
| Household lives in rural area | 0.0461 | 0.0118 | 3.88 | 0 | 0.0228 | 0.0694 |
| Household lives in Nakh aut | -0.1376 | 0.0209 | -6.57 | 0 | -0.1787 | -0.0965 |
| Household lives in Abs gub | -0.0333 | 0.0149 | -2.23 | 0.026 | -0.0626 | -0.0040 |
| Household lives in Mug sal | -0.0508 | 0.0176 | -2.87 | 0.004 | -0.0855 | -0.0161 |
| Household lives in Gan gaz | -0.0752 | 0.0152 | -4.94 | 0 | -0.1050 | -0.0453 |
| Household lives in Region Shak zag | -0.0531 | 0.0182 | -2.91 | 0.004 | -0.0889 | -0.0173 |
| Household lives in Lan ast | -0.0580 | 0.0190 | -3.04 | 0.002 | -0.0955 | -0.0206 |
| Household lives in Shirv | -0.0630 | 0.0187 | -3.37 | 0.001 | -0.0997 | -0.0263 |
| Household lives in Kar mil | -0.0409 | 0.0159 | -2.57 | 0.01 | -0.0722 | -0.0097 |
| Household head is female | -0.0411 | 0.0103 | -3.97 | 0 | -0.0614 | -0.0208 |
| Household head's education level is magister | 0.0672 | 0.0117 | 5.71 | 0 | 0.0441 | 0.0902 |

| | | | | | | |
|---|---------|--------|--------|-------|---------|---------|
| Household head's education level is college | 0.0319 | 0.0117 | 2.71 | 0.007 | 0.0088 | 0.0549 |
| Household head's education level is basic education | -0.0265 | 0.0170 | -1.56 | 0.118 | -0.0599 | 0.0067 |
| Share of household members with basic education | -0.0231 | 0.0345 | -0.67 | 0.502 | -0.0909 | 0.0445 |
| Share of household members with college education | -0.0126 | 0.0355 | -0.36 | 0.722 | -0.0823 | 0.0571 |
| Share of household members with secondary education | 0.0612 | 0.0208 | 2.94 | 0.003 | 0.0204 | 0.1020 |
| Source of household's drinking water is well in yard | -0.0330 | 0.0185 | -1.79 | 0.074 | -0.0693 | 0.0032 |
| Source of household's drinking water is local community tap | 0.0183 | 0.0172 | 1.06 | 0.287 | -0.0155 | 0.0522 |
| Source of household's drinking water is public well | -0.0217 | 0.0214 | -1.02 | 0.31 | -0.0638 | 0.0202 |
| Source of household's drinking water is a spring, river, lake | 0.0242 | 0.0150 | 1.61 | 0.107 | -0.0052 | 0.0537 |
| Household has a TV | 0.1503 | 0.0413 | 3.63 | 0 | 0.0692 | 0.2313 |
| Household has a car | 0.0715 | 0.0118 | 6.04 | 0 | 0.0483 | 0.0947 |
| Household has a sewing machine or knitting machine | 0.0458 | 0.0093 | 4.93 | 0 | 0.0276 | 0.0641 |
| Number of geese and ducks household has | 0.0079 | 0.0012 | 6.5 | 0 | 0.0055 | 0.0103 |
| Intercept | 12.5637 | 0.0659 | 190.39 | 0 | 12.4344 | 12.6931 |