

Incidence of Education and Health Services on Different Income Classes in Pakistan

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Abstract

This study investigates the incidence of education and health services on different income groups in Pakistan using HIES data set 2001-02. This study uses Kienzle (1981) index to measure the incidence of such services for overall Pakistan, its rural-urban segments and four provinces of Pakistan. The findings of the study indicate that both services are pro-poor. It implies that the lower income classes enjoy the benefits which can hopefully improve the relative income positions of the beneficiaries. This study further confirms the previous results by estimating Gini index of gross income and after adding both the services. The results are bootstrapped in order to build confidence interval for the estimated indices as the point estimates are not reliable for policy prescriptions.

I. Introduction

Income inequalities do prevail almost in every society with in a variety of degrees. It stems social disharmony among people. In this regard it is the responsibility of every government to generate sufficient revenues and also to cater for the needs of lower income groups in order to bring harmony among people. Negative income taxation and /or transfer payments are the ways to address this problem. To supplement the efforts mentioned above the basic social services provided to people at large are health and education due to which the relative income position can be enhanced.

Pinpointing the beneficiaries of these social services needs distributional analysis in the economy of Pakistan. If these social benefits accrued to the lower income strata, their relative income position can definitely be improved. Several indices have been implied in the literature like Kienzle (1984) following the widely used tax distributional index of Suits

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(1977) which are based on Lorenz Curve and Gini Coefficient. The empirical work on this theme in developed and developing countries are Kakwani (1976), Reynolds et.al. (1977), Paul (1991), Seldon et.al. (1992), Devarajan et. al. (1995), Vanquez- Martinz (2001), Pinar (2004), Johannes (2005) and Berg (2005), who have different methodologies to analyze fiscal incidence and / or education and health benefits incidences on different income classes. The estimates of these indices shall exhibit progressivity or regressivity for overall Pakistan, its rural-urban segments and of four provinces. The estimated values of the index are point estimates which are hardly beneficial for policy purposes. This problem can be handled by constructing the standard errors of the estimated index values for all the region of analysis in order to build confidence interval at a reasonable level of significance.

The organization of the study is as follows; following introduction, Section II outlines methodology of the study. Section III describes data sources while Section IV elaborates the results. Lastly two appendices and references are placed.

II. Methodology and Data Sources of the Study

The methodology adopted for the allocation of education and health expenditures to individuals who are actually receiving these benefits is taken from the Household Income and Expenditure Survey (HIES) data 2001-02. In this regard, the unit cost of education services provided is estimated from the Demands for Grants of Federal and Provincial Governments for the year 2001-02. The data on health per unit cost for all the regions of analysis are taken from Sustainable Policy Development Centre (SPDC) Karachi 2001.

The net income distribution is constructed by applying the following methodology.

Net or Adjusted Income of the Household = Household's Market Income + (All Government Spending – All Tax Burdens)

The beneficiaries are traced and the allocations are made according to the level and regional classification. The education expenditures are allocated by using the following expression:

$$XE_i = \sum_{j=1}^5 ED_{ij} \left(\frac{C_j}{E_j} \right) \quad (1)$$

Here, the XE_i equals the amount of expenditures / benefits on education received by i^{th} household; ED_{ij} equal i^{th} household member in j^{th} education level/sector. C_j and E_j stands for total public expenditures on education at j^{th} level and total sector/level-wise enrollment for various levels of education. Note that $\frac{C_j}{E_j}$ is the unit cost per student at different educational level and at overall and provinces levels and that the levels of education are primary, secondary, college, professional and higher education.

Similarly the health expenditures are allocated by using the following expression:

$$XH_i = \sum_{j=1}^6 HH_i \left(\frac{EH_j}{TP_j} \right) * W_j \quad (2)$$

In this equation, the XH_i equals the amount of expenditures / benefits on health received by i^{th} household; where the household consists of age-wise distribution of individuals at different levels. Similarly, EH_j stands for total public expenditures on health on j^{th} age group and TP_j is total number of patients in j^{th} age group in a particular region; HH_i is the i^{th} household member of being patients who attend public hospitals for treatment and, W_j stands for weight for j^{th} age group. In addition, residents less than ten years and above sixty years old and females within the age limit of fifteen to fifty years have been allocated double weight. The weight for male/female patients below the age of ten and above sixty years and females within the age group of fifteen years to fifty is double as they are more vulnerable to diseases.² While male within the age group between ten and sixty and females within the age group between ten to fifteen year and above fifty to sixty year are given single weight. Note that $\frac{EH_j}{TP}$ is the unit cost per patient at different regional levels, e.g., at overall and provinces levels.

The data used in this study is taken from HIES 2001-2002, which is conducted by the Federal Bureau of Statistics having sample size of 14,767. The benefit of this type, i.e., micro data is an ideal option that enables a

² According to recent World Health Organization (WHO) report the reproductive age of females are between 15 to 49 years. So it justifies our weightage structure that they face more health problems during this age group.

researcher to manipulate the data according to the need of the research problem. In addition, micro data files contain weighting factors that are designed to obtain the nationally representative estimates of population. Tax rates on customs duty, central excise, and sales tax rates are taken from Central Board of Revenue (CBR) sources. The income tax rates are implied from the notifications for various income brackets of Ministry of Finance (Government of Pakistan), for the two years 1992-93 and 2001-02, with the information that Rs.50,000 in 1992-93 and Rs.80,000 in 2001-02 was exempted from the tax. The information whether a good or service is taxed or otherwise is taken from CBR Year Book of the year 2001-02. The data on public expenditure provided by the government such as education are taken from the Demand for Grants at National and Provincial levels for the year 2001-02 and health from the SPDC Karachi for the year 2001.

III. Empirical Results

The results of our analysis are reported in the following table. The value of the Kienzle index is negative for all the region of analysis for both the government provided services. It shows that both education and health are progressive which favor the low income classes in year 2001-02. However, the degree of progressivity differs across regions. For example education in overall Pakistan is mostly progressive as the index value is -0.222 followed by NWFP. Punjab ranks on number three followed by Pakistan urban and Balochistan. The only province which lags behind is the Province of Sindh. Health expenditures are also progressive throughout. These expenditures are strongly progressive in the Province of Sindh as the index value is -0.654 followed by Pakistan - urban. Overall Pakistan is number third followed by NWFP and Punjab. The second and third last regions according to progressivity are Pakistan-rural and the Province of Balochistan.

1. Confidence Interval for the Kienzle Indexes 2001-02

In table 1, each value represents a single value or a point estimate which can hardly to be used for policy purposes. Hence confidence intervals are built to make it more reliable estimates. The standard procedure which has been followed is known as bootstrapping contributed by Efron (1979). Table.2 reports the bootstrap results of the above mentioned estimates for 2001-02. The mean bootstrap estimates of education expenditure for all the regions are reported in the first row. Since the 250 bootstrap replications have been applied; the estimated bootstrap estimates are not fully compatible with the original Kienzle index values. The second row reports the standard errors of

the estimated bootstrap values. The next two rows show the lower and upper bound for 95% confidence level. Similarly, the fifth row of Table 2 reports the mean bootstrap estimated Kienzle index of health expenditures for all the regions of analysis. Next row shows the standard errors of the estimates followed by lower and upper bounds at 95% confidence level for the health expenditures.

Table: 1. Kienzle Indices Showing Progress of Education and Health for Year 2001-2002

	Pakistan - overall	Pakistan - Rural	Pakistan - Urban	PUNJAB	SINDH	NWFP	BALUCHISTAN
Expenditures	K I E N Z L E I N D I C E S						
Education	-0.222	-0.150	-0.199	-0.207	-0.128	-0.220	-0.173
Health	-0.330	-0.280	-0.353	-0.299	-0.654	-0.307	-0.224

Sources: Author's estimation by using HIES data 2001-02 and applying Kienzle index.

Table: 2. Bootstrap Results of Kienzle Indices of Education and Health for Year 2001-2002

Regions of Analysis		Pakistan - overall	Pakistan - Rural	Pakistan - Urban	PUNJAB	SINDH	NWFP	BALUCHISTAN	
Category of Expenditures	Unit of Analysis	K I E N Z L E I N D I C E S							
Education	Bootstrap Estimated Kienzle Index	0.130	-0.040	0.020	0.050	0.010	0.000	-0.020	
	Standard Errors	0.040	0.030	0.040	0.030	0.040	0.030	0.030	
	(95)	Lower Bound	0.050	-0.100	-0.020	-0.020	-0.070	-0.070	-0.090
		Upper Bound	0.200	0.020	0.120	0.120	0.080	0.070	0.050
Health	% Bootstrap CI Estimated Kienzle Index	0.090	-0.020	0.050	-0.030	-0.210	0.010	-0.020	
	Standard Errors	0.030	0.040	0.040	0.030	0.040	0.030	0.040	
	(95)	Lower Bound	0.030	-0.090	-0.100	-0.100	-0.280	-0.060	-0.090
		Upper Bound	0.160	0.050	0.030	0.030	-0.140	0.070	0.060

Source: Author's estimation by applying 250 replications using HIES data 2001-02.

2. Diagrammatical representation of the Incidence of Education and Health Expenditures on Income Groups in Year 2001-02

Figure 1 and 2 shows the distributional impact / incidence of education and health for overall Pakistan. The Lorenz curves show that both the expenditures are progressive or pro-poor as the curves are tilted to the left of

Figure 1: Lorenz Curve of Education Expenditure for Overall Pakistan 2001-02

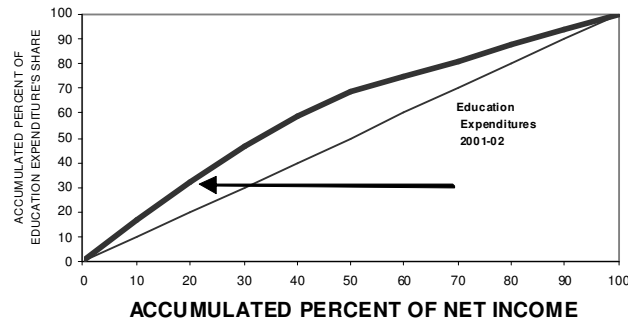
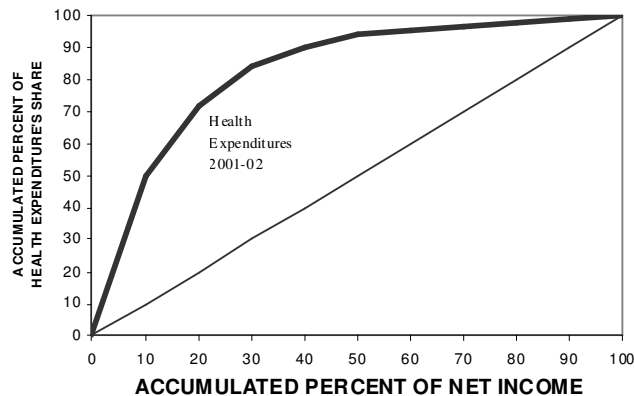


FIGURE 2: LORENZ CURVE OF HEALTH EXPENDITURES FOR OVERALL PAKISTAN 2001-02



perfectly equality line. But the health expenditures are more progressive than education in year 2001-02. It also shows that the lower income groups avail public education system provided by the government. Similarly, health facilities are also enjoyed by the lower income groups as well. The figures of the remaining regions of analysis have been placed in the Appendix of the

study. This appendix shall also comprise of the expression of Kienzle index and other theoretical issues. To confirm the results already obtained, table 3 shows that the inequality of gross income is slightly more than the after inclusion of education and health expenditures of the government of each region. It implies that education and health expenditures are pro poor in Pakistan in the year 2001-02. The diagrammatical representation has been placed in the Appendix 3.

Table: 3. GINI Index of Income Before and After Education and Health for the Year 2001-02

Region	Pakistan-overall	Pakistan-Rural	Pakistan-Urban	PUNJAB	SINDH	NWFP	BALOCHISTAN
Gini index (before)	0.565	0.592	0.532	0.581	0.562	0.593	0.546
Gini index (After)	0.562	0.588	0.528	0.579	0.560	0.587	0.545
Difference	-0.003	-0.004	-0.004	-0.003	-0.002	-0.006	-0.001

Sources: Author's estimations

V. Summary and Conclusions

The aim of this study is to analyze the distributional impacts of the two social services provided by government to various income groups using HIES micro data set of 2001-02. These two categories are related to the allocable government expenditures. The beneficiaries of both of these expenditures are traced by using the above mentioned data. Per unit cost of service approach for the allocation of these benefits have been used. On the average out of total number of surveyed 16,179 households, 15,524 benefit from public education and public health provided facilities. The results show that both are progressive in nature for all the regions of analysis. The results also suggest that apart from other measures of government, the provision of education and health can probably lesson income disparities in Pakistan. The results are further confirmed by estimating the Gini index of gross income before and after the inclusion of these services. All the tables are placed after summary and conclusions section and the graphs are places in the Appendices. This study investigates the overall situation about the nature of distribution for the said social services. Hence estimation of effective rates for each income group might be undertaken in future.

References

- Anwar, T. (2006). Changes in the inequality of consumption and opportunities in Pakistan during 2001-02 and 2004-05. *Research Report. No.3*. Islamabad: Centre for Poverty Reduction and Income Distribution.
- (2003). Trends in inequality in Pakistan between 1998-99 and 2001-02. *The Pakistan Development Review, Vol. 42(4), Part. II*, pp. 809-821.
- Berg, V. D. S. (2005). Fiscal expenditure incidence in South Africa in 1995 and 2000: A report for national treasury. Stellenbosch: Department of Economics University of Stellenbosch. pp. 1-46.
- Bishop, A. G. (1967). Tax burden and benefits of government expenditures by income classes, 1961 and 1967. *Research Publication No. 9 (New Series)*. New York: Tax Foundation, Inc. pp. 11-13.
- DeWulf, L. (1975). Fiscal incidence studies in developing countries: Survey and critique. *IMF Staff Papers* 22, pp. 66-131.
- Efron, B. (1979). Bootstrap methods: Another look at the jackknife. *The Annals of Statistics*, Vol. 7(1), pp. 1-26.
- (2000). Bootstrap and Modern Statistics. *Journal of American Statistical Association* Vol. 95(452), pp. 1293-1296.
- Government of Pakistan (1992-93). Pakistan Economic Survey, Finance Division, Islamabad: Economic Adviser's Wing.
- Federal Bureau of Statistics (1992-93). Household Integrated Economic Survey (Round 1): FBS, Islamabad: Government of Pakistan
- Federal Bureau of Statistics (2001-02). Household Integrated Economic Survey (Round 4): Islamabad: FBS, Government of Pakistan.
- Husain, F., Qasim, M. A. & Sheikh, K. H. (2003). Analysis of public expenditure on education. *The Pakistan Development Review, Vol. 42(4), Part II*, pp. 771-80.
- Ilyas, M. (2000). Distributive effects of government expenditures and Taxes: A case study of Pakistan, 1979, 1986-87 and 1992-93. *Ph.D Thesis*, International Islamic University Islamabad.
- Johannes, A. T., Akwi, T. & Etoh-Anzah, P. (2005). The Distributive impact of fiscal policy in Cameroon: Tax and Benefit Incidence. *Poverty and Economic Policy (PEP) Research Network*, Canada.
- Karagiannis, E. & Kovacevic, M. (2000). A method to calculate the jackknife variance estimator for the Gini coefficient. *Oxford Bulletin of Economics and Statistics, Vol. 62(1)*, pp. 119-122.
- Kemal, A. R. (2006). Income inequalities in Pakistan and a strategy to reduce income inequalities. *PRSP-II Formulation Project*. Islamabad: Ministry of Finance, Government of Pakistan. pp. 1-35.
- Kenneth, V. G. (1973). Collective decision-making models and the measurement of benefits in fiscal incidence studies. *National Tax Journal, Vol. 26(1)*, pp. 177-185.

- Kienzle, C. E. (1981). Measurement of the progressivity of public expenditures and net fiscal incidence. *Southern Economic Journal*, Vol. 48(1), pp. 197-203.
- Kotlikoff, & Summer, L. (1987). Tax incidence: Handbook of public economics. Edited by Alen, J Averbach and Martin Felstein, Amsterdam, *Elsevier Science publisher BV*. 2, pp. 1043-1092.
- Martinez-Vazquez, J. (2001). The impact of budget on the poor: Tax and benefit incidence. International studies program, *working paper* 01-10. pp. 1-65.
- Musgrave, R. A. & Peggy, B. M. (1973). *Public Finance in Theory and Practice*. 2th ed. New York, McGraw-Hill. pp 375-413; 440-453.
- Paul, L. M. (1991). The distribution of federal expenditures. *National Tax Journal*, Vol. 44(2), pp. 269-292.
- Reynold, M. & Smolensky, E. (1974). Post fiscal distribution: 1961 and 1970 compared. *National Tax Journal*, Vol. 27(4), pp. 515-530.
- (1977) *Public expenditures, taxes, and distribution of income*. New York and London: Academic Press. pp. 7-43.
- Seldon, T. & Michael, W. (1992). Benefit incidence analysis in developing countries. World Bank Policy research *Working Papers No. 1015*. Washington D.C. World Bank. pp. 23-34.
- Shao, J. & Tu, D. (1995). *Jackknife and bootstrap*. New York: Springer Series.
- Sherazi, N. S., Ilyas, M. & Ahmad, M. (2001). Redistribute effects of fiscal policy across the income groups in the urban-rural areas of Pakistan. *The Pakistan Development Review*, Vol. 40(2), pp. 519-533.
- Social Policy and Development Centre (2001). Growth, inequality and poverty: Social Policy and Development Centre. *Annual Review*. Karachi: Oxford University Press.
- Somochi, T. (1979). Government expenditures, taxes and income distribution in Thailand. *PhD thesis, University of Kentucky United Kingdom*. pp. 1-96.
- Son, H. H. (2006). Assessing the pro-poorness of government fiscal policy in Thailand. *Working Paper No.15*. International Poverty Centre. United Nation Development Programme, New York. pp. 1-20.
- Stata Corporation (1979). Bootstrap: Bootstrap sampling and estimation. In: Stata base reference manual, Volume 1: A.F. (Release 8). Texas: Stata Corporation. pp. 112-127.
- Suits, D. B. (1977). Measurement of tax progressivity. *American Economic Review*, Vol. 67(4), pp. 747-752.
- Thomas, M. S. & Wasylenko, M. J. (1992). Benefit incidence analysis in Developing Countries. *The World Bank Policy Research Working Paper. No.1015*. pp. 1-55.
- Tucker, S. R. (1959). Distribution of government burdens and benefits. *American Economic Review*, Vol. 43(2), pp. 518-534.

- United Nation (1999). Handbook of input-output able compilation and analysis studies in methods: *Handbook of National Accounting*. Series F. No. 74. New York Department of Economics and Social Affair Statistics Division.
- Vermaeten, F., Gillespie, W. I. & Arndt, V. (1984). Income redistribution and fiscal policy. *Scandinavian Journal of Economics*, Vol. 86(2), pp. 150-165.
- Wagner, W. E. (2007). Using SPSS for social statistics and research methods. California: Pine Forge Press, SAGE Publication Inc. pp. 1-100.

Appendix: 1

A. 1: Expenditures Progressivity/ Regressivity

An expenditures / benefits structure is progressive or pro-poor if the lower income deciles receive most of the expenditures / benefits or receive larger share in the public expenditure than their income share of the total population. And this will be called income equalizing or pro-poor expenditures / benefits structure. The expenditures / benefits structure is regressive if the upper income deciles receive most of the expenditures / benefits or receive larger share in the public expenditure than their income share of the total population, implying regressivity of the expenditures structure or income non-equalizing or pro-rich expenditures / benefits structure. It will be proportional if all the income deciles receive the same percentage share in the public expenditure in accordance with the share of their incomes, then it is termed as distributionally neutral expenditure of benefit system.

A. 2: Public Expenditure/Benefit Distributional Index

This index of expenditure / benefit progressivity / regressivity (E) suggested by Kienzle, (1981) is nothing but a replication of the well-known Suits index by replacing tax with public expenditures or benefits.

$$E = (X - Y) / X = 1 - (Y / X) \quad (\text{A.1})$$

The mathematical formulation of the above expression is as follows:

$$E = 1 - (1/5000) \int_0^{100} E(Y) dy \quad (\text{A.2})$$

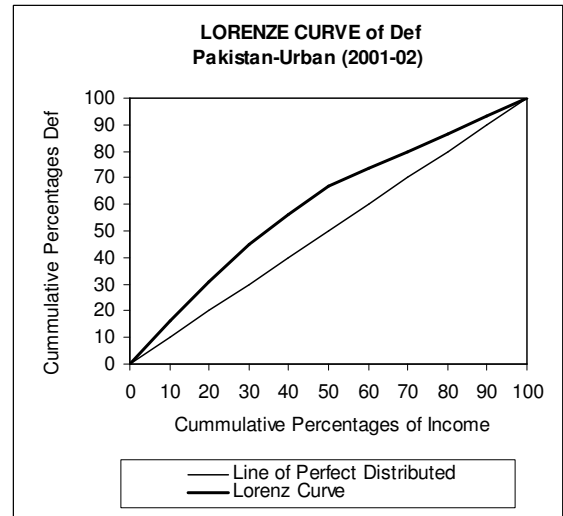
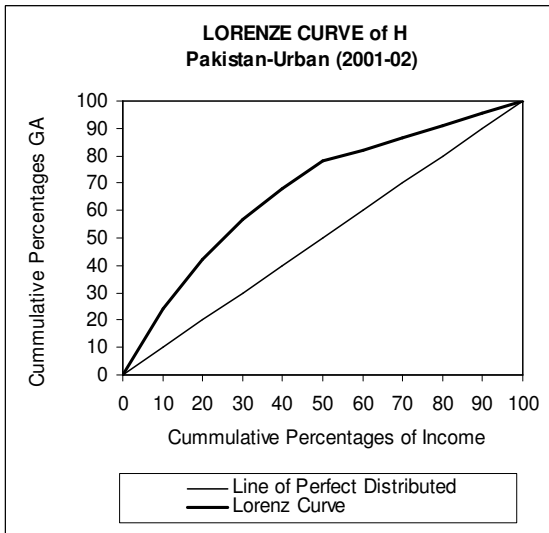
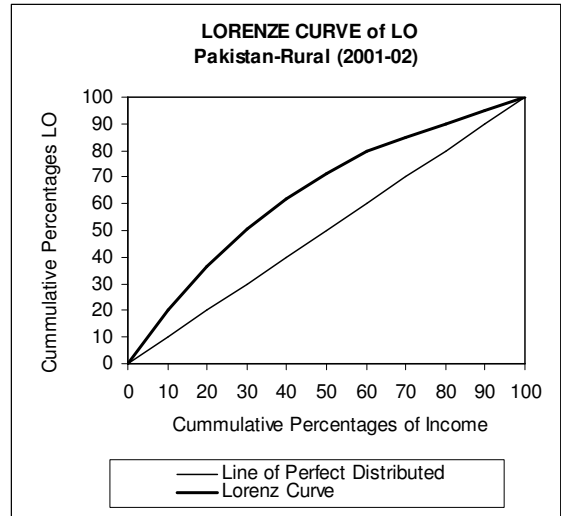
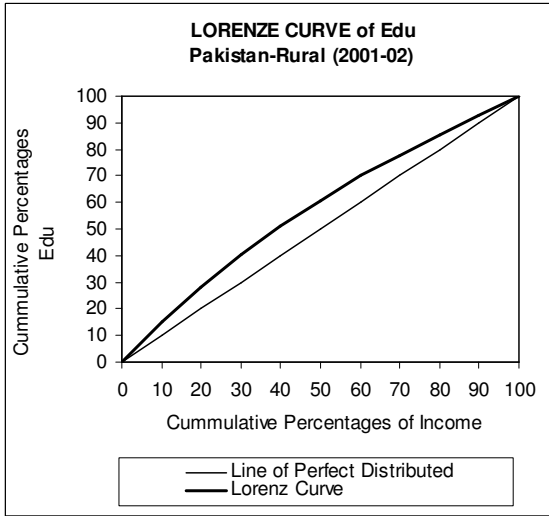
Where Y and E(Y) are the cumulative percentage of total income and the corresponding cumulative percentage of expenditure / benefit. The (1/5000) term in the above expression comes from the area of the triangle below the perfect equality line whose both sides are equal to 100 each. Where as in reality the cumulative distribution of E(Y) is often available for only a few discrete values of Y. To use this index (E) practically, the studies divide the distributions of income and expenditures e.t.c., into classes or groups. In this study the entire data set of the two reference years has been grouped into deciles. So this discrete approximation of the Suits index is given by the following expression:

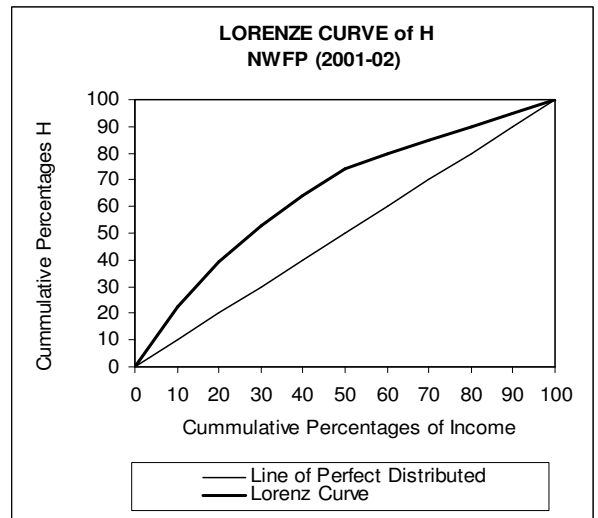
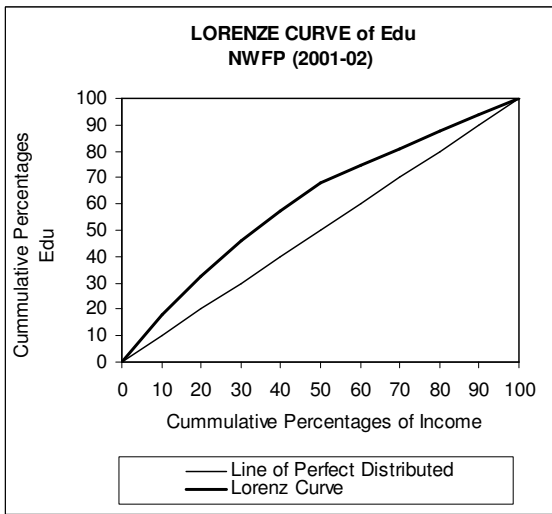
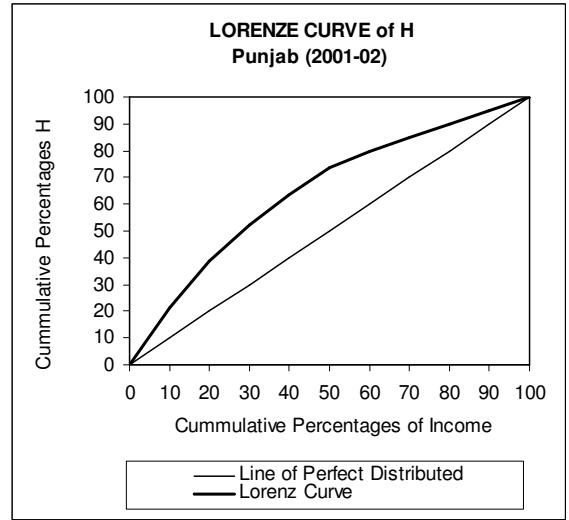
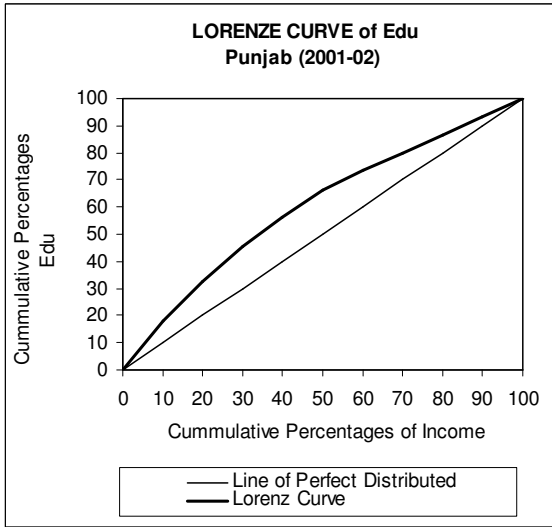
$$E = 1 - (1/5000) \int_0^{100} E(Y) dy \cong 1 - (1/5000) \sum_{i=0}^{n-1} (1/2) [E(Y_i) + E(Y_{i-1})] [Y_i - Y_{i-1}] \quad (\text{A.3})$$

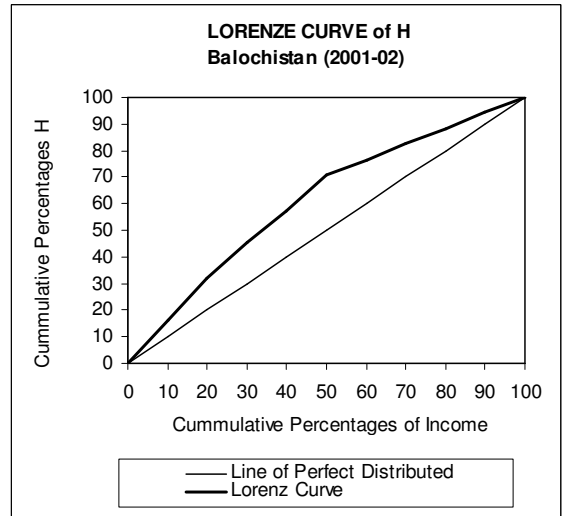
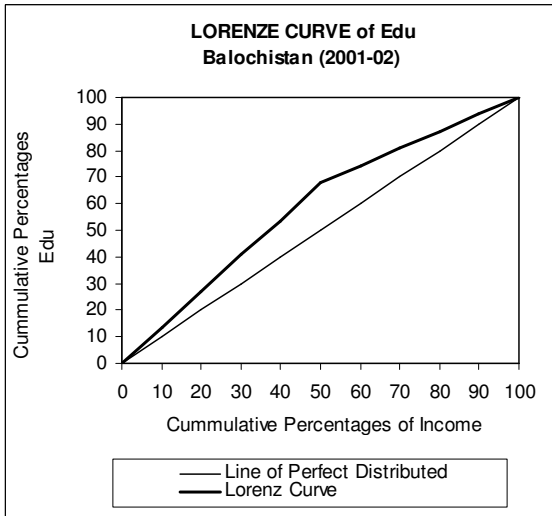
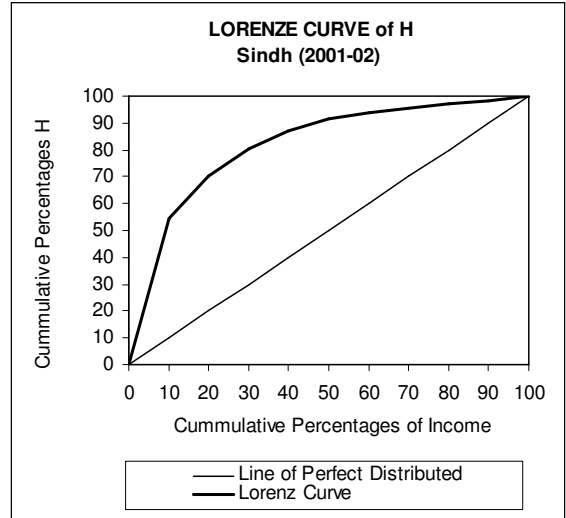
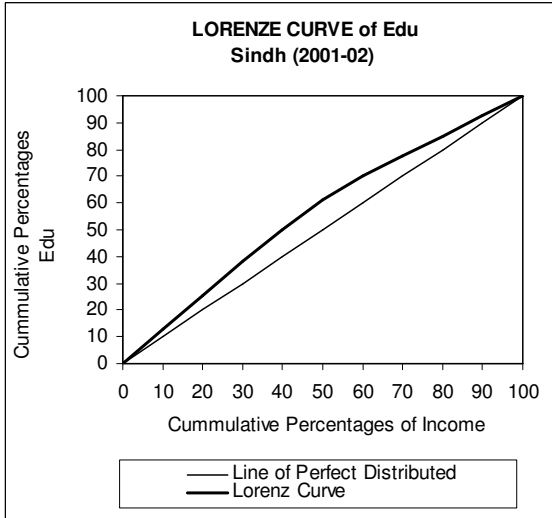
Where n shows the total number of income or taxpayer's classes or deciles. The two extreme values of index E are to equal -1 and +1. If E equals -1, it shows (extreme progressivity), and that the lowest income group / class receive the entire public expenditure / benefit. When E equals 1, it shows (extreme regressivity), that the uppermost group / class receive the total public expenditure / benefit. A 0 value of

the index (E), shows that the expenditure/benefit structure is proportional. It is also important to be careful in its application because the proposed measure may encounter the problem of “crossover”. It is possible that some expenditure structure may be progressive over one range and regressive over another range and the net result may show a value of index equals 0 implying proportionality.

Appendix: 2
Lorenz Curves of Education and Health for all Regions of Pakistan
for the Year 2001-02.







Appendix: 3

Graphs of Lorenz Curves Income before and after Education and Health

