A Note on Measurement of Poverty and Income Inequalities in Pakistan: Some Observations on Methodology

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Only a few attempts have been made at measuring the extent of poverty and inequalities in the distribution of income in Pakistan [1, 2, 3, 4, 5, 7]. Most, in fact all but one [4], have been based on information collected under the Household Income and Expenditure Surveys [8, 9, 10]. The aim of this paper is to point out the methodological shortcomings in the estimation procedure used in these studies and to suggest an alternative improved methodology for measuring poverty using data from the Household Surveys. It must be pointed out that it is not intended to discuss here at any length the estimates presented to illustrate the application of the suggested methodology.

ESTIMATION OF POVERTY

The measurement of poverty in Pakistan was pioneered by Naseem [7]. In fact, to date he and Alauddin [1] are the only two researchers who have made an attempt to estimate the percentage of population lying below the poverty line. Since Alauddin [1] adopted the same methodology as Naseem [7], the discussion of the procedure of estimating poverty used in the two studies can be confined to a critique of Naseem's work.

As Naseem has himself pointed out, one of the key steps in his estimation of poverty has been to arrange the data on real expenditure in the form of "a cumulative distribution showing the percentage of households or individuals having an expenditure of a given amount or less" [7, p.350]. The cumulative distributions are given in Tables III.1 to III.8 [7, pp.333-40] and graphically depicted at the end of the Appendix [7, pp.353-60]. The graphs—showing the 'cumulative percentage of population' on the vertical axis and 'per capita ex-

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[1]That is excluding the author's own study [6].

penditure' on the horizontal axis—are supposed to show the percentage of individuals having a per capita expenditure of a given amount or less. In fact, however, the construction of such cumulative percentage distributions as graphically shown is not warranted by the data from which they have been derived.

Naseem has derived the cumulative distributions from the percentage of population in groups of households classified according to monthly income and the *average* per capita expenditure of the total population in each household-income group. The assumption implicit in the derivation of the cumulative distributions is that each individual in a given household-income group has expenditure *equal* to the *average* for that group.[2] This assumption renders the cumulative distributions and the estimates of poverty meaningless. By thus deriving the cumulative percentage distributions Naseem counts the *total* population of a household-income group having *average* per capita expenditure less than the pre-determined minimum as lying below the poverty line. He ignores completely the possibility of variations from the *average* in the per capita expenditure of individuals belonging to households in a given income group.

How misleading this assumption is in the estimation of the extent of poverty is not difficult to demonstrate. For example, Naseem counts *all* persons belonging to rural households having a monthly income of Rs. 50-99 in 1963-1964 as 'poor' *because* the average of their monthly expenditures—Rs. 17.69 [7, p.333]—is found to be less than the pre-determined poverty levels. However, there could be little doubt that persons belonging to small households having only one or two members[3] and lying towards the upper limit of the income range would have enjoyed levels of expenditure higher than the poverty line and could not therefore be categorised as *poor*. On the other hand, Naseem reckons as 'not poor' all individuals belonging to rural households having a monthly income of Rs. 250-299 in 1963-1964 *because* the average of their monthly expenditures—Rs. 27.19 [7, p.333]—exceeded the pre-determined poverty levels.[4] In this case he overlooks the likelihood of individuals belonging to large households (having seven or more members[5] and lying towards the lower limit of the income range) having had expenditure levels below the poverty level.

In ignoring the variations in the size of households belonging to the same income group and hence in the per capita expenditures of individuals, the methodology used by Naseem [7] fails to draw a line between those having a per

[2]Strictly speaking the implicit assumption is that the per capita consumption expenditure of every household in a particular household-income group is *equal to or less than* the average for that income group. This boils down to assuming the per capita consumption expenditure of each household in a given household-income group as equal to the average.

[3]The numerical significance of such households can be seen from Tables 2, 3 and 4 below.

[4]To be more precise, the total population of a household income group is reckoned as 'not poor' if the average per capita expenditure of the preceding income group—in this case the income group Rs 200-249—is higher than the poverty line. Since Naseem [7] uses interpolation, only a part of the population of a group having per capita expenditure above the poverty line and following a group having per capita expenditure below the poverty line is counted as 'poor'.

[5]Such large households form a considerably high percentage of total households. See Tables 2, 3 and 4.

capita expenditure less than the poverty line and those having a per capita expenditure higher than the poverty line. This fundamental shortcoming of methodology leaves the estimates of poverty virtually without meaning.

AN IMPROVED METHODOLOGY

The Household Surveys provide a cross-classification of households by number of members per household and by monthly household income and we shall show how this information can be used to construct estimates of the extent of poverty free from the danger of excluding part of those who lie below the poverty line and of including some of those who lie above it.

Before outlining the details of our methodology we must point out that to allow comparability between our and Naseem's estimates [7] of poverty we work with his estimates of the per capita poverty line—Rs. 250 and Rs. 300 per annum for rural areas, and Rs. 300 and Rs. 375 for urban areas [7, pp. 321-22]. These figures are in terms of 1959-1960 prices and relate to total consumption expenditure. To avoid having to convert the income distributions to constant prices we convert instead the poverty lines into current prices using price indices given by Naseem.[6] Table 1 shows the monthly per capita poverty lines in current prices for rural and urban areas. It must be pointed out that, due to data availability, our estimates of poverty have to be based on monthly income instead of consumption expenditure. However, we do not make any adjustments in the poverty lines on this account because the total consumption expenditure of the *poor* is not much less than their income.

Table 1

Per Capita Monthly Poverty Line at Current Prices

(in rupees)

	Rural Areas		Urban Areas	
	I	II	I	II
1959-1960	20.83	25.00	25.00	31.25
1963-1964	22.78	27.34	28.41	35.52
1966-1967	28.75	34.51	34.95	43.68
1969-1970	29.08	34.90	36.62	45.78

Source: [7].

Tables 2, 3 and 4 show the cumulative percentage distributions of households of different sizes by monthly household income and, for each household size, the monthly poverty lines based on the per capita poverty lines given in Table 1.[7] The percentage of households of each given size lying below the

[6]The 'average' indices applicable to all household groups as a whole as given in [7, Tables III.19 and III.20, p. 347] have been used.

[7]As our aim in this paper is to illustrate the use of an improved alternative methodology, the household poverty lines have been obtained as the product of the per capita poverty line and the number of members per household (it being assumed that households classified as having more than nine members all have ten members each). Lack of space does not allow presenting poverty lines for persons of different ages and working with a set of poverty lines for various age compositions in households of different sizes. This exercise has been carried out in detail in [6].

Table 2

Distribution of Households by Income and Size, 1963-1964

Monthly Household Income (in rupees)	Household Size (number of members)									
	1	2	3	4	5	6	7	8	9	10
					Rural Areas					
Below 50	49.2	12.1	3.7	1.4	0.8	0.3	0.4	0.0	0.0	0.0
Below 100	85.7	65.1	43.1	27.5	16.8	11.7	7.3	5.0	2.1	0.8
Below 150	96.8	79.2	70.7	57.9	53.6	40.9	32.4	24.5	14.9	7.5
Below 200	100.0	89.9	89.0	75.6	71.6	66.0	53.4	50.3	36.2	17.3
Below 250	100.0	94.0	92.7	87.1	85.3	79.2	70.4	65.4	48.9	27.1
Below 300	100.0	96.6	96.3	92.6	93.4	87.7	83.8	78.0	65.9	44.4
Below 400	100.0	98.7	98.8	98.0	97.3	91.9	91.5	89.9	81.9	63.9
Percentage of all Households (x)	3.0	7.1	11.7	16.6	15.9	15.8	11.7	7.5	4.5	6.3
Monthly poverty line in rupees (I)	22.78	45.56	68.34	91.12	113.90	136.68	159.46	182.24	205.02	227.80
(II)	27.34	54.68	82.02	109.36	136.70	164.04	191.38	218.72	246.06	273.40
Percentage of households below poverty line (y) (I)	22.4	11.0	18.2	22.9	27.0	33.1	36.4	41.1	37.5	22.8
(II)	26.9	17.1	28.9	33.2	43.8	47.9	46.5	55.9	47.9	35.2

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Table 2—*Contd.*

					Urban Areas						
Below 50		22.6	4.7	0.6	0.0	0.4	0.4	0.5	0.0	0.0	0.0
Below 100		81.1	43.9	25.3	18.1	11.3	7.9	3.3	2.7	0.0	0.0
Below 150		96.2	72.9	62.1	55.2	39.6	31.8	22.5	17.7	7.8	5.1
Below 200		96.2	85.0	78.2	73.8	67.5	54.9	49.8	40.1	31.3	12.6
Below 250		96.2	90.7	83.3	81.9	80.7	71.5	66.5	93.3	41.7	31.6
Below 300		96.2	94.4	88.5	86.9	84.5	80.6	78.5	70.1	54.8	46.8
Below 400		98.1	98.1	92.5	95.0	91.3	90.5	90.0	83.0	70.4	63.3
Percentage of all households (x)		3.1	6.3	10.3	13.1	15.7	14.3	12.4	8.7	6.8	9.3
Monthly poverty line in rupees	(I)	28.41	56.82	85.23	113.64	142.05	170.46	198.87	227.28	255.69	284.10
	(II)	35.52	71.04	106.56	142.08	177.60	213.12	248.64	284.16	319.68	355.20
Percentage of households below poverty line (y)	(I)	12.8	10.1	18.0	28.2	35.1	41.3	49.2	52.8	43.2	42.0
	(II)	16.1	21.2	30.1	49.3	55.0	59.3	66.1	67.9	57.9	55.9

Source: [8].

Table 3

Distribution of Households by Income and Size, 1966-1967

Monthly Household Income (in rupees)		Household Size (number of members)									
		1	2	3	4	5	6	7	8	9	10
						Rural Areas					
Below 50		22.2	2.5	1.2	0.2	0.7	0.5	0.0	0.0	0.9	0.9
Below 100		74.1	52.5	33.7	21.6	15.9	6.3	5.5	5.1	3.7	1.6
Below 150		100.0	81.5	71.3	57.1	48.5	32.7	25.6	16.2	14.7	5.4
Below 200		100.0	93.5	87.3	81.6	73.6	59.5	47.4	41.9	33.9	11.3
Below 250		100.0	96.5	94.7	92.6	85.7	76.0	71.6	64.6	54.1	22.7
Below 300		100.0	96.5	96.7	95.6	92.6	85.0	82.7	77.8	69.7	35.1
Below 400		100.0	98.0	98.8	97.8	97.5	93.5	93.8	91.9	85.3	61.1
Percentage of all households (x)		1.0	7.7	13.1	15.8	16.8	15.4	11.2	7.6	4.2	7.1
Monthly poverty line in rupees	(I)	28.75	57.50	86.25	115.00	143.75	172.50	201.25	230.00	258.75	287.50
	(II)	34.51	69.02	103.53	138.04	172.55	207.06	241.57	276.08	310.59	345.10
Percentage of households below poverty line (y)	(I)	12.8	10.0	24.8	32.3	44.4	44.8	48.0	55.5	56.8	32.0
	(II)	15.3	21.5	36.3	48.6	59.8	61.8	67.5	71.5	71.4	46.8

Continued—

Table 3—*Contd.*

		1	2	3	4	5	6	7	8	9	10
						Urban Areas					
Below 50		2.2	1.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Below 100		37.3	24.5	18.8	8.2	6.4	3.8	2.4	1.3	0.5	0.0
Below 150		72.4	56.8	51.5	37.2	27.6	19.3	12.6	9.5	3.9	1.5
Below 200		88.1	81.4	74.5	65.0	52.9	27.5	29.7	25.8	11.9	6.5
Below 250		92.5	89.1	86.3	78.9	69.5	46.2	50.8	44.8	24.2	16.3
Below 300		96.3	93.8	92.1	86.2	79.8	57.6	65.4	59.0	40.6	22.5
Below 400		99.3	95.9	95.9	92.8	90.9	69.6	82.1	75.5	66.3	42.9
Below 500		100.0	97.5	97.1	95.4	93.9	75.3	87.8	87.6	78.3	60.4
Percentage of all households (x)		3.1	7.6	11.6	14.3	15.7	14.3	11.5	9.1	4.7	7.9
Monthly poverty line in rupees	(I)	34.95	69.90	104.85	139.80	174.75	209.70	244.65	279.60	314.55	349.50
	(II)	43.68	87.36	131.04	174.72	218.40	262.08	305.76	349.44	393.12	436.80
Percentage of households below poverty line (y)	(I)	1.5	10.5	22.0	31.3	40.1	31.1	48.5	53.2	44.3	42.7
	(II)	1.9	18.6	39.1	50.9	59.0	49.0	66.4	67.2	64.5	49.3

Source: [9].

Table 4

Distribution of Households by Income and Size, 1969-1970

Monthly Household Income (in rupees)		Household Size (number of members) 1	2	3	4	5	6	7	8	9	10
					Rural Areas						
Belwo 50		18.5	1.3	0.8	0.6	0.4	1.2	0.7	0.0	0.0	1.4
Below 100		70.7	39.5	25.1	14.2	7.8	5.4	3.2	1.9	2.6	2.1
Below 150		89.2	78.1	66.2	52.5	40.4	28.4	20.7	13.6	11.2	4.9
Below 200		96.9	92.5	87.3	79.4	64.5	56.3	46.1	32.2	25.0	12.6
Below 250		96.9	96.1	95.0	94.0	82.4	75.3	64.6	57.1	43.9	25.9
Below 300		96.9	98.7	97.6	96.5	89.7	85.4	80.0	72.4	58.6	44.1
Below 400		98.5	99.6	99.5	98.4	95.3	95.1	92.8	91.1	82.8	67.8
Percentage of all households (x)		2.4	8.2	13.7	17.6	16.2	14.7	10.1	7.7	4.2	5.2
Monthly poverty line in rupees	(I)	29.08	59.60	89.40	119.20	149.00	178.80	208.60	238.40	268.20	298.00
	(II)	34.90	69.80	104.70	139.60	174.50	209.40	244.30	279.20	314.10	349.00
Percentage of households below poverty line (y)	(I)	10.8	8.6	19.9	28.9	39.7	44.5	49.3	51.3	49.2	43.4
	(II)	12.9	16.4	28.9	44.5	52.2	59.9	62.5	66.0	62.0	55.7

Continued—

Table 4—*Contd.*

		1	2	3	4	5	6	7	8	9	10
						Urban Areas					
Below 50		1.6	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Below 100		19.3	10.6	9.1	4.2	2.6	0.9	0.2	0.3	0.0	0.0
Below 150		59.4	45.4	34.2	24.7	19.7	9.4	6.7	3.4	3.0	0.7
Below 200		83.8	71.6	58.6	50.5	42.2	31.6	18.2	13.1	6.5	4.0
Below 250		91.1	83.0	74.7	69.7	62.6	53.7	37.7	30.5	21.1	9.1
Below 300		93.8	91.1	82.1	80.5	74.3	67.6	53.4	47.9	36.6	20.1
Below 400		96.9	96.1	90.1	90.6	89.7	83.1	77.0	72.9	62.9	41.9
Below 500		97.9	97.2	94.6	94.2	94.8	90.5	88.3	84.0	78.4	63.8
Percentage of all housholds (x)		4.3	8.0	11.5	14.9	15.4	14.1	12.1	7.8	5.2	6.7
Monthly poverty line in rupees	(I)	36.62	73.24	109.86	146.48	183.10	219.72	256.34	292.96	329.58	366.20
	(II)	45.78	91.56	137.34	183.12	228.90	274.68	320.46	366.24	412.02	457.80
Percentage of households below poverty line (y)	(I)	1.2	4.9	14.1	23.3	34.6	40.3	39.7	44.5	44.4	34.5
	(II)	1.5	8.8	27.8	41.8	54.0	60.6	58.2	64.5	64.8	54.6

Source: [10].

poverty line has been estimated by linear interpolation. The percentage of total households and of total population in poverty are shown in Table 5. The percentage of total households in poverty (a) has been obtained as:

$$a = \frac{\sum_{i=1}^{10} x_i \cdot y_i}{100}$$

where

x = households in size group i as a percentage of total households;

y = *poor* households in size group i as a percentage of all households in size group i; and

i = size of household (1 to 10 members).

The percentage of population in poverty (b) has been estimated as:

$$b = \frac{\sum_{i=1}^{10} x_i \cdot y_i \cdot i}{100 \cdot w}$$

where

w = the average size of household.

By taking the distribution of each given size of households separately, our methodology provides the basis of distinguishing between households having per capita income less than the poverty line and those having per capita income higher than the poverty line. There is no likelihood, as in the method adopted in [1, 7] of counting as *poor* or *non-poor* those who cannot be so defined.

Table 5

Extent of Poverty in Pakistan

	Annual Per Capita Poverty Line in 1959-1960 Prices			
	Rural areas		Urban areas	
	Rs. 300	Rs. 250	Rs. 375	Rs. 300
	Percentage of households below the poverty line			
1963-1964	39.5	27.4	51.7	35.5
1966-1967	53.1	37.8	50.2	34.5
1969-1970	47.6	35.0	46.2	29.4
	Percentage of population below the poverty line			
1963-1964	41.6	29.2	55.0	39.0
1966-1967	55.8	40.6	54.0	38.5
1969-1970	52.6	39.5	51.9	33.7

Source: Estimated from Tables 2, 3 and 4. For method of estimation see text. Average size of household (w) for rural areas: 1963-1964 (5.5), 1966-1967 (5.6), 1969-1970 (5.3); and for urban areas: 1963-1964 (5.9), 1966-1967 (5.6), 1969-1970 (5.5), as given in [8, 9, 10].

THE GINI COEFFICIENT

The estimation of the Gini coefficient as a measure of income inequalities has been the subject of more—though still only a very few—studies [1, 2, 3, 5, 7]. Since in all studies the same data and estimation procedure have been used, we shall draw examples from [7] to illustrate the methodological shortcomings.

What is basic to the estimation of the Gini coefficient is information on income shares of various segments of the population arranged in ascending order of income status—that is, for example, the share of the 'poorest 12 percent', the next richer 15 percent and so on should be known. From the Household Surveys it is possible to derive the shares in total income and expenditure of population arranged by income of households to which they belong. For example, in 1963-1964 the share in total expenditure of 38 percent of population belonging to the lowest income households in rural areas was 28 percent [7, p.341]. It must however be emphasised that this 38 percent population cannot be described as the *poorest* 38 percent. Owing to variations in the size of households classified in the same household-income group the *poorest* 38 percent of population would not be concentrated in households falling in the three lowest monthly income groups. Part of the *poorest* population would also be found in households reporting higher incomes but having a larger number of members.

The effect of this factor on the estimation of the Gini coefficients can be easily illustrated. In 1963-1964, while households classified in the three lowest household-income groups accounted for 38 percent of the rural population [7, p.341], of our estimated *poorest* 29.2 percent and 41.6 percent population only 25. 3 percent and 33.3 percent respectively belonged to these three lowest household income groups.[8] On this basis it may be argued that about 15 to 20 percent of the population that is included in the 'poorest 38 percent' using Naseem's method is not the *poorest* in terms of per capita income. That the 'poorest' percentiles and deciles (so defined on the basis of total household income) are likely to include some proportion of the *richer* percentiles and deciles (if defined on the basis of per capita income) the shares of the *poorest* sections of the population would be less than what these are estimated to be using the household income criterion of defining 'poor' and 'rich'. Inequalities would hence be more pronounced by an unknown extent than the Gini coefficients of income and expenditure given in earlier studies suggest [1, 2, 3, 5, 7]. Lack of data however precludes a precise estimation of the Gini coefficients of income in Pakistan.

Another important point to be noted is that most studies [1, 3, 5, 7] arrive at a lower estimate of the Gini coefficient on the basis of population than on the basis of households. Naseem explains the differences in his two estimates by "the fact that poorer households have smaller number of members in them

[8] With the methodology presented in this paper it is possible to estimate the percentage of households and population lying below the poverty line in each household size group as well as in each household income group.

while richer households have larger number of members" [7, p.323].[9] This explanation is based on the observation that size of household increases with monthly household income [8, 9, 10].[10] As we have already discussed, it is per capita income and not household income that should be used as the criterion of defining 'poorer' and 'richer' households. Our estimates of poverty based on per capita poverty lines show the percentage of population to have been higher than the percentage of households in poverty (see Table 5 above). This indicates that *poorer* households are in fact on the average larger than *richer* households. The Gini coefficients estimated on the basis of population (if data were to have been available by per capita income) would therefore be higher—not lower—than those estimated on the basis of households. Hence, contrary to what [1, 3, 7] suggest, income in Pakistan has been distributed *more* and not less inequitably than indicated by the Gini coefficients derived from the distribution of households by household income.

CONCLUSIONS

The main focus of this paper has been to highlight the methodological issues involved in the measurement of poverty and income inequalities using data from Pakistan's Household Surveys. Its main conclusions in this respect can be summarised as: The extent of poverty defined as the percentage of population lying below the poverty line can be measured using the cross-classification of households (and population) by monthly household income and size of household. The level of household income alone—heretofore used as the basis of measuring the extent of poverty in Pakistan—is not a satisfactory criterion for estimating poverty; the Household Survey data does not warrant the estimation of Gini coefficients. Estimating the Gini coefficient of income or expenditure either for households or population has no meaning since the shares in total income or expenditure of households and population arranged by per capita income cannot be determined. All that can be said of previously published estimates of the share in income and expenditure of the so-called 'poorest' in Pakistan is that these have been over estimates; and while there is a direct correlation between household income and size of household, available evidence if analysed in detail shows an inverse correlation between per capita income and size of household. The general supposition that income has been more equitably distributed among the population than among households made in past studies cannot therefore be justified.

A final remark would be in order at the end of the paper. The Statistical Division can considerably improve the availability of data suitable for analysing problems of poverty and income inequalities by classifying, if possible, the information collected under Household Surveys by per capita income instead of by household income.

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[9] According to Bergan [3], "the income distribution would appear to be less unequal if income per household . . . were replaced by household income per capita or per earner", [3, p. 80]. It would be appropriate to point out that Khandker [5], in spite of showing Gini coefficients estimated on the basis of population to be lower than those estimated on the basis of households, suggested that the coefficients may turn out to be very different if the distribution of population on the basis of per capita income could be used.

[10] Naseem's comparison of Pakistani and Indian data in [7, Table III.17a, p.345] is misleading. Since data for India is available on the basis of per capita income the poorest 5 percent' really mean the *poorest* 5 percent. For Pakistan on the other hand, the 'poorest 5 percent' as estimated by Naseem are only the 5 percent belonging to households reporting lowest total incomes.

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