Poverty Scorecard for Pakistan – an Update using the PSLM2007-2008 Data[1]

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Abstract

The GoP adopted the poverty scorecard as the targeting tool for the Benazir Income Support Program (BISP) in early 2009. The poverty scorecard was developed using Pakistan Social and Living Standard Measurement Survey (PSLM) 2005-2006 data. This paper uses PSLM 2007-2008 data to update the poverty scorecard analysis, including the scores for each indicator and the targeting performance. The results show slight change of scores for some of the variables used in the poverty scorecard but the targeting performance remains very similar with the previous simulation based on PSLM2005-2006.

1. Introduction

The Government of Pakistan (GoP) launched the Benazir Income Support Program (BISP) in 2008 to cushion the poor and vulnerable from the negative effects of the food price inflation that climaxed in 2008. To meet the urgent need to implement the BISP, the government initially requested all members of the National Assembly (MNAs) along with all senators to provide a list of 8,000 beneficiary families on a prescribed form. This list is further verified by the National Database Registration Authority (NADRA) using selection/verification filters. In January 2009, the GoP officially adopted the poverty scorecard as the primary targeting tool to identify the beneficiaries. The poverty scorecard is a proxy means test based targeting instrument, which was developed based on the most recent Pakistan Social and Living Standards Measurement Survey (PSLM) at that time (2005-2006 round).

PSLM2005-2006 was the best available data at that time to develop the poverty scorecard, however, the data fails to capture the recent development in Pakistan – including the economic and political revolution and the food and financial crises. From this perspective, the newly available PSLM 2007-2008 data offers more timely information to update the poverty scorecard and further guide the poverty scorecard implementation. This purpose of this note is to complement the first paper "poverty scorecard for Pakistan: a recommended approach for targeting", and provide an update using the PSLM2007-2008 data.

The note is organized as follows: section 2 compares the poverty predictors used in the poverty scorecard between PSLM2005-2006 and PSLM2007-2008; section 3 compares the regression results between PSLM2005-2006 and PSLM2007-2008; section 4 evaluates the targeting performance and section 5 discusses the cut-off scores and issues of families vs. households; and section 6 concludes.

2. The comparison of the poverty predictors between PSLM2005/2006 with PSLM2007/2008

A set of variables were selected to predict the welfare indicator in the poverty scorecard. These variables were chosen by taking into account of two separate criteria: correlation with the welfare indicator and verifiability of the predictors. These variables include household and individual characteristics, such as the number of members and dependents, ownership of durable goods and housing characteristics, ownership of productive assets, especially land holding , livestock and farm equipment.

These variables were used to predict the welfare measure. Similar as previous analysis, household consumption expenditure (monthly) per adult equivalent is used as the welfare measure. The same measure is also used for providing the official poverty estimates in Pakistan. Household expenditure includes all expenditures on nondurables, the imputed value of non-durables received as gifts or produced in household, while it excludes expenditures on durable goods and assets.

Table 1 presents the descriptive statistics of these predictors based on PSLM2005/2006 and PSLM2007/2008. It is noticeable that there is a significant improvement in education related indicators.

For example, 37.4% of households have all their children between 5 and 16 years old attend school in 2007-2008 compared to 33.3% in 2005-2006; similarly, only 12.8% of households did not send any of their children in the same age group to school in 2007-2008, which is much less than 15.9% in 2005-2006.

The housing condition has also improved from 2005-2006 to 2007-2008. For example, 44.3% of households have more than 0.4 numbers of rooms per person in 2007-2008 compared with 40.6%; 69.3% of household have flush toilet in 2007-2008 compared with 59.5% in 2005-2006. There is also a significant increase in possession of durable assets. For example, 52.8 % of households own at least one refrigerator, freezer or washing machine in 2007-2008 compared with 44.3% in 2005-2006; 16.2 % of households own at least one air-conditioner, air-cooler, geyser or heater in 2007-2008, compared with 14.1% in 2005-2006; similar trends are also found out in ownership of cooking stove, cooking range, or microwave oven and engine drive vehicles.

The difference of these predictors between PSLM 2007-2008 round and PSLM 2005-2006 round imply that the score weight might be different using the most recent PSLM2007-2008 data. Section 3 updates score weight and compare it with regression based on PSLM2005-2006 data.

3. The comparison of the regression between PSLM2005/2006 with PSLM2007/2008

The OLS regression method is used to find a good combination of variables in predicting poverty. The OLS method regresses the consumption variable on various set of the variables. Since the poverty scorecard has been collected in 16 districts in the test phase, this update analysis first use the exact same model to check whether the coefficients or the scores are the same between PSLM2005/2006 and PSLM2007/2008 data, and if different, to what degree they are different. Table 2 presents the results.

Most coefficients or scores are very similar between the regression using PSLM2005/2006 and PSLM2007/2008 data. The largest difference in scores is around 2 points. The ratio of rooms over number of household members (room_ratio) plays a more significant role in predicting poverty in the most recent data: a household with room ratio greater than 0.4 gets 14 points based on PSLM2007-2008 data rather than 12 points in the previous data. However, types of toilet play a less significant role in predicting poverty: a household with flush toilet would get 3 points under the previous simulation, but only get 2 points in the new simulation and a household with latrine toilet would get 2 points under the previous simulation, but would not get any points under the new simulation. One possible explanation is that given the economic development and the overall household infrastructure improvement, types of toilet becomes less correlated with poverty – that is – more and more households start to have private toilet, however, room ratio become more relevant in predicting poverty because the richer would invest bigger houses and the variation of room ratio becomes more significant between the poor and non-poor.

4. Targeting Performance and other Models

No targeting is perfect. There are a number of indicators which can help to assess the targeting performance and to evaluate different models. Detailed definition and explanation of these indicators

can be found in the original scorecard paper. This note briefly describes these indicators and uses them to evaluate the targeting performance.

Targeting performance is measured by the extent to which there is an overlap between the true target population (intended beneficiaries) and program beneficiaries selected by the targeting mechanism. Two indicators are essential in determining targeting performance at any given cut-off: (1) under-coverage rate or exclusion error, which measures the extent to which intended beneficiaries are excluded; and (2) leakage rate or inclusion error, which measures the extent to which the targeting mechanism mistakenly includes non-target groups. In addition, regression statistics like R-square is also important to find a good regression model. R square is a measure of model prediction by comparing the actual expenditure and the expenditure predicted by a model. The higher the R-square is, the better the model fit is.

Table 3 below shows the comparison of targeting performance between PSLM2005-2006 and PSLM2007-2008 based on the same model proposed in the original poverty scorecard paper. The model fits better using PSLM 2005-2006 data in terms of adjusted R- square. The adjusted R square is 57.4% using the previous PSLM but only 52% using PSLM 2007-2008 data. However, there is little difference in terms of targeting performance based on simulations using these two datasets (less than 1% when poorest 25% of population is targeted).

Table 3: Comparison of Targeting Performance between PSLM2005/2006 and PSLM2007/2008			
Target group	Statistics (%)	PSLM 2005/2006	PSLM 2007/2008
	Coverage	2.4	2.7
	Undercoverage	88.2	85.7
Poorest 10% of population	Leakage	50.8	46.8
	Coverage	13	13.2
	Undercoverage	61.1	60.5
Poorest 20% of population	Leakage	40.2	40.1
	Coverage	19.1	18.7
	Undercoverage	52.1	52.3
Poorest 25% of population	Leakage	37.1	36.3
	Coverage	25.7	24.4
	Undercoverage	42.8	44.2
Poorest 30% of population	Leakage	33.3	31.4
R-squared (%)		57.4	52.5
Number of variables		23	23.0
Source: The World Bank staff estimation using PSLM2005-2006 and PSLM2007-2008 data;			

In order the produce a simply yet effective poverty scorecard in the original simulation, several asset variables were grouped together when they have similar weight in predicting poverty. For example, question 6 in the original scorecard asks "does the household own at least one refrigerator, freezer, or washing machine". However, during the pilot of the poverty scorecard, it was found that individual asset questions are much easier for households to answer thus the revised scorecard questionnaire asks households whether they own each asset separately. This makes it possible to include individual assets as predicators in the poverty scorecard simulation.

In theory, models with more precise information on asset ownership may improve the prediction of poverty and thus reduce the targeting errors. This paper uses PSLM2007-2008 to empirically test it by comparing the original model and the model using individual assets in the regression (model B). The regression result is presented in Appendix table 1. Table 4 provides the targeting performance results. The results show that despite the fact that the adjusted R square is higher for model B, the targeting performance is actually quite similar between the original model and model B. Thus, there is no strong evidence in favor of using model B.

Table4. Compare targeting performance between original model and model B						
	Model1. Original			Model B. using individual assets		
targeted population	coverage	under-coverage	leakage	coverage	under-coverage	leakage
10	2.7	85.7	46.8	2.2	88.4	48.0
15	7.3	72.1	42.7	6.8	73.4	41.6
20	13.2	60.5	40.1	12.8	61.2	39.4
25	18.7	52.3	36.3	18.5	52.5	35.7
30	24.4	44.2	31.4	23.6	45.8	31.1
35	29.5	39.7	28.5	29.7	39.1	28.3
40	35.1	35.0	26.0	35.5	34.4	26.1
45	40.6	30.6	23.0	41.4	29.8	23.6
50	46.2	27.1	21.0	46.6	26.3	20.9
55	52.9	23.0	19.9	52.8	22.8	19.6
Adjusted R-square	0.52			0.54		

5. The cut-off score and issues of family vs. household

The proposed scorecard is based on household expenditure data since all survey data is collected at the household level. A household is defined as the unit that lives within one housing structure and shares a common kitchen (choola). However, the BISP benefit is based at the family level, where the family is a nuclear group including a husband, a wife and their children. Following with the convention used in the original poverty scorecard paper, this paper still use the number of ever-married women in a household as a proxy for the number of families in a household. The benefit amount is decided at Rs. 1000 per month per family.

The choice of the cut-off score is a critical policy decision, which soon needs to be finalized since the scorecard data collection in the test phase is about to complete. The decision of the cut-off score needs to take into account of the program budgets, implementation costs, grievance redressal policies and the targeting performance. In the case of BISP, the decision of the cut-off needs to also consider the overlap between the Members of National Assembly identified beneficiaries with the poverty scorecard identified beneficiaries. Such information will soon be available from the BISP rapid assessment in which the field work is scheduled to be completed before Ramzan. The finalization of the cut-off score should also be based on the scorecard analysis in some (if not all) test phase districts.

In this update, PSLM2007-2008 is used to simulate the cut-off scores and the associated coverage rate and targeting performance at the national level. Table 5 summarizes the results. Note that all calculations are based on estimated population as of 2008-2009 and the estimated number of families per household is derived using the PSLM 2007-2008 data. According to this data, there are on average around 1.46 families in a household. With the population estimate of 2008-2009 (164 million) and the average household size of 6.63, the total numbers of households and families in 2008-2009 are estimated to be 24.7 million and 36.1 million, respectively.

Table5. Program coverage, budgetary needs and targeting performance as respect to cut-off scores										
	Coverage (%)			Budget Needs	Targeting Performance (%)					
	Family			(Rs. Billion)	Poorest 17% as target group		poorest 25% as target group		Poorest 40% as target group	
cutoff scores	Percent	Million	percent of population	Rs. 1000/m	under-coverage	leakage	under-coverage	leakage	under-coverage	leakage
15.0	11.2	4.0	15.0	48.5	55.7	49.8	61.4	35.6	68.8	16.8
15.8	12.9	4.7	17.0	56.0	52.4	52.4	57.8	38.1	65.4	18.6
16.7	14.6	5.3	19.0	63.2	48.5	54.0	54.1	39.8	61.8	19.7
17.5	16.3	5.9	21.0	70.5	45.3	55.7	50.7	41.3	58.5	21.1
18.3	18.0	6.5	23.0	78.2	41.6	56.8	47.2	42.7	55.1	22.0
19.0	19.9	7.2	25.0	86.0	37.5	57.5	43.4	43.4	51.8	22.8
19.9	21.6	7.8	27.0	93.6	33.9	58.3	39.9	44.4	48.4	23.6
21.0	24.2	8.8	30.0	105.0	29.6	60.1	35.6	46.3	43.6	24.8
24.9	33.7	12.2	40.1	146.2	17.2	64.8	21.7	51.1	29.7	29.8
Source: the World Bank staff estimation based on PSLM2007-2008.										
Note: program coverage in terms of families and population is estimated separately										

Targeting performance is estimated based on three scenarios: the poorest 17 percent, the poorest 25 percent, and the poorest 40 percent of the population is to be targeted by the BISP program. The poorest 17 percent is chosen because the most recent poverty national count estimation using PSLM2007-2008 suggests the national poverty rate is 17 percent; the poorest 25 percent of population is chosen in order to be consistent and comparable with the original poverty scorecard paper; the

poorest 40% of population is chosen because most people in this group are still very poor and vulnerable even though they are not counted as "official poor".

Selecting the score of 17.5 as a cutoff score would imply that 16.3 percent of families, which is about 5.9 million families, or 21 percent of population to be covered. If the poorest 17 percent is the targeted group, about 45 % of the targeted poor would be excluded; if the poorest 25 percent is the targeted group, about 55.7% would be excluded. Though the leakage rate looks high if the poorest 17 percent or 25 percent are targeted (55.7% and 41.3%), most leakage actually goes to the families who are just about the poverty line and still very poor because only 21.1% of the budget would be leaked to the families who are not in the bottom 40 percent.

The relative high under-coverage rate is not new in PSLM2007-2008. It was the case in the previous simulation using PSLM2005-2006. This high rate suggests that the BISP program should be very careful in addressing the grievance redressal policies and policies for the overlap between the MNA identified beneficiaries and the poverty scorecard identified beneficiaries. The latter will be more formulated with analyses and results from the BISP rapid assessment.

6. Conclusions and next steps

The paper uses the most recent PSLM2007-2008 data to update the poverty scorecard, which was adopted by the GoP in early 2009 as the primary targeting tool for the BISP. The paper carefully compares the poverty predictors proposed in the poverty scorecard between the two survey rounds and found there are some changes of these predictors between the two rounds. As a result, the weights (scores) for each individual predictor using PSLM 2007-2008 are slightly different from the simulation based on PSLM2005-2006. However, the targeting performance is very similar when the same model (with different score weight) applied to both rounds. The paper also uses a more elaborate model with each asset as separate poverty predictor in the model, however, the targeting performance remains at the similar level despite some improvement in adjusted R-square. Thus, there is no strong evidence in favor of using this elaborate model with individual assets as separate predictors.

This paper again needs to underscore the difference between families and households. While poverty scorecard is anchored on "household" level, the BISP benefits target on "families". Enumerators have to be carefully and adequately trained to collect information at the "household" level. In the test phase implementation, there are some cases that family information instead of household information was collected. Careful analyses are planned using poverty scorecard information in the 16 district in the test phase, which will shed more lights on the quality of poverty scorecard information collection. Nonetheless, the household level based on poverty score card information collection has to be stressed and strictly implemented in the field.

Finally, as the original poverty scorecard paper and this paper point out, the poverty scorecard is not a "perfect" targeting system. The leakage rate is significantly reduced when the poorest 40 percent of population is set as the targeted group, but the under-coverage rate remains less favorable, particularly when the cut-off score is set below or around the poverty line. Based on analysis using PSLM2001-2002, PSLM2004-2005, PSLM2005-2006 and PSLM 2007-2008, though it is relative easy to distinguish poor and

rich using proxy means test formula it is actually very difficult to find good poverty predictor(s) to distinguish the very poor and the poor (for example, the poorest at the bottom 10 percentile and the poor at the bottom 30 percentile) because there are not too many predictors available to distinguish among the poor and the less poor except the consumption. The proxy means test literature suggests that the exclusion error would typically improve substantively when the program coverage increases above the poverty line. However, this would entail a higher overall budget if the benefit amount remains the same.

Thus, policies and implementation arrangement needs to be carefully crafted to address the grievance redressal. Policies need to be carefully implemented to re-identify the beneficiaries and streamline the transition from the existing BISP beneficiaries which were identified by MNAs and senators to the poverty scorecard identified beneficiaries. The forthcoming BISP rapid assessment shall provide more information on this aspect.

Next Steps:

1. NADRA should update the score weight based on this note

2. BISP needs to consider the cut-off scores based on the amount of budget that is to be allocated solely to the BISP cash transfer benefits

3. The Rapid assessment shall inform the BISP on the overlap between the MNA identified beneficiaries and the scorecard identified beneficiaries, which will inform the policy on transition

4. The test phase district analysis, which is population based, will check the robustness of sample based cut-off estimations.

Table1. Comparison of poverty predictors between PSLM2005-2006 and PSLM2007-2008				
	2005-2006		**20007-2008**	
Poverty Predictors	**Mean**	**SD**	**Mean**	**SD**
1 Number of people in the household under the age of 18 or over the age of 65				
0-2	37.8	48.5	50.9	50
3-4	31	46.2	30.7	46.1
5-6	20.6	40.4	14.4	35.1
7 or more	10.6	30.8	4	19.5
2 Highest education level of the household head				
Head never attended school	47.4	49.9	42	49.4
Head completed less than class 1 to class 5 included	16.7	37.3	16.7	37.3
Head completed Class 6 to class 10 included	24	42.7	27.9	44.9
Head completed Class 11, college or beyond	11.9	32.4	13.4	34
3 Number of children in the household between 5 and 16 years old currently attending school				
No children between 5 and 16 years old in the household	24.7	43.1	25.6	43.6
All children between 5 and 16 years old are attending school	33.3	47.1	37.4	48.4
Only some children between 5 and 16 years old are attending school	26.1	43.9	24.2	42.8
None of the children between 5 and 16 years old are attending school	15.9	36.5	12.8	33.4
4 Number of rooms per person				
>=0-<=0.2	16	36.6	14.1	34.8
>0.2-<=0.3	27.1	44.4	24.9	43.3
>0.3-<=0.4	16.4	37	16.6	37.2
>0.4	40.6	49.1	44.3	49.7
5 Toilet kind used by the household				
Flush connected to a public sewerage, to a pit or to an open drain system	59.5	49.1	69.3	46.1
Dry raised latrine or dry pit latrine	10.8	31.1	9.7	29.6
There is no toilet in the household	29.7	45.7	21	40.7
6 At least one refrigerator, freezer, or washing machine	44.3	49.7	52.8	49.9
7 At least one air conditioner, air cooler, geyser or heater	14.1	34.8	16.2	36.8
8 At least one cooking stove, cooking range or microwave oven	32.2	46.7	40.4	49.1
9 Ownership of engine drive vehicles				
At least one car/tractor AND at least one motocycle/scooter	1.1	10.5	1.5	12
At least one car/tractor BUT no motorcycle/scooter	2.5	15.5	2.5	15.5
No car/tractor BUT at least one motorcycle/scooter	11.5	31.9	17.6	38.1
Neither car/tractor NOR motocycle/scooter	84.9	35.8	78.4	41.2
10 At least one TV	48	50	57.5	49.4

11	Ownership of livestock				
	At least one buffalo/bullock AND at least one cow/goat/sheep	13	33.6	11.9	32.4
	At least one buffalo/bullock BUT no cow/goat/sheep	9.2	28.8	7.4	26.2
	No buffalo/bullock BUT at least one cow/goat/sheep	11	31.3	8.8	28.3
	Neither buffalo/bullock NOR cow/goat/sheep	66.8	47.1	71.9	45
12	Ownership of agricultural land				
	Own no agricultural land	70.1	45.8	79.7	40.2
	Own >0-<=12.5 acres agricultural land	26.8	44.3	17.7	38.2
	Own >12.5 acres agricultural land	3.2	17.5	2.6	15.8
Note: means are weighted by sampling weight					

Table 2: The Final Regression Model								
			2005/2006			2007/2008		
	Variable	**Definition**	**Coeff**	**t-stats**	**Scores**	**Coeff**	**t-stats**	**Scores**
DEMOGRAPHICS	(i) The number of dependents (age<18 or age>65) in the household is:							
	Dependent1*	Less or equal than 2	0.33	34.6	15	0.31	18.4	13.34
	Dependent2*	Equal to 3 or 4	0.22	26.4	10	0.19	11.8	8.19
	Dependent3*	Equal to 5 or 6	0.11	13.8	5	0.10	6.0	4.3
EDUCATION	(ii) The level of education of the Head of the Household is:							
	headedu_com2*	Attended less than class 1 to class 5 included	0.02	2.1	1	0.04	4.4	1.63
	headedu_com3*	Class 6 to class 10 included	0.06	8.4	3	0.06	7.1	2.38
	headedu_com4*	Class 11, college or beyond	0.22	21.9	10	0.23	22.2	10
	(iii) The number of children from 5 to 16 years old currently attending to the school is:							
	school5_16_rich*	"No children between 5 and 16 years old" or "All children between 5 and 16 attend school"	0.1	11.8	4	0.13	13.6	5.62
	school5_16_some*	Not all children between 5 and 16 years old in the household attend school	0.07	7.9	3	0.06	5.7	2.65
HOUSE CHARACTERISTICS	(iv) The ratio of rooms over number of household members is:							
	room_ratio3_2*	Greater than 0.2 and smaller or equal than 0.3	0.04	5.4	2	0.05	5.2	2.23
	room_ratio3_3*	Greater than 0.3 and smaller or equal than 0.4	0.08	9.2	4	0.12	10.4	4.94
	room_ratio3_4*	Greater than 0.4	0.26	28.9	12	0.33	31.9	14.18
	(v) The kind of toilet used by the household is:							
	toilet_flush*	A flush connected to a public sewerage, to a pit or to an open drain	0.08	10.1	3	0.04	4.2	1.6
	toilet_latrine*	Dry raised latrine or dry pit latrine	0.04	4.8	2	-0.01	0.5	-0.24
ASSETS	(vi) – (ix) The household owns the following durable goods:							
	refr_frez_wash*	At least one refrigerator, freezer or washing machine	0.08	10.7	3	0.06	7.1	2.46
	air_cooler*	At least one air conditioner, air cooler, geyser or heater	0.2	22.6	9	0.16	17.4	7.04

cook_micro*	at least one cooking stove, cooking range or microwave oven	0.12	16.2	5	0.14	17.7	5.86
tv*	At least one TV	0.05	7.8	2	0.03	3.9	1.21
(x) The household owns cars and/or motos:							
car_moto2*	One car or one car with one moto	0.53	35.1	24	0.53	32.0	22.71
only_moto*	One moto (but no car)	0.16	19.0	7	0.15	17.4	6.04
(xi) The household owns the following livestock							
animal_buffalo2*	At least one buffalo or bullock	0.12	16.7	6	0.14	16.8	4.42
animal_no2*	No buffalo or bullock, but at least one cow or goat or sheep	0.05	5.4	2	0.01	0.5	0.26
(xii) The household owns the following size of agricultural land:							
agriland_acres_1*	Some agricultural land but less or equal than 12.5 acres	0.09	12.8	4	0.05	4.8	2.02
agriland_acres_2*	More than 12.5 acres of agricultural land	0.15	10.8	7	0.16	7.9	6.73