

**Poverty Assessment Tool Accuracy Submission: Addendum for New Poverty Lines  
USAID/IRIS Tool for Uganda  
Submitted: June 28, 2010**

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

- Re-ran the models at the \$1.25/day line, using the new purchasing power parity (PPP) rates lines released by the World Bank
- Calibrated the model to also allow predictions at the \$2.50/day line
- Used household per capita expenditures based on the \$1.25/day model to predict at the \$0.75/day and \$1.00/day line; used household per capita expenditures based on the \$2.50/day model to also predict at the \$2.00/day line
- Incorporated the prediction models into a CSPro data entry template. This CSPro template closely resembles the paper questionnaire and allows the entry, storage, and retrieval of household demographics. The output of the data entry template has been expanded from the current data entry template in Epi Info, permitting poverty prediction at five poverty lines. In addition, poverty status at the five poverty lines is cross tabulated with regional location, the household head's characteristics, household size, and housing conditions. This additional information provided is intended for indicative purposes rather than statistical inference. Please see attached document with screenshots of this template.
- Revised the paper questionnaire to reflect best practice in survey design

The data source used for the PAT in Uganda 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 \$1.25 PPP was applied and the results at the \$1.25/day and \$2.50/day lines. Accompanying this document are the revised questionnaire and screenshots of the CSPro data entry template and output.

**Updating the poverty line**

The tool originally predicted poverty outreach at the international poverty line of \$1.08/day in 1993 PPP terms. With the release of the 2005 PPP rates and the adoption of the \$1.25/day line in 2005 PPP terms by the World Bank, it seemed prudent to update the PAT to the new line, as well as update the tool to permit predictions at multiple poverty lines: \$0.75, \$1.00, \$1.25, \$2.00, and \$2.50.

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)<sup>1</sup>. The applicable poverty line for USAID tool development is the one that yields the higher household poverty rate for a given country.

In Uganda the applicable threshold is the international poverty line of \$1.25/day in 2005 PPP terms. The value of this line at the time of the survey is 324,367 Shillings per capita per year. This line identifies 47.1% of households as “very poor.”

By comparison, Uganda’s national poverty lines – separate urban and rural lines for each of four regions – identify 31.6% of the population as “very poor.” The poorest half of this group represented 15.8% of the total population, less than the percentage living below the \$1.25/day line.”

### **Results for \$1.25/day model**

Table 1 summarizes the accuracy results achieved by each of the eight estimation methods in predicting household poverty relative to the new \$1.25/day poverty line. For Uganda, the most accurate method, on the basis of BPAC, is the 2-step LP or OLS regression. However, the 1-step Quantile regression is only slightly less accurate and requires only 15 indicators. Following precedent from previous decisions made in consultation with USAID, the 1-step Quantile was selected as the best model, 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 \$1.25/day model.

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<sup>1</sup> 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 applicable 2005 PPP rate for Uganda is 744.61786 shillings per U.S. dollar.

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

<b>Uganda (PPP)</b> \$1.25/day line* Share of “very poor”: 47.1%	<b>Total Accuracy</b>	<b>Poverty Accuracy</b>	<b>Under-coverage</b>	<b>Leakage</b>	<b>PIE</b>	<b>BPAC</b>
<b>Single-step methods</b>						
OLS	78.05	80.32	19.68	26.95	3.43	73.05
Quantile regression (estimation point: 54)	<b>77.28</b>	<b>75.74</b>	<b>24.26</b>	<b>23.99</b>	<b>-0.13</b>	<b>75.47</b>
Linear Probability	79.06	80.05	19.95	24.53	2.16	75.47
Probit	77.16	79.51	20.49	28.03	3.55	71.97
<b>Two-step methods</b>						
OLS – 48 percentile cutoff	79.06	78.17	21.83	22.64	0.38	77.36
Quantile (estimation points: 54, 15) 48 percentile cutoff	78.43	77.09	22.91	22.91	0.00	77.09
LP – 50 percentile cutoff	79.44	78.98	21.02	22.64	0.76	77.36
Probit – 50 percentile cutoff	78.30	76.28	23.72	22.37	-0.63	74.93
* \$1.25/day poverty line is 324,367 Shillings per capita per year in September 2004 prices. The international poverty line is based on World Bank’s calculations and the recent 2005 PPP exchange rates.						

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

	<b>Number of households identified as very poor by the tool</b>	<b>Number of households identified as not very-poor by the tool</b>
<b>Number of “true” very poor households (as determined by benchmark survey)</b>	281 (35.7%)	90 (11.4%)
<b>Number of “true” not very-poor households (as determined by benchmark survey)</b>	89 (11.3%)	328 (41.6%)

**Table 3: Regression Estimates using 1-step Quantile Method for Prediction at the \$1.25/day Poverty Line**

.54 Quantile regression

Number of obs = 788

Min sum of deviations 312.4208

Pseudo R2 = 0.3474

<b>Indicator</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>T</b>	<b>P&gt; t </b>	<b>[95% Conf. Interval]</b>
HH size	-0.2596	0.0229	-11.3500	0.0000	-0.3045 -0.2147
HH size squared	0.0116	0.0015	7.6700	0.0000	0.0086 0.0145
HH head age	-0.0032	0.0077	-0.4200	0.6760	-0.0184 0.0119
HH head age squared	0.0001	0.0001	0.6500	0.5160	-0.0001 0.0002
HH lives in Central Region	-0.0132	0.0535	-0.2500	0.8050	-0.1182 0.0918
HH lives in Eastern Region	0.0071	0.0549	0.1300	0.8980	-0.1007 0.1148
HH lives in Northern Region	0.0370	0.0783	0.4700	0.6370	-0.1168 0.1908
HH lives in urban location	0.1238	0.1009	1.2300	0.2200	-0.0742 0.3218
HH member has a serious injury or chronic illness	0.1980	0.0770	2.5700	0.0100	0.0469 0.3491
Number of metal pots owned	-0.2234	0.0647	-3.4500	0.0010	-0.3504 -0.0964
HH owns one or more spray pumps	0.2185	0.1128	1.9400	0.0530	-0.0030 0.4401
Number of chicken and duck owned	0.0035	0.0011	3.1200	0.0020	0.0013 0.0057
Number of leather shoes owned by HH head	0.0394	0.0198	1.9900	0.0470	0.0005 0.0784
Number of panga owned	0.1187	0.0290	4.0900	0.0000	0.0618 0.1756
Roof of dwelling is made of banana leaves/ fibers/ grass or bamboo/ wood	-0.1751	0.0554	-3.1600	0.0020	-0.2840 -0.0663
HH cooking fuel is charcoal or paraffin	0.5718	0.0967	5.9100	0.0000	0.3820 0.7616
HH light is cannot afford or candles/ battery-driven lights/ pocket lights	-0.2404	0.1034	-2.3200	0.0200	-0.4434 -0.0374
HH's light is gas lamp or electricity (public grid with legal socket)	0.3096	0.0847	3.6600	0.0000	0.1433 0.4758
HH head is a widow(er)	-0.2330	0.0628	-3.7100	0.0000	-0.3563 -0.1098
HH head's highest education passed is	0.2498	0.0923	2.7100	0.0070	0.0686 0.4309

only secondary/ post primary education						
HH head highest education passed is incomplete secondary education	0.1061	0.0520	2.0400	0.0420	0.0040	0.2082
Share of HH members (excluding head) with no schooling or incomplete grade one	-0.4062	0.1009	-4.0300	0.0000	-0.6042	-0.2082
Share of HH members (excluding head) with completed superior education	2.5126	0.6190	4.0600	0.0000	1.2975	3.7278
Intercept	13.9535	0.1929	72.3300	0.0000	13.5748	14.3322

### Results for \$2.50/day model

Table 4 summarizes the predictive accuracy results for the \$2.50/day poverty line using the Quantile model specification from the \$1.25/day poverty line. The indicators are the same as those in the model for the \$1.25/day 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 \$2.50/day 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 \$2.50/day model.

*Table 4: Accuracy Results Obtained for Prediction at the \$2.50/day Poverty Line*

<b>Uganda</b> \$2.50/day Line Share of Poor: 79.4%	<b>Total Accuracy</b>	<b>Poverty Accuracy</b>	<b>Under-coverage</b>	<b>Leakage</b>	<b>PIE</b>	<b>BPAC</b>
<b>Single-step methods</b>						
Quantile regression (estimation point: 58)	86.80	91.69	8.31	8.31	0.00	91.69

*Table 5: Poverty Status of Sample Households, as Estimated by Model and Revealed by the Benchmark Survey, at \$2.50 Poverty Line*

	<b>Number of households identified as poor by the tool</b>	<b>Number of households identified as not poor by the tool</b>
<b>Number of “true” poor households (as determined by benchmark survey)</b>	574 (72.8%)	52 (6.6%)
<b>Number of “true” not poor households (as determined by benchmark survey)</b>	52 (6.6%)	110 (14.0%)

**Table 6: Regression Estimates using 1-step Quantile Method for Prediction at the \$2.50 Poverty Line**

.58 Quantile regression

Number of obs = 788

Min sum of deviations 306.4911

Pseudo R2 = 0.3504

Indicator	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
HH size	-0.2654	0.0223	-11.8900	0.0000	-0.3092 -0.2216
HH size squared	0.0117	0.0015	7.9400	0.0000	0.0088 0.0146
HH head age	-0.0032	0.0074	-0.4400	0.6600	-0.0177 0.0112
HH head age squared	0.0001	0.0001	0.7200	0.4730	-0.0001 0.0002
HH lives in Central Region	-0.0059	0.0529	-0.1100	0.9120	-0.1097 0.0980
HH lives in Eastern Region	0.0040	0.0539	0.0700	0.9410	-0.1018 0.1098
HH lives in Northern Region	0.0323	0.0773	0.4200	0.6760	-0.1194 0.1839
HH lives in urban location	0.1516	0.1027	1.4800	0.1400	-0.0501 0.3533
HH member has a serious injury or chronic illness	0.2061	0.0751	2.7400	0.0060	0.0586 0.3536
Number of metal pots owned	-0.2497	0.0634	-3.9400	0.0000	-0.3741 -0.1253
HH owns one or more spray pumps	0.2675	0.1122	2.3800	0.0170	0.0473 0.4876
Number of chicken and duck owned	0.0039	0.0011	3.6500	0.0000	0.0018 0.0060
Number of leather shoes owned by HH head	0.0382	0.0194	1.9700	0.0490	0.0002 0.0763
Number of panga owned	0.1304	0.0289	4.5200	0.0000	0.0738 0.1870
Roof of dwelling is made of banana leaves/ fibers/ grass or bamboo/ wood	-0.1451	0.0543	-2.6700	0.0080	-0.2517 -0.0386
HH cooking fuel is charcoal or paraffin	0.5384	0.0981	5.4900	0.0000	0.3459 0.7310
HH light is cannot afford or candles/ battery-driven lights/ pocket lights	-0.2200	0.1003	-2.1900	0.0290	-0.4169 -0.0230
HH's light is gas lamp or electricity (public grid with legal socket)	0.3042	0.0846	3.5900	0.0000	0.1381 0.4704
HH head is a widow(er)	-0.2362	0.0612	-3.8600	0.0000	-0.3562 -0.1161
HH head's highest education passed is	0.2079	0.0919	2.2600	0.0240	0.0275 0.3883

only secondary/ post primary education						
HH head highest education passed is incomplete secondary education	0.0867	0.0519	1.6700	0.0950	-0.0152	0.1886
Share of HH members (excluding head) with no schooling or incomplete grade one	-0.4462	0.0988	-4.5100	0.0000	-0.6402	-0.2522
Share of HH members (excluding head) with completed superior education	2.9627	0.5998	4.9400	0.0000	1.7853	4.1401
Intercept	14.0318	0.1870	75.0300	0.0000	13.6646	14.3989