

Decomposing Well-being Indicators using Distributional Data

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Abstract

This paper makes two principal contributions: *first*, we propose a method for representing well-being aggregates and estimating population subgroup decompositions when data is available on population distributions across subgroups; *second*, we analyze the Quality of Life (QOL) of ‘poor’ and ‘non-poor’ population segments of 86 countries for the years 1980s and 1990s. The three major findings of this paper are as follows: *First*, nearly every well-being indicator declines as poor’s population share increases; *second*, evidence of a significant difference in the QOL-poor’s population share relationship between Asian and nonAsian countries is present for only few QOL indicators. In other words, the tendency for QOL to decline with increasing poor’s population share is common to the Asian and nonAsian countries; third, women suffer a double QOL disadvantage in areas of health and education as the poor’s share of population increases. This is due to the existence of relatively wider gender gaps in the well-being indicators among poor populations in Asia and elsewhere.

JEL classification: C21; I12; I31; O15

Key words: Well-being indicators of the poor, poverty, random coefficient models,

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1. Introduction

Improving the quality of life (QOL) and the ability of people to live longer and more satisfying lives are among the main goals of international development.³ Unfortunately, available data sources are often fairly uninformative regarding how well-being and the ability to live longer differ amongst people as well as how they are influenced by public policy choices. The high level of aggregation in widely-used well-being indicators (e.g., life expectancy, infant mortality rate and various forms of morbidity) is a common limitation of these indices; and it is often population subgroup decompositions of well-being indicators that are desired, but that this is unavailable from the conventional data sources.⁴ For instance, it may be desirable to analyze differences in the causes and standards of living of ‘poor’ and ‘non-poor’ or ‘rural’ and ‘urban’ or other population segmentations. Are the poor inherently less healthy? Does public health spending matter more to them? How is the allocation of resources among members of a household affected as poverty increases? How do poverty and the environment interact? These are questions that are of interest to economists as well as policy makers and must be addressed in order to achieve the overall goal of improving the QOL. The highly aggregated nature of available data make it difficult for these questions to be addressed adequately using existing tools of analysis extant in the development literature.

There are many reasons for the unavailability of subgroup decomposition of well-being indicators: lack of survey integration (some surveys have recorded health data, some recorded income, but fewer recorded both), too small a sample to capture relatively

³ See for example World Bank (1990, 2000), Streeten et al. (1981), Sen (1981, 1985), Dasgupta (1993), Kakwani (1993), and Anand and Ravallion (1993).

⁴ For detailed discussions see B. Bidani and Ravallion (1997), Prescott and Jamison (1985), Waldmann (1992) and Anand and Ravallion (1993)

low-frequency events (such as infant death), or simply the lack of access by users to the underlying micro data. The problem is not unique to well-being data, but it is quite common for such data.

While there is a large literature on the cross-country relationship between well-being indicators and average income, less attention has been given to the relationship with the distributions of income and population. In particular, very few studies have been devoted to the analysis of well-being for various segments of the population.

This paper makes two principal contributions: *first*, we propose a method for representing well-being aggregates and estimating population subgroup decompositions when data is available on population distributions across subgroups; *second*, we analyze the QOL of ‘poor’ and ‘non-poor’ population segments of 86 countries for the 1980s and 1990s.

This paper is organized as follows. Section 2 presents a simple statistical model that enables us to analyze the QOL of poor and non-poor population segments. Section 3 presents the statistical framework to estimate population subgroup decompositions when data is available on population distributions across subgroups. Section 4 discusses the empirical implementation and analyses of QOL of poor and non-poor population segments of 86 countries for the 1980s and 1990s. Section 5 concludes by summarizing the major findings.

2. A Model for Analyzing QOL of Poor and Non-poor Population

Using national level data to analyze the QOL of ‘poor’ and ‘nonpoor’ population segments is possible on the basis of two key information components: first, an analysis of

national well-being indicators in a cross-country framework, together with the data on the share of the population that is poor is required; second, imposition of additional structure on the data must be imposed (discussed ahead). The starting point for the method is the conceptualization of a national indicator in terms of a weighted average of corresponding ‘poor’ and ‘nonpoor’ indicators, with poor and nonpoor population shares serving as the appropriate weights. An additional assumption, representing additional structure on the data, is the underlying (unobserved or latent) poor and nonpoor QOL indicators are each comprised of two components: one that is common to poor and nonpoor people for all countries in the sample, and one that is purely country-specific. We do *not* assume that the QOL of the poor and nonpoor population segments is the same in every country under study, but only that there is some portion of the poor’s QOL and some portion of the nonpoor’s QOL that is shared in every country and which can be estimated.

Specifically, assume that y_{it}^N is the value of well-being indicator at the national level in country i for time t ; y_{it}^P and y_{it}^{NP} are the values of the indicators for the poor and non-poor population segments in country i for time t , respectively; and s_{it}^P is the share of the population who are poor in country i for time t . Then,

$$y_{it}^N = s_{it}^P y_{it}^P + (1 - s_{it}^P) y_{it}^{NP} \quad (1)$$

$$y_{it}^P = y_t^P + \mathbf{e}_{it}^P \quad (2)$$

$$y_{it}^{NP} = y_t^{NP} + \mathbf{e}_{it}^{NP} \quad (3)$$

where y_t^P represents that part of the indicator for poor segments of the population that is common across countries and e_{it}^P represents that part of the indicator for the poor segment of the population that differs across countries. Similarly, y_t^{NP} represents that part of the indicator for the non-poor segment of population that is common across countries while e_{it}^{NP} represents that part of the indicator for the non-poor segment of the population that differs across countries.

Using (2) and (3), equation (1) can be represented as

$$y_{it}^N = y_t^{NP} + \left(y_t^P - y_t^{NP} \right) s_{it}^P + \left(e_{it}^P - e_{it}^{NP} \right) s_{it}^P + e_{it}^{NP} \quad (4)$$

Letting

$$v_{it} = \left(e_{it}^P - e_{it}^{NP} \right) s_{it}^P + e_{it}^{NP} \quad (5)$$

then

$$y_{it}^N = y_t^{NP} + \left(y_t^P - y_t^{NP} \right) s_{it}^P + v_{it} \quad (6)$$

The intercept of regression equation (6) is an estimate of the indicator for the non-poor segment of the population, while the slope represents the difference between the poor and non-poor values of the indicator. The error term, v_{it} , captures the variation across countries.

This model framework suggests using cross-country data to fit a linear regression of the values of the national well-being indicators (y_{it}^N) on a constant (y_t^{NP}) and share of the population that is poor (s_{it}^P). The fitted intercept will be an estimate of the common component to each country's nonpoor-specific indicator. The fitted slope will be

an estimate of the difference between the common components of each country's nonpoor- and poor-specific indicators. At the least, we might interpret the specific regression equation (6) as describing QOL differences between countries that differ in poor's population shares. Also the model is directly applicable to the data on QOL and poor's population shares for multiple years. Specifying the model with a temporal trend (as we do in this paper, where periods under consideration are the early 1980s and 1990s) or a year dummy and a term for the interaction between poor's population share and the time trend (or the year dummy) allows an examination of changes in the intercept and slope over time. We interpret these changes as estimates of overall increases or decreases in the particular well-being indicator and as changes over time in the inequality between poor and nonpoor QOL. The method provides a straightforward tool for analyzing QOL trends in 86 countries in our sample.

3. Estimating Population Subgroup Decomposition

The problem is to estimate the means for the poor and non-poor segments of the population when we only know the aggregate indicator and population distribution across two subgroups defined by poor and non-poor. We treat the latent subgroup values as random coefficients in a regression of the observed aggregates on the distributional data. Consider the identity in equation (1):

$$y_{it}^N = s_{it}^P y_{it}^P + (1 - s_{it}^P) y_{it}^{NP} \quad (1)$$

The subgroup indicators y_{it}^P and y_{it}^{NP} are latent (not observed), but y_{it}^N and s_{it}^P are observed. We also observe a vector of explanatory variables for country i , X_{it}^N , for time

t , and two vectors of explanatory variables for the poor and non-poor subgroups in country i , \mathbf{Z}_{it}^P and \mathbf{Z}_{it}^{NP} for time t respectively. Let

$$\mathbf{y}_{it}^P = \mathbf{a}_P + \mathbf{b}'_P \mathbf{X}_{it}^N + \mathbf{g}'_P \mathbf{Z}_{it}^P + \mathbf{e}_{it}^P \quad (7a)$$

$$\mathbf{y}_{it}^{NP} = \mathbf{a}_{NP} + \mathbf{b}'_{NP} \mathbf{X}_{it}^N + \mathbf{g}'_{NP} \mathbf{Z}_{it}^{NP} + \mathbf{e}_{it}^{NP} \quad (7b)$$

which, upon substituting into (1), leads to the regression:

$$\mathbf{y}_{it}^N = s_{it}^P \left(\mathbf{a}_P + \mathbf{b}'_P \mathbf{X}_{it}^N + \mathbf{g}'_P \mathbf{Z}_{it}^P \right) + (1 - s_{it}^P) \left(\mathbf{a}_{NP} + \mathbf{b}'_{NP} \mathbf{X}_{it}^N + \mathbf{g}'_{NP} \mathbf{Z}_{it}^{NP} \right) + \mathbf{m}_{it}, \quad (8)$$

where

$$\mathbf{m}_{it} = s_{it}^P \mathbf{e}_{it}^P + (1 - s_{it}^P) \mathbf{e}_{it}^{NP} \quad (9)$$

We assume that

$$E(\mathbf{e}_{it}^P) = 0, \quad E(\mathbf{e}_{it}^{NP}) = 0 \quad \text{and}$$

$$\begin{aligned} E(\boldsymbol{\varepsilon}_{ij} \boldsymbol{\varepsilon}_{i'j'}) &= \boldsymbol{\sigma}^2 \boldsymbol{\Omega}_{jj'} \quad \text{for } i = i', \text{ where } j = P, NP \\ &= 0 \quad \text{for } i \neq i' \end{aligned} \quad (10)$$

where $\boldsymbol{\Omega}$ is a 2×2 matrix (common to all countries) whose (j, j') th element is $\boldsymbol{\Omega}_{jj'}$.

The error term \mathbf{m}_{it} in (8) has a mean of zero and a block-diagonal covariance matrix;

specifically:

$$E(\mathbf{m}_{it}) = 0 \quad \text{for all } i,$$

$$E(\boldsymbol{\mu}_{it}^2) = \boldsymbol{\sigma}^2 \mathbf{n}'_i \boldsymbol{\Omega} \mathbf{n}_i = d_{ii},$$

$$E(\boldsymbol{\mu}_{it} \boldsymbol{\mu}_{i't'}) = 0 \quad \text{for } i \neq i', \quad (11)$$

where n_i is a 2×1 column vector of population shares and the covariance matrix is $D = \text{diag}(d_{11} \ . \ . \ . \ d_{nn})$, where d_{ii} is as defined in (11). Thus we have a Hildreth-Houck generalized least squares model (Hildreth and Houck, 1968). The estimation of this model requires knowledge of the covariance matrix, D .

4. Analysis of QOL of ‘Poor’

“It is in the deprivation of the lives that people can lead that poverty manifests itself. Poverty can involve not only the lack of the necessities of material well-being, but the denial of opportunities for living a tolerable life. Life can be prematurely shortened. It can be made difficult, painful or hazardous. It can be deprived of knowledge and communication. And it can be robbed of dignity, confidence and self-respect—as well as the respect of others. All are aspects of poverty that limit and blight the lives of many millions in the world today.”

(Human Development Report, 1997)

It is clear that poverty is highly associated with deprivation in various aspects of quality of life. Thus, dealing with the poverty is the main instrument which can effectively eliminate deprivation and inequalities in human well-being.

Poverty has degraded human lives for centuries. Human deprivation is still persistent in the developing countries of the world. Today, nearly a third of the people (1.3 billion) live on less than \$ 1 a day (1985 PPP \$). Approximately 800 million people do not get enough to eat and more than a half million are chronically malnourished. More than 840 million adults are still illiterate. About 800 million people lack access to health services, and more than 1.2 billion access to safe water. Moreover, nearly 160 million children under age five are malnourished, and more than 110 million school age children

are not attending school. The maternal mortality rate is nearly 500 women per 100,000 live births. It is important to note that deprivation is not limited to only developing countries of the world. The developed countries are also afflicted. Today, more than 100 million of their people still live below the income poverty line- at 50% of the individual median adjusted disposable income. More than a third of adults do not complete upper-secondary education.

At the same time, the uneven progress has given rise to disparities among regions, not only across countries, but also within countries- between women and men and rural and urban, between ethnic groups, between poor and non-poor. For instance, in 1994 the ratio of the income of the richest 20% of the world to that of the poorest 20% was 78 to 1, up from 30 to 1 in 1960. Finally, the face of poverty is changing. Even though most poor still live in Asia, the profile of poverty is rapidly shifting. In the next century a poor person is less likely to be in Asia, and more likely to be an unskilled, low-wage worker in urban Africa and Latin America.

There is growing empirical evidence pointing to increasing inequality in the world income distribution and a divergence in the trend of incomes, as globalization has proceeded. A number of recent empirical studies indicate that global inequality, both in terms of ‘between-countries’ and ‘within-countries’ is high and probably increasing. However, the precise nature and various mechanisms whereby the on-going process of globalization has altered the pattern of income distribution and the QOL and conditions facing the world’s poor are yet to be carefully analyzed. Quantifying the net progress of world’s poor is the central goal of this paper.

The ensuing subsections address four practical issues:

- Nature of the data examined;
- Specific QOL indicators analyzed;
- Yardsticks against which the QOL of the poor segment is measured; and
- Manner in which the term “poor” is made operational.

4.1 Nature of the Data

Quantitative indicators were selected using country-level data. No single database contained all the relevant data and aggregate data were available for a wide range of countries, both for developing and developed countries of the world; for different points of time as far as the 1960s; and for a wide range of information, although not for every variable one might ideally wish to study. Most of the data examined have been assembled by the Human Development Report office of UNDP, and the World Bank.

Among the main weaknesses of the aggregate data is that none of the QOL indicators analyzed are measured separately for the poor and non-poor segments of the population. In section 2, a direct econometric technique was developed that allowed inferences to be drawn about the QOL of the poor segments of the population from national-level data. Given the formidable size of the poor across countries, there is paucity of data available to measure directly the level and trend of the QOL of poor population across countries.

4.2 QOL Indicators

QOL is a multidimensional concept with many influences that vary in importance over time and across different countries. In our analysis, QOL is viewed broadly as

having multiple domains, each of which has at least several indicators. These domains are: nutrition, health, education, income, gender equality, fertility, political and civil freedom, environmental quality, access to information, and access to infrastructure. Several indexes of the general state of social and human development are also examined.

In order to analyze the QOL of ‘poor’ and ‘nonpoor’ population segments of countries, we have used 45 well-being indicators which are grouped into 11 QOL components: *indices* (human development index, gender-related development index, and gender empowerment index); *gender* (literacy gap between male and female, enrollment gap between male and female, life expectancy gap, income gap, female economic activity rate, female primary net enrollment as percentage of male, female secondary net enrollment as percentage of man, and suicide gap); *income* (GDP per capita); *education* (adult literacy rate, combined first, second and third level gross enrollment ratio, children not reaching grade five, and public education expenditure); *health* (life expectancy at birth, infant mortality rate, maternal mortality rate, under age five mortality rate, infants with low birth weights, AIDS cases, tuberculosis cases, and population without access to health services); *Nutrition* (daily per capita supplies of calories, and underweight children under age five); *fertility* (total fertility rate, contraceptive prevalence rate, births to mothers under age 20, and population growth rate); *political and civil liberties* (political rights index and civil liberties index); *access to information* (TV sets per 1000 people); *environment* (percentages of people with access to safe drinking water, sanitation, CO2 emissions, SO2 emissions, and annual deforestation); and *Crime and others* (drugs crime, intentional homicides, dependency ratio, female and male suicide rates, and divorce rate). The data on these indicators have been collected from various sources including the

Human Development Report and World Development Indicators for the years 1980s and 1990s. Table 1 lists all 45 QOL indicators used in our analysis. Appendix 1 defines the indicators and provides the data sources.

4.3 Comparisons

Both historical and comparative yardsticks were adopted for assessing QOL of poor segments of the population of the world. Specifically, several QOL indicators were selected and three types of comparisons were made:

- between poor Asia and non-poor Asia;
- between poor Asia and poor populations in other regions;
- poor segments of the population at different points in time.

A main feature of the available data is that many variables were measured at only one, usually quite recent, point in time. For these QOL indicators only between-country analysis was possible. By contrast, for those indicators that were measured at two or more points in time, QOL patterns at each point in time as well as temporal trends (a within-country analysis) could be determined.

4.4 Defining ‘Poor’

A fundamental difficulty in examining the QOL of the poor relates to the absence of a commonly accepted definition or measure of the term ‘poor’. It is a statistical concept defined by every country’s national government, commonly based on its poverty line deemed appropriate by its authorities. Developing countries that have set national poverty lines have generally used the food poverty method. These lines indicate the

insufficiency of economic resources to meet basic minimum needs in food. There are three approaches to measuring food poverty: cost-of-basic-needs method, food energy method, and food share method. All three approaches are sensitive to the price level used to determine the cost of the relevant food bundle. And all three concentrate mainly on calories or dietary energy, because protein deficiency due to inadequate economic resources is perceived to be rare in most societies. In industrial societies national poverty lines are also used to measure relative poverty. However, we emphasize that the measure of ‘poor’ based on national poverty lines are not comparable across countries because each country sets its own poverty line based on what they consider appropriate.

As a result of the difficulty in defining the concept of “poor”, we use two different ways of measuring poor populations. *First*, poverty lines for international comparison. To overcome the problem of non-comparability of measures of poor based on national poverty lines, the World Bank measures poverty based on an international poverty line and the commonly used standard is \$ 1 a day, measured in 1985 international prices and adjusted to local currency using purchasing power parities (PPPs), because it is typical of poverty lines in low-income countries. *Second*, for comparison among industrial countries, we use a poverty line corresponding to the US poverty line of \$14.40 (1985

Table 2. The Relative Size of Poor Population, by Country⁵, 1990s

Country (1)	Poor Population (2)	Country (3)	Poor Population (4)
<i>Canada</i>	5.9	<i>Chile</i>	15
<i>Norway</i>	2.6	<i>Costa Rica</i>	18.9
<i>United States</i>	14.1	<i>Venezuela</i>	11.8
<i>Japan</i>	3.7	<i>Panama</i>	25.6
<i>Belgium</i>	12	<i>Mexico</i>	14.9
<i>Sweden</i>	4.6	<i>Malaysia</i>	5.6
<i>Australia</i>	7.8	<i>Colombia</i>	7.4
<i>Netherlands</i>	14.4	<i>Thailand</i>	0.1
<i>United Kingdom</i>	13.1	<i>Ecuador</i>	30.4
<i>France</i>	12	<i>Philippines</i>	27.5
<i>Finland</i>	3.8	<i>Brazil</i>	28.7
<i>Germany</i>	11.5	<i>Peru</i>	49.4
<i>Denmark</i>	7.6	<i>Jamaica</i>	4.7
<i>Austria</i>	8	<i>Dominican Republic</i>	19.9
<i>Luxembourg</i>	4.3	<i>Sri Lanka</i>	4
<i>Italy</i>	2	<i>Jordan</i>	2.5
<i>Ireland</i>	36.5	<i>China</i>	29.4
<i>Spain</i>	21.1	<i>South Africa</i>	23.7
<i>Slovenia</i>	1	<i>Tunisia</i>	3.9
<i>Czech Republic</i>	1	<i>Indonesia</i>	14.5
<i>Slovakia</i>	1	<i>Algeria</i>	1.6
<i>Poland</i>	20	<i>Bolivia</i>	7.1
<i>Hungary</i>	4	<i>Honduras</i>	46.5
<i>Estonia</i>	37	<i>Guatemala</i>	53.3
<i>Belarus</i>	22	<i>Egypt</i>	7.6
<i>Lithuania</i>	30	<i>Nicaragua</i>	43.8
<i>Bulgaria</i>	15	<i>Botswana</i>	34.7
<i>Romania</i>	59	<i>Morocco</i>	1.1
<i>Russian Federation</i>	50	<i>Lesotho</i>	50.4
<i>Latvia</i>	22	<i>Zimbabwe</i>	41
<i>Kazakhstan</i>	65	<i>India</i>	52.5
<i>Ukraine</i>	63	<i>Kenya</i>	50.2
<i>Uzbekistan</i>	63	<i>Pakistan</i>	11.6
<i>Turkmenistan</i>	61	<i>Nepal</i>	53.1
<i>Kyrgyzstan</i>	88	<i>Nigeria</i>	28.9
<i>Moldova, Rep. of</i>	66	<i>Madagascar</i>	72.3
		<i>Mauritania</i>	31.4
		<i>Bangladesh</i>	28.5
		<i>Zambia</i>	84.6
		<i>Senegal</i>	54
		<i>Côte d'Ivoire</i>	17.7
		<i>Tanzania, U. Rep. of</i>	16.4
		<i>Uganda</i>	50
		<i>Malawi</i>	42.1
		<i>Guinea</i>	26.3
		<i>Rwanda</i>	45.7
		<i>Guinea-Bissau</i>	87
		<i>Ethiopia</i>	33.8
		<i>Niger</i>	61.5

⁵ Poor population shares in column 4 is based on the international poverty line, \$ 1 a day (1985 PPPs), while poor population shares in column 2 is based on the US poverty line, \$ 14.40 (1985, PPPs)

PPPs) a day per person. The population share of poor defined by these two poverty measures are reported in Table 2, which documents the share of poor population in countries 86 developing and industrial countries. It is evident from above table that most of the countries in our sample based on the US poverty line are the industrial countries of the world with exception of some countries which belonged to the former Soviet Union. Most countries in our second sample based on the international poverty line are the developing countries of the world. In total, we have 86 countries in our sample for the analysis of the QOL of poor. We emphasize that these two samples do not have any country in common. Thus, these two samples also serve the purpose of checking the robustness of our estimated results for the interrelationships between various indicators of QOL and population shares of poor segments across countries. One change that does make a difference in terms of the relative size of the poor population is a cut-off point for the poverty line; this is not surprising since it changes the definition of the subgroups.

Table 3 reports estimates of the headcount indices for \$ 1 per day at 1993 PPP. From the Table 3 we notice that aggregate poverty rate has fallen slightly over the period, from 28.3% of the 1987 population living in households with consumption per capita below \$1 per day to 28.0% in 1998. Throughout the period, the region with the highest poverty relative to the \$1 per day line is Sub-Saharan Africa, followed closely by South Asia. Eastern Europe and Central Asia began the period as the region with the lowest poverty incidence, but by the end of the period it had overtaken the Middle-East and North Africa. It changed little in Latin America and Sub-Saharan Africa, and it rose sharply in Eastern Europe-Central Asia. The main causes of the disappointing rate of poverty reduction are too little economic growth in many of the poorest countries and

persistent inequalities that inhibited the poor from participating in the growth that did occur (Chen and Ravallion, 2000).

Table 3. Population living on less than \$ 1 per day and Head Count Index in Developing Countries, 1987, 1990, and 1998

Regions	Population covered by at least one survey	Head Count Index (Percent)			
		1987	1990	1998 new	1998 (GEP)
East Asia and the Pacific	90.8	26.6	27.6	14.7	15.3
(excluding China)	71.1	23.9	18.5	9.4	11.3
Eastern Europe and Central Asia	81.7	0.2	1.6	3.7	5.1
Latin America and the Caribbean	88	15.3	16.8	12.1	15.6
Middle East and North Africa	52.5	4.3	2.4	2.1	1.9
South Asia	97.9	44.9	44	40	40
Sub-Saharan Africa	72.9	46.6	47.7	48.1	46.3
Total	88.1	28.3	29	23.4	24
(excluding China)	84.2	28.5	28.1	25.6	26.2

Note: The \$1 a day is in 1993 purchasing power parity terms. The numbers are estimated from those countries in each region for which at least one survey was available during the period 1985–98. The proportion of the population covered by such surveys is given in column 1. Survey dates often do not coincide with the dates in the above table. To line up with the above dates, the survey estimates were adjusted using the closest available survey for each country and applying the consumption growth rate from national accounts. Using the assumption that the sample of countries covered by surveys is representative of the region as a whole, the numbers of poor are then estimated by region. This assumption is obviously less robust in the regions with the lowest survey coverage. The head count index is the percentage of the population below the poverty line. Further details on data and methodology can be found in Chen and Ravallion (2000) *How Have the World's Poorest Fared in the 1990s?*

5. Quantitative Analysis of QOL of Poor

The quantitative data on QOL of poor are useful for both graphical and econometric analyses. Both approaches are presented below.

5.1 Graphical Results

Application and interpretation of the statistical model in section 2 are illustrated in Figure 1 and 2, which plots country values of HDI against the poor population share for 1990s. Separate regression lines have been fitted to the data corresponding to poor share of population defined by the international poverty line and the US poverty line. As noted

earlier, the HDI was used because it is reasonably broad and well-established development indicator. Related regression estimates reported and discussed later will be used to assess the statistical significance of the patterns and trends portrayed graphically here.

The regression lines between the HDI and poor share of the population slope down for both cases, which indicate that the HDI is lower in more heavily poor countries, and within countries the HDI tends to be lower among poor populations than among non-poor populations.

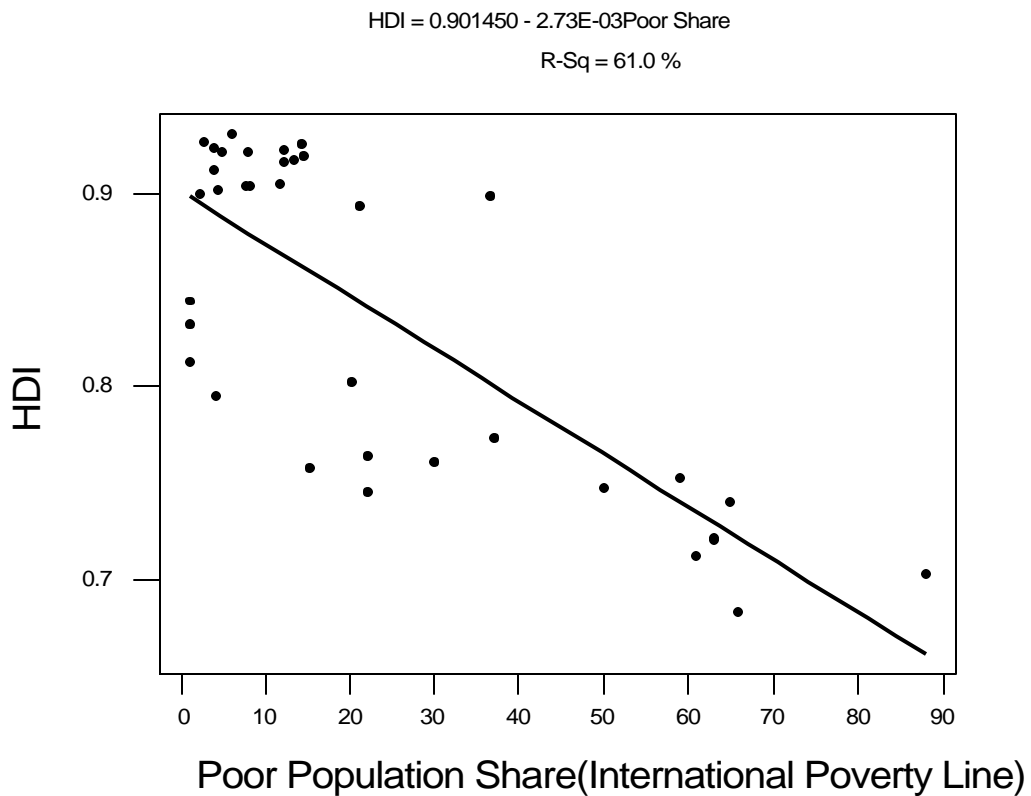


Figure 1. Human Development Index versus Poor Population Share

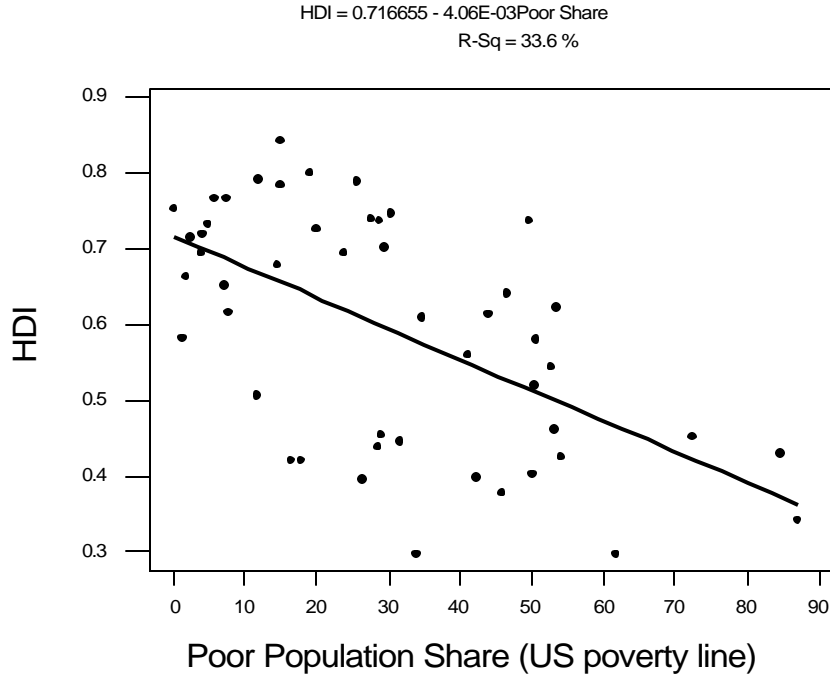


Figure 2. Human Development Index versus Poor Population Share

Figure 3 shows that the life expectancy of populations of various regions has improved from 1970 through 1998. The plot also reveals that the improvements were not uniform across regions. For instance, the highest improvement has been made by the Middle East & North African countries (an improvement of 15 years over the period 1970-1998), followed closely by South Asia. The significant gain in longevity by the Middle East-North African countries is an indication that these countries have been able to translate rapid growth in their GDP owing to oil revenues into better health outcomes and significant reductions in the incidence of poverty. On the other hand, significant gain in life expectancy by South Asian countries can be explained partly a some reduction in the incidence of poverty, and partly because they began at a relatively low level of life

expectancy of 49 years in 1970. The least improvement has been made by Eastern Europe and Central Asia (an improvement of 1 year throughout the period). This observation is not at all surprising given the fact that Eastern Europe and Central Asian countries experienced significant increases in the incidence of poverty over the period 1987-1998 (Table 3). The Sub-Saharan countries made a gain of 6 years in their life expectancy, from 44 years in 1970 to 50 years in 1998. However, it is a disappointing performance given the fact that they began with a low level of longevity and also given the length of the period under consideration. Nevertheless, the small gain is understandable given the observed performance in poverty reduction. Over a period of two decades (1977-1998), Sub-Saharan Africa had almost a zero reduction in the incidence of poverty.

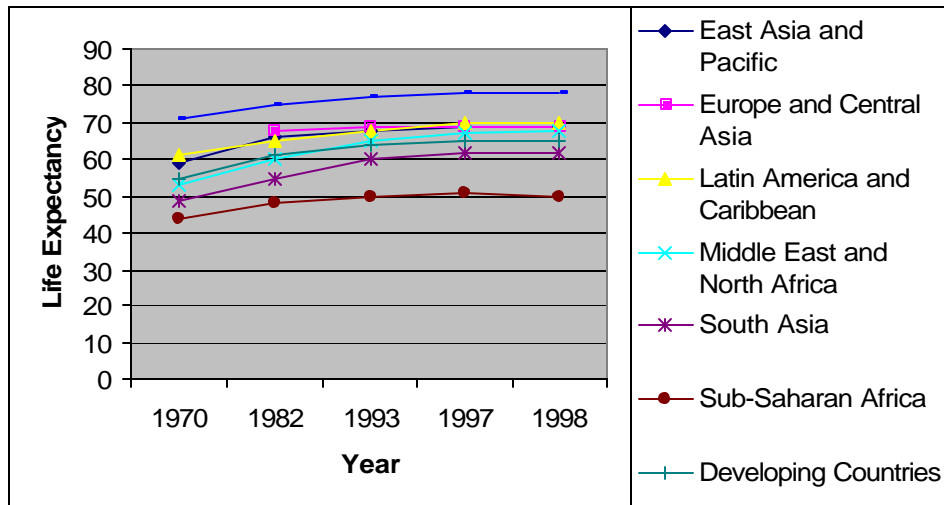


Figure 3. Trends in Life Expectancy

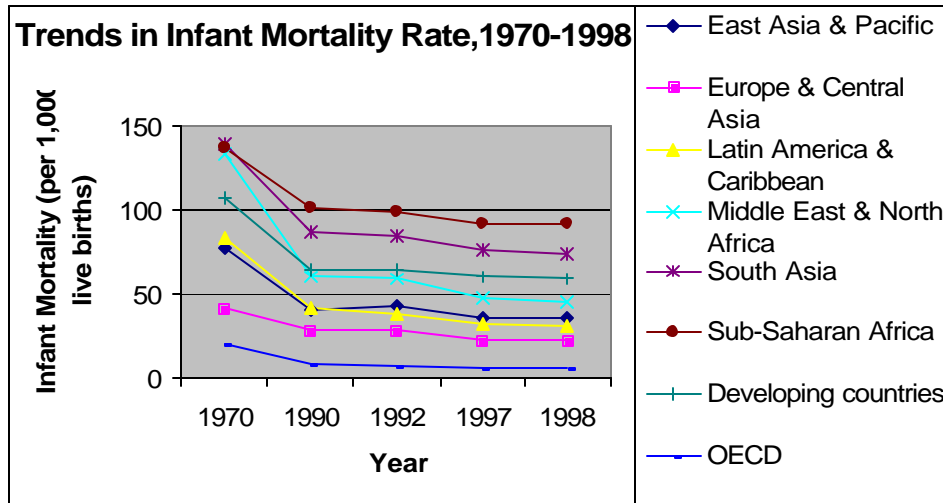


Figure 4. Trends in Infant Mortality Rate, 1970-1998

Figure 4 shows the trends in infant mortality rates across various regions. While all regions succeeded in reducing the incidence of infant mortality rates, once again the disappointing performance of Sub-Saharan Africa is notable. Sub-Saharan Africa had infant mortality rate of 137 per 1,000 live births in 1970, which was reduced to a still high 92 per 1,000 live births by 1998. Given the length of period under consideration, the reduction is essentially disappointing. However, Sub-Saharan Africa's poor performance in reducing the incidence of infant mortality rate is consistent with its performance in alleviating the incidence of poverty. As noted earlier, Sub-Saharan Africa made almost no progress in terms of reducing the incidence of poverty over the period of two decades spanning 1977-1998.

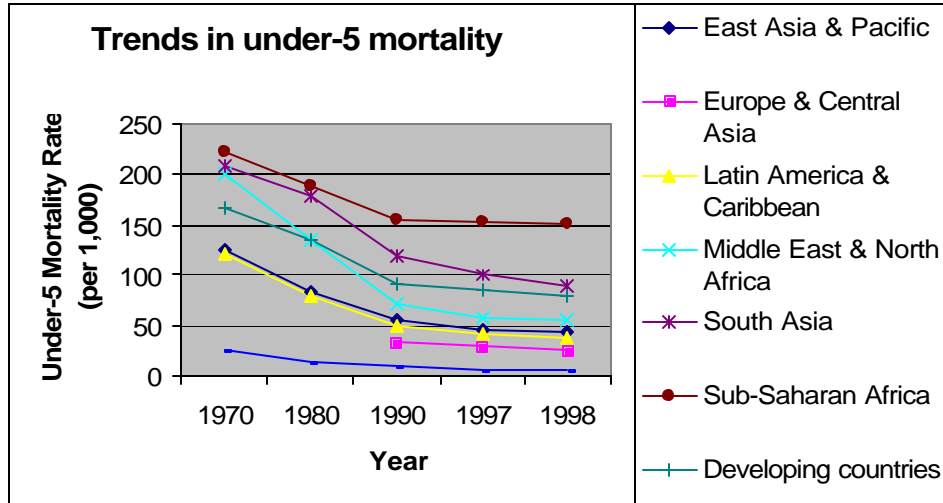


Figure 5. Trends in under-5 mortality rates

Figure 5 shows the trends in under-5 mortality rates. With the exception of Sub-Sahara, all other regions succeeded in reducing under-5 mortality rates by a substantial rate. The total reduction in under-5 mortality rate achieved by Sub-Saharan African was a mere 3% during the period of 1990-1998.

As seen from a policy perspective, two inferences appear unmistakable from the preceding graphical results: *QOL is lower in more heavily poor countries and that within countries the QOL tends to be lower among poor populations than among non-poor populations. Every QOL indicator considered in the graphical analysis is highly associated with the incidence of poverty. Dealing with poverty is the main instrument that can effectively eliminate deprivation in human well-being.*

Cross-country Regression Results

Tables 4.1-4.2 contain estimates of the parameters of least squares regressions fit to cross-country data on a wide range of QOL indicators for the year 1997 (or the most recent years available). Forty-five indicators were grouped into the 10 QOL components listed above plus several summary development indexes.

Following the earlier discussion, regressions for each QOL indicator on the poor population share were fitted to data for as many countries as possible. The specification included an indicator variable for non-Asian countries and an interaction term between the non-Asian indicator variable and poor population share. Including these variables allowed us to test whether the intercept and slope of the underlying regression of QOL on poor population share differed between the Asian and non-Asian countries, that is, comparing average non-poor and poor QOL between Asian and non-Asian countries.

The results in Table 4.1-4.2 provide a rich descriptive summary of the QOL of poor population in Asia and suggest three major findings:

First, nearly every QOL indicator declines as poor population share increases. The finding that poor's QOL is worse than non-poor's QOL applies to indicators ranging from human development indexes, literacy gap (Male-Female), and population without access to public health services. For most of the regressions, the negative association between QOL and poor population share is robust with alternative measures of poor population share.

Second, evidence of a significant difference in the QOL-poor population share relationship between Asian and non-Asian countries are present for only few QOL

indicators. For nearly all indicators, the tendency for QOL to decline with increasing poor population share is common to the Asian and non-Asian samples. None of the exceptions to this finding is particularly notable.

Third, poor women suffer a double QOL disadvantage in the areas of health and education. The first disadvantage is due to their poor subgroup, which is associated with lower rates of literacy, secondary school enrollment, health, nutrition, and longevity. The second disadvantage is due to existence of relatively wider gender gaps in indicators of the QOL among poor segments of population in Asia and elsewhere. For example, Table 1.1-1.2 indicates that the male-female gap in education widens significantly as poor population share increases. Women's normal advantage in life expectancy is substantially lower among poor than non-poor populations. The QOL disadvantage of poor women is presumably magnified further by the effects of poor health and education on other QOL indicators not measured here, such as security and access to credit.

5. Concluding Remarks

This paper makes two principal contributions: *first*, we propose a method for representing well-being aggregates and estimating population subgroup decompositions when data is available on population distributions across subgroups; *second*, we analyze the QOL of 'poor' and 'non-poor' population segments of 86 countries for the 1980s and 1990s. The three major findings of this paper are: *First*, nearly every well-being indicator declines as poor's population share increases; *second*, evidence of a significant difference in the QOL-poor's population share relationship between Asian and non-Asian, countries is present for only few QOL indicators. In other words, the tendency for QOL to decline

with increasing poor's population share is common to the Asian and non-Asian countries; *third*, women suffer a double QOL disadvantage in areas of health and education as the poor's share of population increases. This is due to the existence of relatively wider gender gaps in the well-being indicators among poor populations in Asia and elsewhere.

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Table 1: Well-Being components and Indicators

Well-being Components	Indicators and Measurements (1990 &2000)
1. Indexes	Human Development Index Gender-related Development Index Gender Empowerment Index
2. Gender	Female Share of Earning (%) Labor-Force Gap (Male-Female) Literacy Gap (Male-Female) Enrollment Gap (Male-Female) Life Expectancy Gap (Male-Female)
3. Income	GDP per capita (PPP) Population Below Poverty Line (%) Agricultural value added per hectare (US \$) Agricultural value added per worker (US \$) GDP per worker (US \$)
4. Education	Gross primary enrollment ratio (%) Gross secondary enrollment ratio (%) Literacy rate (% of people) Public Expenditure on Education (% GNP)
5. Health	Life expectancy at birth (years) Infant Mortality rate (per 1,000 live births) Public expenditure on health (% of GDP)
6. Nutrition	Calories available per capita (as % of need)
7. Fertility	Total Fertility Rate Contraceptive prevalence rate
8. Political	Index of Political Freedom Index of civil liberties
9. Access to Information	TV sets (per 1,000 people) Daily Newspapers (per 1,000 people)
10. Environment	Percentage of people with access to safe drinking water (%) Percentage of people with access to sanitation (%) Annual Deforestation (%)
11. Infrastructure	Percentages of cropland irrigated and roads paved telephones (per 1000 people)

Sources: World Development Reports (1990, 2002), Human Development Reports (1990, 2000).

TABLE 4.1. Quality of Life of Poor. Comparisons with Non-poor and Poor Non-Asian++

Indicator	Constant	Poor Share	Non-Asia Dummy	Non-Asia Dummy× Poor Share	R-Square	N
INDEXES						
1.Human Development Index	0.727** (12.20)	-0.00417* (-1.94)	-0.0145 (-0.21)	0.00018 (0.08)	0.34	49
2.Gender-related Development Index	0.347** (6.02)	-0.00009 (-0.04)	0.0879 (1.22)	-0.00093 (-0.34)	0.08	34
3.Gender Empowerment Index	0.719** (10.52)	-0.00437* (-1.85)	-0.0155 (-0.20)	0.00042 (0.16)	0.30	46
GENDER						
4. Literacy Gap (Male-Female)	7.38 (1.39)	0.398** (2.07)	1.45 (0.23)	-0.332 (-1.57)	0.13	49
5. Enrollment Gap (Male-Female)	1.53 (0.40)	0.259** (1.96)	2.51 (0.57)	-0.234* (-1.64)	0.10	48
6. Life Expectancy Gap (Male-Female)	-4.60** (-5.79)	0.0826** (2.88)	0.312 (0.33)	-0.0611* (-1.94)	0.29	49
7. Log GDP Per capita Gap (Male-Female)	1.19** (5.04)	0.0148* (1.73)	-0.019 (-0.07)	0.0073 (0.78)	0.13	48
8. Female Economic Activity Rate (% of Male rate)	59.1** (7.30)	0.156 (0.53)	-5.58 (-0.58)	0.139 (0.43)	0.01	49
9. Female Primary Net Enrollment (% of Male Rate)	105** (14.34)	-0.476** (-1.97)	-7.96 (-0.96)	0.378 (1.45)	0.11	45
10. Female Secondary Net Enrollment (% of Male Rate)	108** (9.58)	-0.862** (-2.32)	-9.30 (-0.72)	0.536 (1.32)	0.20	41
11. Female Tertiary Student (% of Male)	82.50** (3.69)	-0.223 (-0.28)	-19.7 (-0.74)	0.233 (0.26)	0.05	23
INCOME						
12. Log GDP Per capita (PPP)	3.64** (25.77)	-0.0101* (-1.97)	0.080 (0.50)	0.00076 (0.14)	0.32	48
EDUCATION						
13. Adult Literacy (%)	87.9** (9.40)	-0.760** (-2.25)	-9.6 (-0.87)	0.445 (1.20)	0.18	49
14. Combined first, second and third level gross enrollment (% gross)	62.0** (8.51)	-0.81 (-0.31)	6.88 (0.80)	-0.278 (-0.96)	0.02	49
15. Children not Reaching Grade 5 (%)	2.12 (0.29)	0.602** (2.08)	8.92 (1.02)	-0.13 (-0.41)	0.45	30
16. Public Education Expenditure (% of GDP)	4.22** (4.84)	-0.353 (-1.12)	1.54 (1.43)	-0.0022 (-0.06)	0.02	40
HEALTH						
17. Life Expectancy at Birth	70.4** (16.37)	-0.199 (-1.28)	-2.03 (-0.40)	-0.100 (-0.50)	0.04	49
18. Infant Mortality Rate (per 1,000 live birth)	28.4 (1.79)	0.885 (1.55)	3.90 (0.21)	0.152 (0.24)	0.03	49
	109.0	16.0**	15.00	-7.50	0.25	49

19. Maternal Mortality 1990 (per 100,000 live birth)	(0.60)	(2.42)	(0.70)	(-1.04)		
20. Under Age Five Mortality Rate	36.10 (1.35)	1.34 (1.39)	1.20 (0.04)	0.58 (0.55)	0.04	49
21. Infants with Low Birth Weights (%)	10.4** (3.23)	0.430** (3.15)	-1.07 (-0.28)	-0.368** (-2.53)	0.31	48
22. AIDS Cases (per 100,000)	26.4 (0.37)	-0.65 (0.20)	5.70 (0.07)	3.00 (0.90)	0.02	44
23. Tuberculosis Cases (per 100,000)	37.10 (0.75)	2.20 (1.23)	2.0 (0.03)	0.25 (0.13)	0.02	46
24. Population without Access to Health Services (%)	18.1** (1.99)	0.715** (2.16)	-1.30 (-0.12)	-0.369 (-1.00)	0.22	36
NUTRITION						
25. Daily Per capita Supplies of Calories	2580** (18.12)	-3.52 (-0.60)	253.00 (1.58)	-7.94 (-1.41)	0.04	49
26. Under Weight Children under age Five 1990-97 (%)	20.8** (4.38)	0.539** (3.13)	-10.9* (-1.94)	-0.278 (-1.47)	0.45	49
FERTILITY						
27. Total Fertility Rate	...	...	...	...	...	...
28. Contraceptive Prevalence Rate	57.7** (6.54)	-0.342 (-1.07)	-0.20 (-0.02)	-0.216 (-0.62)	0.03	48
29. Births to Mothers Under Age 20 (%)	9.05** (2.84)	-0.134 (-0.58)	0.59 (0.14)	0.347 (1.37)	0.04	17
30. Population Growth Rate (%)	2.38** (8.85)	-0.006 (-0.56)	-0.127 (-0.40)	0.0142 (1.34)	0.12	49
ENVIRONMENT						
31. Annual Deforestation (%)	1.90** (2.58)	-0.390 (-1.46)	-0.649 (-0.74)	0.0205 (0.70)	0.11	49
32. Carbon Dioxide Emissions per capita (metric ton)	2.65** (3.87)	-0.0436* (-1.76)	0.105 (0.13)	0.0065 (0.24)	0.25	46
33. Population without Access to Safe Water (%)	20.6** (2.91)	0.033 (0.13)	-4.20 (0.50)	0.479* (1.71)	0.36	48
34. Population without Access to Sanitation (%)	17.7* (1.84)	1.19** (3.43)	8.50 (0.74)	-0.774** (-2.03)	0.31	47
ACCESS TO INFORMATION						
35. TV Sets (per 1,000 people)	167** (3.97)	-2.15 (-1.48)	18.9 (0.38)	-0.04 (-0.03)	0.02	41
CRIMES AND OTHERS						
36. Drugs Crime (per 100, 000 people)	23.9 (0.81)	-0.489 (-0.51)	92.1** (2.00)	-0.66 (-0.60)	0.31	24
37. Intentional Homicides (per 100,000 people)	6.60 (0.60)	-0.014 (-0.03)	11.50 (0.77)	0.049 (0.09)	0.08	21
38. Dependency Ratio (%)	62.1** (10.97)	0.185 (0.90)	3.29 (0.49)	0.25 (1.12)	0.04	49

Source: See Appendix 1. ** Significant at the 5% level, *Significant at the 10% level, ++ Poor share is defined as population below income poverty line (%) \$1.00 a day, 1989-94.

TABLE 4.2. Quality of Life of Poor. Comparisons with Non-poor and Poor Non-Asian++

Indicator	Constant	Poor Share	Non-Asia Dummy	Non-Asia Dummy× Poor Share	R-Square	N
INDEXES						
1.Human Development Index	0.759** (10.94)	-0.00059 (-0.54)	0.148** (2.10)	-0.0023* (-1.87)	0.65	36
2.Gender -related Development Index	0.746** (8.55)	-0.0001 (-0.06)	0.157* (1.78)	-0.00274 (-1.45)	0.53	32
3.Gender Empowerment Index	0.645** (21.83)	-0.037* (-2.36)	...	...	0.18	28
GENDER						
4. Literacy Gap (Male-Female)	-0.040 (-0.39)	0.0126** (3.21)	...	...	0.26	32
5. Enrollment Gap (Male-Female)	-2.6 (-0.06)	0.001 (0.60)	15.6 (0.34)	-0.386 (-.49)	0.05	35
6. Life Expectancy Gap (Male-Female)	12.2** (-5.19)	0.055 (1.48)	5.84** (2.43)	-0.112** (-2.68)	0.32	36
7. Log GDP Per capita Gap (Male-Female)	0.146 (1.36)	0.00063 (0.37)	0.089 (0.81)	-0.00093 (-0.49)	0.05	36
8. Female Economic Activity Rate (% of Male rate)	84.20** (6.02)	-0.007 (-0.03)	-8.80 (-0.62)	0.056 (0.23)	0.08	36
9. Female Primary Net Enrollment (% of Male Rate)	...	...	...	...	...	...
10. Female Secondary Net Enrollment (% of Male Rate)	98.8** (42.10)	0.0566* (1.86)	1.26 (0.55)	...	0.14	25
11. Female Tertiary Student (% of Male)	129.00** (5.25)	-0.163 (-0.32)	-20.4 (-0.82)	0.220 (0.41)	0.06	26
INCOME						
12. Log GDP Per capita (PPP)	3.65** (11.57)	-0.00366 (-0.74)	0.673** (2.10)	-0.10 (-1.79)	0.68	36
EDUCATION						
13. Adult Literacy (%)	100.00** (163.95)	-0.0247** (-2.56)	-1.01 (-1.62)	0.0152 (1.40)	0.29	36
14. Combined first, second and third level gross enrollment (% gross)	76.2** (5.69)	-0.004 (-0.02)	12.8 (0.93)	-0.242 (-1.02)	0.02	36
15. Children not Reaching Grade 5 (%)	...	...	...	...	...	...
16. Public Education Expenditure (% of GDP)	7.09** (3.35)	-0.0108 (-0.33)	-1.61 (-0.75)	0.0198 (0.53)	0.05	35
HEALTH						
17. Life Expectancy at Birth	68.30** (18.38)	-0.0129 (-0.22)	8.96** (2.37)	-1.141* (-2.14)	0.62	36

18. Infant Mortality Rate (per 1,000 live birth)	13.6 (1.63)	0.361** (2.75)	-9.55 (-1.13)	-0.083 (0.56)	0.74	36
19. Maternal Mortality 1990 (per 100,000 live birth)	6.6 (0.30)	0.969** (2.79)	-3.7 (-0.16)	0.239 (0.61)	0.73	34
20. Under Age Five Mortality Rate	18.00 (1.58)	0.459** (2.55)	-13.6 (-1.77)	-0.016 (-0.57)	0.77	36
21. Infants with Low Birth Weights (%)	5.65** (3.46)	-0.0103 (-0.67)	0.26 (0.17)		0.04	22
22. AIDS Cases (per 100,000)	1.10 (0.02)	-0.012 (-0.01)	32.6 (0.52)	-0.28 (-0.27)	0.06	33
23. Tuberculosis Cases (per 100,000)	53.3** (2.28)	0.199 (0.54)	-42.8* (-1.79)	0.869** (2.09)	0.64	34
24. Population without Access to Health Services (%)	...	...	...	...	...	...
NUTRITION						
25. Daily Per capita Supplies of Calories	2994** (8.28)	-4.81 (-0.84)	319.00 (0.87)	-2.61 (-0.41)	0.42	35
26. Under Weight Children under age Five 1990-97 (%)	...	...	...	...	...	...
FERTILITY						
27. Total Fertility Rate	...	...	...	...	...	...
28. Contraceptive Prevalence Rate	50.30** (1.90)	0.111 (0.31)	25.40 (0.97)	-0.416 (-1.09)	0.43	27
29. Births to Mothers Under Age 20 (%)	11.8* (1.84)	0.018 (0.18)	-7.91 (-1.21)	0.206* (1.82)	0.44	35
30. Population Growth Rate (%)	1.61 (1.10)	-0.0028 (-0.13)	-1.16 (-0.79)	0.0034 (0.16)	0.36	33
ENVIRONMENT						
31. Annual Deforestation (%)	...	...	...	...	...	...
32. Carbon Dioxide Emissions per capita (metric ton)	6.40 (1.18)	-0.0077 (-0.09)	4.64 (0.84)	-0.078 (-0.82)	0.20	36
33. Population without Access to Safe Water (%)	...	...	...	...	...	...
34. Population without Access to Sanitation (%)	...	...	...	...	...	...
35. SO2 Emissions per capita (metric ton)	6.1 (0.10)	0.41 (0.31)	47.10 (0.75)	-0.79 (-0.58)	0.06	27
ACCESS TO INFORMATION						
36. TV Sets (per 1,000 people)	777.00** (4.35)	-8.48** (-2.71)	-224.00 (-1.24)	4.57 (1.36)	0.47	35
CRIMES AND OTHERS						
37. Drugs Crime (per 100, 000 people)	0.01 (0.02)	0.75 (0.28)	168.00 (0.98)	-3.71 (-1.23)	0.18	29

38. Intentional Homicides (per 100,000 people)	15.2** (2.08)	-0.042 (-0.37)	-10.80 (-1.46)	0.190 (1.49)	0.28	31
39. Dependency Ratio (%)	43.5** (6.25)	0.334** (3.08)	5.13 (0.72)	-0.31** (-2.51)	0.60	36
40. Female Suicide Rate (per 100, 000 people)	17.60** (3.08)	-0.129 (-1.46)	-9.23 (-1.58)	0.138 (1.38)	0.09	29
41. Male Suicide Rate (per 100, 000 people)	89.0** (3.63)	-0.72* (-1.89)	-63.60** (-2.54)	1.01** (2.35)	0.24	29
42. Divorce Rate (% of marriages) 1996	72.0** (3.30)	-0.585* (-1.70)	-30.6 (-1.38)	0.671* (1.71)	0.12	32
43. Suicide Rate Gap (Male-Female)	71.40** (3.63)	-0.591* (-1.94)	-54.4** (-2.71)	0.868** (2.53)	0.28	29

Source: See Appendix 1.

** Significant at the 5% level

*Significant at the 10% level

++ Poor share is defined as the people below income poverty line (%) \$ 14.40 a day, 1989-95.

Table 5. Trends in life expectancy, 1970-1998 (years of life)

Region	1970	1982	1993	1997	1998
East Asia and Pacific	59	66	68	69	69
Europe and Central Asia	n.a.	68	69	69	69
Latin America and Caribbean	61	65	68	70	70
Middle East and North Africa	53	60	65	67	68
South Asia	49	55	60	62	62
Sub-Saharan Africa	44	48	50	51	50
Developing Countries	55	61	64	65	65
OECD	71	75	77	78	78

Source: World Bank Statistical Information Management and Analysis (SIMA) database.

Note: ^a 1980.

Table 6. Trends in infant mortality, 1970-1998 (per 1,000 live births)

Region	1970	1990	1992	1997	1998	Reduction 1990-1998
East Asia & Pacific	78	40	42	36	35	11%
Europe & Central Asia	41 ^a	28	28	23	22	22%
Latin America & Caribbean	84	41	38	32	31	25%
Middle East & North Africa	134	60	59	47	45	24%
South Asia	139	87	85	77	75	13%
Sub-Saharan Africa	137	101	99	92	92	9%
Developing countries	107	65	65	60	59	10%
OECD	20	8	7	6	6	28%
(Diff. Developing countries - OECD)	87	57	58	54	53	
(Developing Countries/ OECD)	5	8	9	10	10	

Source: World Bank Statistical Information Management and Analysis (SIMA) database.

Note: ^a 1980.

Table 7. Trends in under-5 mortality, selected years, 1970-1998 (per 1,000)

Region	1970	1980	1990	1997	1998	Reduction 1990-1998
East Asia & Pacific	126	82	55	46	43	22%
Europe & Central Asia	n.a.	n.a.	34	29	26	24%
Latin America & Caribbean	123	78	49	41	38	24%
Middle East & North Africa	200	136	71	58	55	22%
South Asia	209	180	121	100	89	26%
Sub-Saharan Africa	222	188	155	153	151	3%
Developing countries	167	135	91	84	79	14%
OECD	26	14	9	6	6	30%

Source: World Bank Statistical Information Management and Analysis (SIMA) database.

Note: n.a. Not Available

Table 8. Population living on less than \$ 1 per day and Head Count Index in Developing Countries, 1987, 1990, and 1998

Regions	Population covered by at least one survey	Head Count Index (Percent)			
		1987	1990	1998 new	1998 (GEP)
East Asia and the Pacific	90.8	26.6	27.6	14.7	15.3
(excluding China)	71.1	23.9	18.5	9.4	11.3
Eastern Europe and Central Asia	81.7	0.2	1.6	3.7	5.1
Latin America and the Caribbean	88	15.3	16.8	12.1	15.6
Middle East and North Africa	52.5	4.3	2.4	2.1	1.9
South Asia	97.9	44.9	44	40	40
Sub-Saharan Africa	72.9	46.6	47.7	48.1	46.3
Total	88.1	28.3	29	23.4	24
(excluding China)	84.2	28.5	28.1	25.6	26.2

Note: The \$1 a day is in 1993 purchasing power parity terms. The numbers are estimated from those countries in each region for which at least one survey was available during the period 1985–98. The proportion of the population covered by such surveys is given in column 1. Survey dates often do not coincide with the dates in the above table. To line up with the above dates, the survey estimates were adjusted using the closest available survey for each country and applying the consumption growth rate from national accounts. Using the assumption that the sample of countries covered by surveys is representative of the region as a whole, the numbers of poor are then estimated by region. This assumption is obviously less robust in the regions with the lowest survey coverage. The head count index is the percentage of the population below the poverty line. Further details on data and methodology can be found in Chen and Ravallion (2000) How Have the World's Poorest Fared in the 1990s?