Education Order in Punjab: A District Level Study

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Abstract

This paper attempts to evaluate the status of education in the current districts of Punjab and compare this with the status of education attainment in 1998. The tool used for assessment and comparison is the calculation of the Education Index (EI) for the districts of Punjab. The Education Index is a composite index which is calculated using enrollment at different education levels and literacy rates. The main data sources used are the Population Census 1998, Punjab Development Statistics 1998 and the Multiple Indicator Cluster Survey (MICS) 2008. Using data from these sources, robustness in the results is verified by comparing different weighting simulations of the EI. The EI results are found using the UNDP methodology and the Principal Component Analysis (PCA) method. Both methodologies of calculation lead us to ascertain the robustness of the EI calculation using the data. This testing allows an important conclusion to emerge that the different weighting schemes does not largely affect the ranking of districts. Further, by comparing the results for both years, considerable development in education status is observed; however, an unexpected result also appears. The relative pattern of education status across Punjab has hardly altered in the last ten years even with the considerable progress that has been witnessed. This shows that an unchanging relative ranking of districts seems to exist unless significant endorsement of education takes place within the lowest ranked districts.

Development studies have continuously discussed avenues for development and progress. The process aims to eliminate poverty and displacement based on each country's resources, institutions and cultures. One aspect that proves to alleviate inequality and poverty has been investment in human capital which is reflected in the investment towards development of knowledge and skills. As a result, education policy has been always been a core development issue for developing countries and international institutions. This development issue can truly be tackled once an assessment of education status is attempted. The task of education assessment is not a new consideration. It helps pave decision making for the future in education across regions. Many attempts have been made in calculating and estimating an Education Index (EI) for countries and regions across the world. The most frequent attempt at estimating education is made by the UNDP in the process of estimating human development through the Human Development Index. Using the EI method from the HDI, people have been successful in giving policymakers a condensed understanding of the status of education around the world.

In the process of development, Pakistan needs to invest in its human capital and evaluate its path for the future. Although an Education Index alone can not point out the major hindrances to education, it is a tool which helps understand the level at which investment in human capital has truly made a difference to the nation. This paper aims to estimate the education standards using the latest Punjab MICS 2007-08 dataset and compare the findings with an estimation of the education standards in 1998 for Punjab. Simultaneously, gender based and rural/urban education indices are calculated to further understand trends and patterns in education attainment.

Literature Review

Modern economists can trace the understanding of human well-being as far back as Aristotle. Since then the awareness of human well-being has developed into a much larger balloon of academic discussions. The Human Development Index (HDI) is one of the most widely used and acknowledged measures of human development. This measure, developed and published by the UNDP's first annual Human Development Report (HDR) 1990, helped pave the way for all future debates on human development. The HDI is structured around Amartya Sen's capabilities approach that underlines the importance of a standard of living which allows empowerment to individuals through three social goals: standard of living, health and education (Stanton, 2007). By using GDP per capita, life expectancy, literacy and enrollment respectively,

as proxies to measure each goal, the HDI is calculated to understand the overall state of human development for a particular area. Before the HDI, many cases have used other measures to calculate social well-being in a country such as GNP per capita and other quality of life indices. However, none of the indices has gained as much recognition as Mahbub ul Haq's HDI (HDR 1990) has since its' introduction.

Critically considered, the HDI is criticized for not measuring social well being and development accurately. Some basic criticisms are surrounded around the choice of variables, fixed weighting methodology and redundancy. Authors advocate that the wrong indicators are used in measuring the three goals and other potential options must be added for better measurement such as civil liberties, distributional effects, and environmental impacts (Stanton, 2007). Another important concern regarding the HDI is its weighting method. Each dimension of development is given an equal one-third weight which is continuously questioned by literature. Ghaus, Pasha and Ghaus (1996) and Noorbakhsh (1998) have provided other ways of assigning weights and calculating ranks such as the Principal Component Analysis (PCA) method and Borda method. Lastly, many question the true importance of the HDI and whether more than one dimension is required for the measurement of social wellbeing as compared to a standalone GDP per capita comparison. Regardless of these concerns, the HDI is continuously referred to and is commended for its ease in comparability and calculation across countries.

In estimating the geographic status of education, literature is divided between two branches. One branch evaluates education based on the quality of education. One such example is of Cortes and Gabriel (2008), who use two components: average proficiency and passing rate to calculate an index. This index is used to help develop education targets for future evaluation of the Brazilian education system. The other branch of literature examines education ranking and status through the HDI. Many papers have discussed the education index in the process of calculating the HDI or other multi-dimensional development indices. Jordan (2008) presents an interesting case for examining the development levels of different counties in Georgia, USA. Using attainment of high school degree, attainment of Bachelors degree and enrollment from primary to high school, an equally weighted (one-third weight each) education index is calculated. This paper establishes an important finding that the education dimension contributes significantly to the HDI and thus gives argument for the importance of considering education in any development index. Various other studies such as by Agostini and Richardson (1997) and

Hanham et al (2002) all evaluate Human Development Indices and consider the education index. Similarly, Bedi and Ramachandran (2008) consider the HDI for rural Andhra Pradesh, India. In their paper, they attempt to compare methodologies and ascertain the best technique in finding a meaningful measure of well-being. They use literacy rate and enrollment ratios for this study in calculating the education index. They compare UNDP's method to the PCA method to conclude the greater benefit of the PCA method in approximating weights according the variation within data alone.

In an attempt to study the education index in Punjab, Pakistan, it becomes important to consider literature which has already attempted to create the HDI and the EI for Punjab and/or Pakistan. In the case of Pakistan, data has always been a central problem especially for the purpose of the HDI. However, in calculating the education index, obtaining the necessary variables becomes fairly easier. The oldest attempt at measuring well being in Pakistan was in Ghaus et al (1996) where literacy rate, primary and secondary enrollment was collected from the District Census Reports of 1981. Both the PCA and the Z-sum technique were used to calculate the rankings of districts within the provinces of Pakistan. Haroon Jamal (2001) worked on the calculations of a social development index which considered primary, secondary and tertiary enrollment rates for males and females separately while using PCA. Next, the National Human Development Report (NHDR) for Pakistan was published in 2003. Due to lack of data, literacy rate and gross primary enrollment alone were extracted from the Population Census (1998) and Pakistan Integrated Household Survey (1998) and then used to calculate the HDI rankings. Lastly, the latest set of relevant papers is contributed by Jamal and Khan (2007). This recent work uses literacy rate and combined gross enrollment for the understanding of how rankings and growth have taken place using the EI as a measurement tool.

Data Sources and Methodology

For the calculations of the year 1998, the annual Punjab Development Statistics 1998 Report and the 1998 Population Census were used. For the calculations of 2008, the data that is being used for this exercise is extracted from the recently conducted Punjab Multiple Indicator Clusters Survey (MICS) 2007-08. MICS is a household survey which was first conducted in 2003-04 for the entire country. Recently for the year 2007-08, the MICS was recollected only for Punjab by the Punjab Bureau of Statistics. It holds information of 91,075 households and lists

592,843 members. One great improvement in the collection of the MICS 2007-08 is that this dataset is also representative at the Tehsil level for Punjab. Such a dataset holds immense potential for more detailed work on the development of Tehsils in Punjab.

In order to calculate the intensity of education for each district, the following variables were extracted from the datasets. Enrollment in three age groups of 5-9 years, 10-14 years and 15-24 years which aim to represent primary, secondary and tertiary levels of education are used[1]. The tertiary grades are further divided into tertiary general (arts of science) and tertiary technical (medicine, law, engineering, business, commerce etc). Lastly, literacy is also included in the education index as the number of literate (who are read and write) individuals to the population of 10 years and above.

The first main concern in calculating the EI is deciding which methodology to assign weights to the different indices that enter the EI. There is the original method used by UNDP (in the process of calculating the HDI) which is to assign fixed weights. The second method that is mostly used in literature is the Principal Components Analysis method which assigns weights depending on the variation within the indicators.

Through the first method, the Education Index (EI) is constructed using the two indicators: adult literacy and combined gross enrollment (primary, secondary and tertiary). These indicators are used to create indices by subtracting from the actual values, the lowest goalpost and dividing by the difference between the maximum and minimum goalposts, as shown below. The maximum goalpost for both is 100% and the minimum for both is 0; hence, an index is calculated. These two indices are combined to calculate the Education Index.

$$\text{Adult Literacy Index} = \frac{\text{adult literacy value} - \text{min}}{\text{max} - \text{min}} = \frac{\text{adult literacy value} - 0}{100 - 0} \quad (1)$$

$$\text{Combined Gross Enrollment Index} = \frac{\text{enrollment} - \text{min}}{\text{max} - \text{min}} = \frac{\text{enrollment} - 0}{100 - 0} \quad (2)$$

$$\text{Education Index} = \frac{2}{3}(\text{adult literacy index}) + \frac{1}{3}(\text{enrollment index}) \quad (3)$$

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[1] The classification of indicators is followed from the recent paper by Jamal and Jahan (2007).

The second method by which the EI can be calculated is the Principal Components Analysis method. For this purpose, the following five components are considered: literacy rate, gross primary enrollment, gross secondary enrollment, gross tertiary (general) enrollment and gross tertiary (technical) enrollment. The advantage of the PCA method allows one to generate and assign weights to each component. The manner of generating weights is such that the variable which has the greatest variance will receive the largest weight. These five components are then weighted and added together to compute the Education Index for each district.

Other methodologies used in literature include the zero sum technique and computing the taxonomic distance of indicators (Ghaus et al, 1996). These techniques are not used as widely as the UNDP and PCA method. For this paper, both weighting schemes have been used to calculate the EI for 2008. The need for this exercise is to ascertain the difference in both results. The results of both techniques can be compared to show that either method seems to yield similar results in ranking of the EI. As can be seen from Table 1, the groups of bottom and top ten districts remain the same even though the rankings may shift higher or lower by slight dissimilarity. This shows that regardless of the superiority of the PCA method, the UNDP process is reasonable and acceptable for any basic analysis.

Punjab: Education Statistics

The MICS 07-08 can holds a wealth of information helpful to development of Punjab. The first statistic that is usually reported when evaluating education is the literacy rate. As Table 2 shows, the literacy ratio for Punjab is 59.3 percent. By observation, the Punjab literacy rate is close to the rural literacy rate unlike the urban literacy rate which stands high at 74.6 percent. This suggests that Punjab could possibly be classified as rural at large. The primary gross attendance ratios seem encouraging for Punjab; however, it must be remembered that "gross" measures include enrollment of individuals of all ages. The third statistic on the primary net attendance ratio shows that only approximately 53% of eligible population is attending primary school. The rest of the attendees would be students who are older and are not of the eligible population for primary school. Only 29% of eligible individuals are attending secondary school and consequently, 43% of eligible students for secondary school are actually attending primary school instead. These simple figures for Punjab are important in helping establish how effectively the student population is enrolled in schools. The last indicator shows the division of

primary school attendance according to type of school. It seems that the private sector has a very close attendance rate to that of government schools. The large attendance rate of private schools proves its importance in contributing to the education sector of Punjab. District level values for each of the indicators below can give a better focus of the situation as it varies across the province.

Main Findings and Policy Implications

Primary schooling has been receiving the most attention in policy circles and has as a result also grown largely through the years. However, it is important that while primary enrollment is an issue so is enrollment at other education levels. Eligible student populations need to be targeted with policies that encourage attendance of eligible grades instead of lower levels of education. Hence, policies that encourage better enrollment at secondary and tertiary education levels will help enhance combined enrollment rates as well.

There are some very important considerations that arise from the data in the MICS. A common way of displaying data is in the form of tables; however, a more interesting manner is through color coded maps which help visualize hidden patterns. Consequently, similar maps have been displayed in the Appendix, which help display the results in a far more interesting manner. A compelling result appears consistently. Northern Punjab appears to perform better in all different assessments of education status as compared to Southern Punjab. Figure 1 shows the literacy rate spread for 2008 for all the districts of Punjab. It is clear that the districts which lie in the north of Punjab exhibit a higher literacy rate compared to the south of Punjab. Even within the southern districts of Punjab the lowest literacy rate does not fall below 50%. This same pattern is seen within the 2008 EI for districts: most of the northern districts appear to have an EI which is above the mean (Figure 2). This seems to hold with common understanding of the development of districts in Punjab.

Primary enrollment and education has always been a major goal of the World Bank. Hence, it is important to consider net primary enrollment rates in Punjab. Figure 3 shows that southern districts have around 40% or lower net primary enrollment ratios. This is a cause for concern for district governments. When comparing male and female enrollment ratios, strikingly, not all of the northern districts seem to have less than 0% difference. Only districts in the north-east and DG Khan show very small differences between male and female enrollment ratios

(Figure 4). However when considering Punjab, the difference in education attainment between genders appears to be a serious situation even with continuous growth and development.

Each district within Punjab has rural and urban areas within itself; hence, the MICS survey is also able to report a representative sample of rural and urban households. Using this data, calculating an EI for rural and urban areas of each district is quite possible. These results show that there exists quite a large difference in education status between rural and urban areas of a district. Chakwal happens to be the only district which shows the least difference between its rural and urban areas. Those districts which happen to possess a larger difference between rural and urban EI's can be seen to fall at the bottom of the overall district EI ranking (Figure 5). Thus it becomes important to evaluate in greater detail the difference between rural and urban areas of these districts. Supply and demand considerations may vary from district to district and must be considered for effective policies to enhance literacy and enrollment levels in the bottom ten.

When looking at Punjab, it is important to backtrack and be able to evaluate how the situation has changed. In order to evaluate progress, a comparison is carried out between the years 1998 and 2008. By observing the literacy age profile (Figure 6) for both years, its encouraging that younger age groups today, show higher literacy ratios compared to the young age groups 10 years ago. This profile also shows that the literacy rate gap falls as one moves towards the higher age groups. This indicates the poorer education standards that older age groups faced in their younger ages.

By constructing an EI for 1998 and comparing it to that of 2008, it is possible to estimate the annual growth rate. In the last ten years, the statistics show that there has been growth in the education status of districts. Growth is also seen in the education index for males and females (calculated separately). It is satisfying to observe that the largest growth rates of Punjab have been seen in the districts of southern Punjab, particularly south western Punjab (Figure 7). The same pattern in the growth rates is observed for male and female Education Indices shown in Figures 8 and 9. Also, encouragingly, the EI for females has seen larger annual growth rates than the growth rates of the EI for males. When comparing the years 1998 to 2008, it becomes clear that the spread of education status and intensity has hardly changed. There has been growth across the province which has yielded a somewhat "catch-up" effect for the southern districts. By catching up, southern districts have been able to achieve higher literacy rates and enrollment rates which were reflective of the Northern provinces only a decade ago. Nonetheless, the

relative pattern of education spread across Punjab seems hardly altered in the last ten years which implies that continuous construction and estimation of the Education Index might remain futile for the future. It is possible that such a pattern is entrenched due to historical and institutional forces within the province.

This discussion can be extended to estimate education status for the next ten or so years. If the respective average annual growth rate between 1998 and 2008 is assumed to remain constant in the future for each district, it is possible to estimate the value of the EI in 2018 and further. Since the pattern is the same across Punjab, this estimation seems a possible result for reflection. Table 3 shows these estimation results. Estimated EI values of 2018 and 2020 indicate that the literacy and enrollment levels, especially for the bottom ten, will increase considerably to reflect EI values in between 75-90. By projection, the possible education status of the districts in the future can be observed; however, achieving this education status by the prosposed years is another task. For this to take place, the average annual growth rate must be maintained which will require simultaneous growth in the supply of education. This responsibility of providing the supply of education will need to be shouldered between the private and the government.

Conclusion

Considering education indices from different angles is only a window into the numerous issues which need to be improved. A district-level analysis alone can help identify districts and their relative weaknesses. In order to carry the evaluation further, it is important to use the MICS for a more in depth tehsil-wise analysis of each district. The same district case extensions can shed light on the differences between tehsils within a district. This presents a wonderful opportunity to establish further vulnerabilities of a district. Many problems exist that are associated with supply and demand for education at different levels, rural/urban areas and between different genders. In reality, attempts have been made through various policies to alleviate supply and demand side hindrances. However, very few policies are actually assessed post implementation for improvement purposes. Therefore, it is important to see that along with implementation, continuous reevaluation and readjustment is key to true development in the education sector across Punjab and Pakistan.

References

Agostini, S.J. and S.J. Richardson. (1997). A Human Development Index for U.S. Cities: Methodological Issues and Preliminary Findings. *Real Estate Economics*, 25(1):13-41.

Asian Development Bank (2002). *Poverty in Pakistan- Issues, Causes and Institutional Responses*.

Bedi, J. & H. Ramachandran (2004). Human Development Index for Rural Andhra Pradesh, National Council of Applied Economic Research. Working Paper no. 99.

Buchanan, G. & M. Neri (2009). The Brazilian Education Quality Index (IDEB): Measurement and Incentives Upgrades, Centre de Politicas Sociais *(CPS)*.

Ghaus, A., Pasha, H. & Ghaus, R. (1996). Social Development Ranking of Districts of Pakistan, *The Pakistan Development Review*, 35:4.

Hanham, A.C., S. Brehanu, and S. Leveridge. 2002. "A Human Development Index for West Virginia Counties." Research Paper 2005. Center for Community, Economic and Workforce Development. West Virginia University Extension Service.

Jamal, H. & A. Jahan (2007). Education Status of Districts: An Exploration of Inter-temporal Changes, Research Report No. 71, Social Policy and Development Centre, Karachi.

Jamal, H. & A. Jahan (2007). Trends in Regional Human Development Indices, Research Report No. 73, Social Policy and Development Centre, Karachi.

Jamal, H. (1995). Social Development and Economic Growth: A Statistical Exploration, Research Paper Series, Social Policy and Development Centre, Karachi.

Noorbakhsh, F. (1998). The Human Development Index: Some Technical Issues and Alternative Indices, *Journal of International Development*, 10. pp. 589-605.

Slottje, D. (1991). Measuring the Quality of Life across Countries, *The Review of Economics and Statistics*, 73(4). pp. 684-593.

Stanton, E. (2007). The Human Development Index: A History, Working Paper Series, number 127. Political Economy Research Institute, University of Massachusetts Amherst.

Wasti, A. and M. Siddiqui. Development Rank Ordering of Districts of Pakistan: Revisited, *Pakistan Journal of Applied Economics*, Vol. 18 No. 1&2, 2002-2008.

Appendix

Table 1 - Comparing PCA and UNDP methods				
	PCA	Ranking		UNDP
Rawalpindi	67.8	1	Rawalpindi	75.6
Jhelum	66.8	2	Jhelum	73.4
Chakwal	65.1	3	Gujrat	71.8
Gujrat	64.7	4	Sialkot	71.3
Sialkot	63.3	5	Chakwal	71.0
Lahore	61.2	6	Lahore	70.2
Gujranwala	60.5	7	Gujranwala	69.6
Narowal	60.3	8	Narowal	69.3
Attock	59.4	9	Mandi Bahauddin	66.2
Mandi Bahauddin	58.4	10	Faisalabad	65.0
Toba Tek Singh	56.2	11	Toba Tek Singh	64.8
Faisalabad	55.8	12	Attock	64.5
Hafizabad	55.4	13	Hafizabad	62.1
Sahiwal	53.2	14	Mianwali	60.4
Mianwali	52.5	15	Sargodha	60.3
Sheikhupura	51.4	16	Sahiwal	60.2
Sargodha	51.2	17	Sheikhupura	60.0
Khushab	51.0	18	Layyah	59.6
Nankana Sahib	50.6	19	Multan	59.6
Bhakkar	50.3	20	Khanewal	59.2
Multan	50.1	21	Nankana Sahib	59.2
Layyah	48.9	22	Khushab	59.1
Khanewal	48.8	23	Bhakkar	58.9
Okara	48.7	24	Pakpattan	57.5
Kasur	48.6	25	Okara	57.5
Pakpattan	48.1	26	Kasur	57.4
Vehari	47.9	27	Vehari	55.6
Jhang	45.1	28	Jhang	55.1
Bahawalnagar	45.1	29	Bahawalnagar	54.6
Lodhran	43.0	30	Dera Ghazi Khan	54.2
Bahawalpur	40.6	31	Lodhran	52.6
Dera Ghazi Khan	40.1	32	Muzaffargarh	52.4
Muzaffargarh	39.6	33	Bahawalpur	51.5
Rahim Yar Khan	37.5	34	Rahim Yar Khan	50.3
Rajanpur	34.8	35	Rajanpur	48.4

Table 2 – Education Profile for Punjab			
	Punjab	Male	Female
Literacy ratio			
	59.3	68.7	49.5
Rural	52.0	63.5	40.0
Urban	74.6	79.6	69.4
Primary school gross attendance ratio			
	97.2	101.6	92.5
Primary school net attendance ratio			
	52.9	54.0	51.8
Secondary school net attendance ratio			
	28.7	29.6	27.8
Percentage of secondary school age children attending primary			
	43.4	46.3	40.4
Government and private primary school attendance rate			
Govt	55.9	-	-
Private	43.0	-	-
Madrassa	0.2	-	-

Table 3 - Education Index Projections			
	Average Annual Growth 98-08	Projections	
		2018	2020
Attock	3.9	86.8	93.6
Bahawalnagar	4.8	71.9	78.9
Bahawalpur	4.6	63.8	69.9
Bhakkar	6.5	94.1	106.7
Chakwal	3.6	92.4	99.2
Dera Ghazi Khan	7.0	78.7	90.1
Faisalabad	2.7	72.6	76.5
Gujranwala	3.2	83.0	88.4
Gujrat	2.0	78.9	82.1
Hafizabad	3.7	80.1	86.2
Jhang	3.9	66.1	71.4
Jhelum	1.9	81.0	84.2
Kasur	5.2	80.7	89.2
Khanewal	4.8	77.6	85.1
Khushab	4.4	78.6	85.7
Lahore	1.6	71.7	74.0
Layyah	5.6	84.3	94.0
Lodhran	6.5	80.7	91.5
Mandi Bahauddin	3.6	83.1	89.2
Mianwali	4.0	77.6	83.9
Multan	4.3	76.6	83.4
Muzaffargarh	6.6	75.0	85.2
Nankana Sahib		50.6	50.6
Narowal	3.7	87.0	93.6
Okara	4.6	76.3	83.4
Pakpattan	6.2	87.5	98.6
Rahim Yar Khan	4.5	58.5	63.9
Rajanpur	7.1	69.3	79.6
Rawalpindi	1.0	75.2	76.8
Sahiwal	4.6	83.3	91.0
Sargodha	2.7	66.9	70.5
Sheikhupura	3.9	75.3	81.2
Sialkot	2.0	77.5	80.7
Toba Tek Singh	2.9	74.9	79.3
Vehari	5.5	81.4	90.6

Figure1-9 District Code List	
1	Attock
2	Bahawalnagar
3	Bahawalpur
4	Bhakkar
5	Chakwal
6	Dera Ghazi Khan
7	Faisalabad
8	Gujranwala
9	Gujrat
10	Hafizabad
11	Jhang
12	Jhelum
13	Kasur
14	Khanewal
15	Khushab
16	Lahore
17	Layyah
18	Lodhran
19	Mandi Bahauddin
20	Mianwali
21	Multan
22	Muzaffargarh
23	Nankana Sahib
24	Narowal
25	Okara
26	Pakpattan
27	Rahim Yar Khan
28	Rajanpur
29	Rawalpindi
30	Sahiwal
31	Sargodha
32	Sheikhupura
33	Sialkot
34	Toba Tek Singh
35	Vehari

Figure 1 – Literacy Rate for Punjab
MICS 2007-08
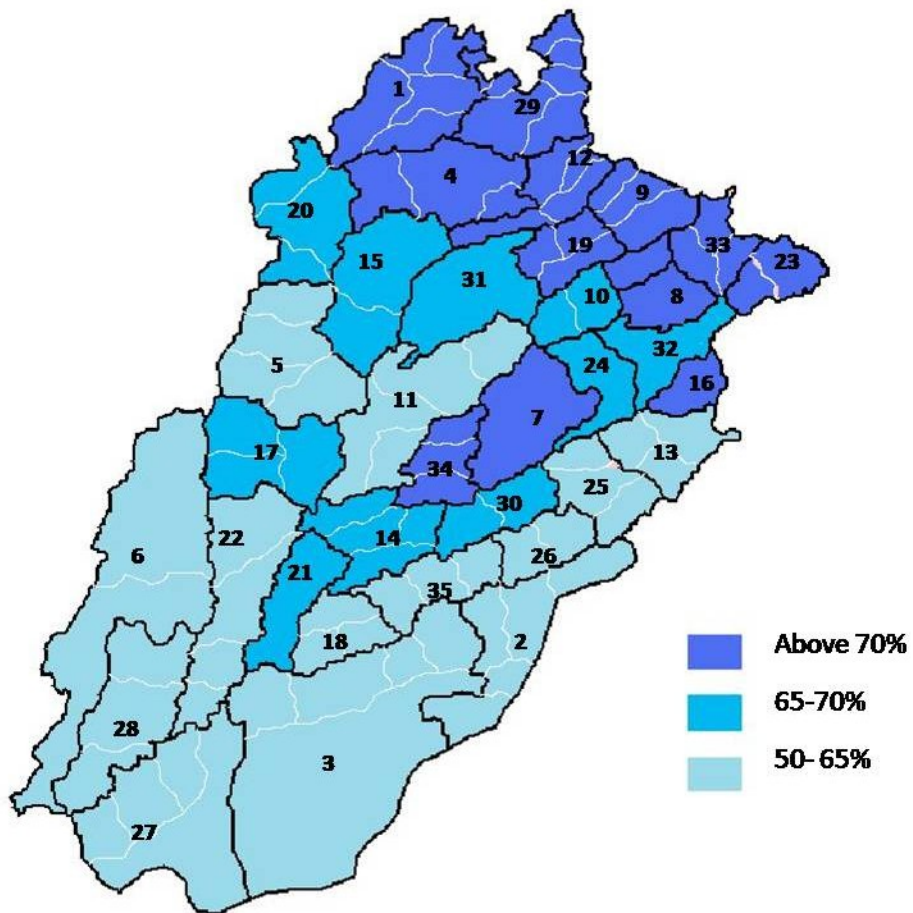
Figure 2 – Districts above and below EI Mean
MICS 2008
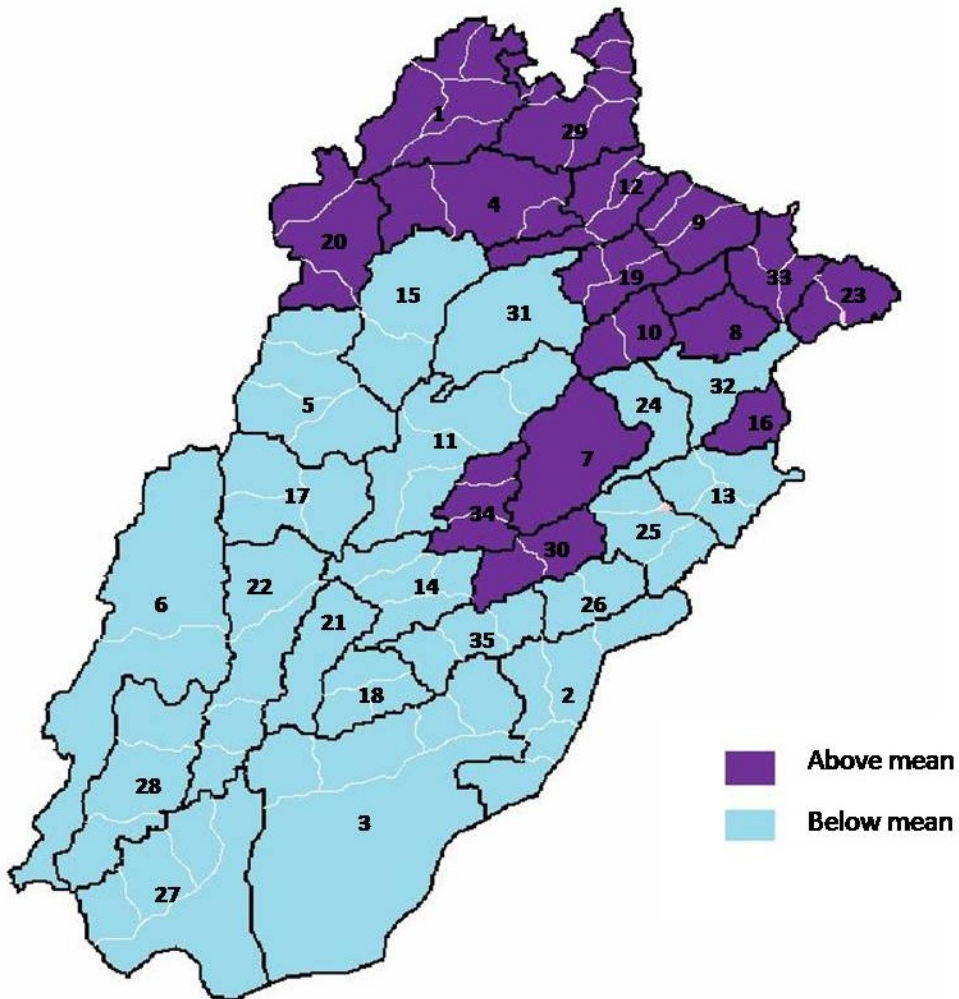
Figure 3 – Net Primary Enrollment Ratios (5-9 years)
MICS 2007-08
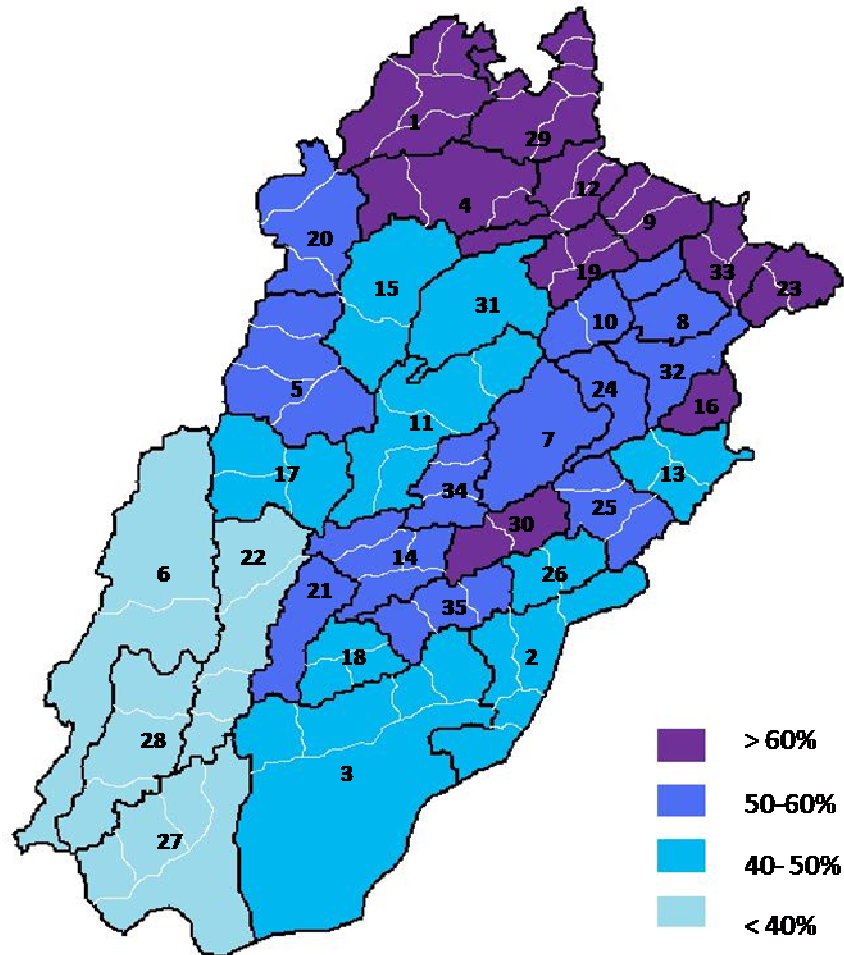
Figure 4 – Percentage Difference in
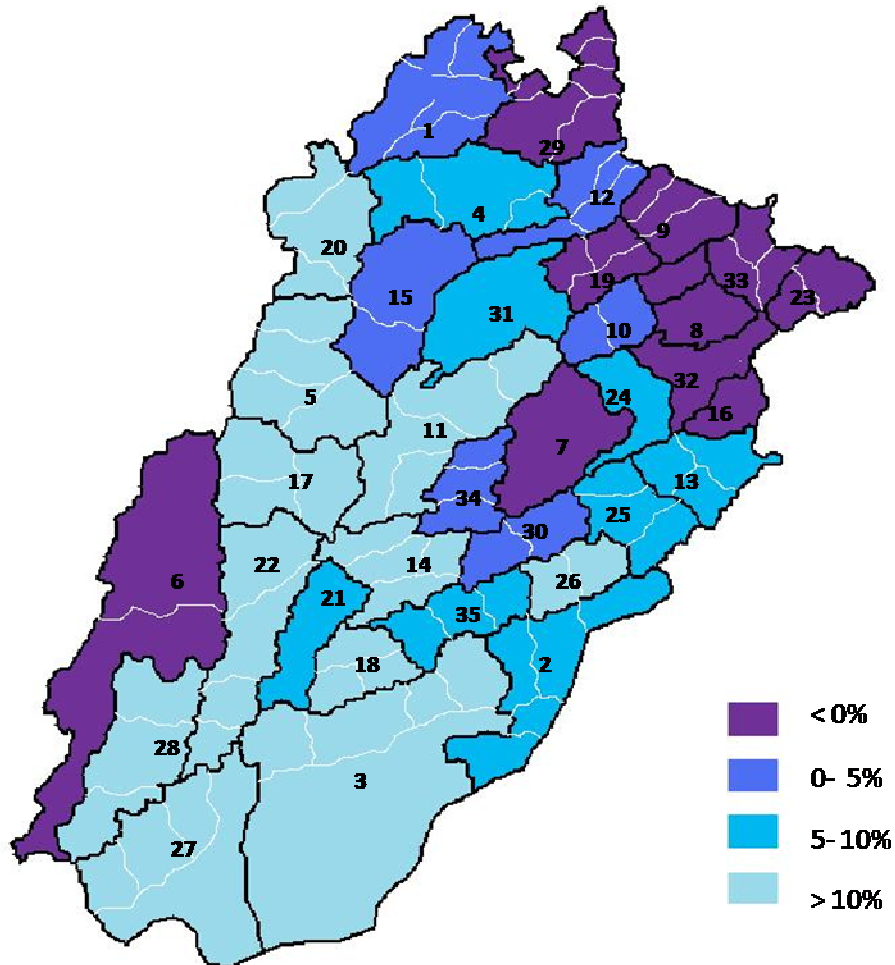## Male and Female Enrollment ratios MICS 2008

■	< 0%
■	0- 5%
■	5-10%
■	>10%

Figure 5 – Difference in Rural and Urban EI
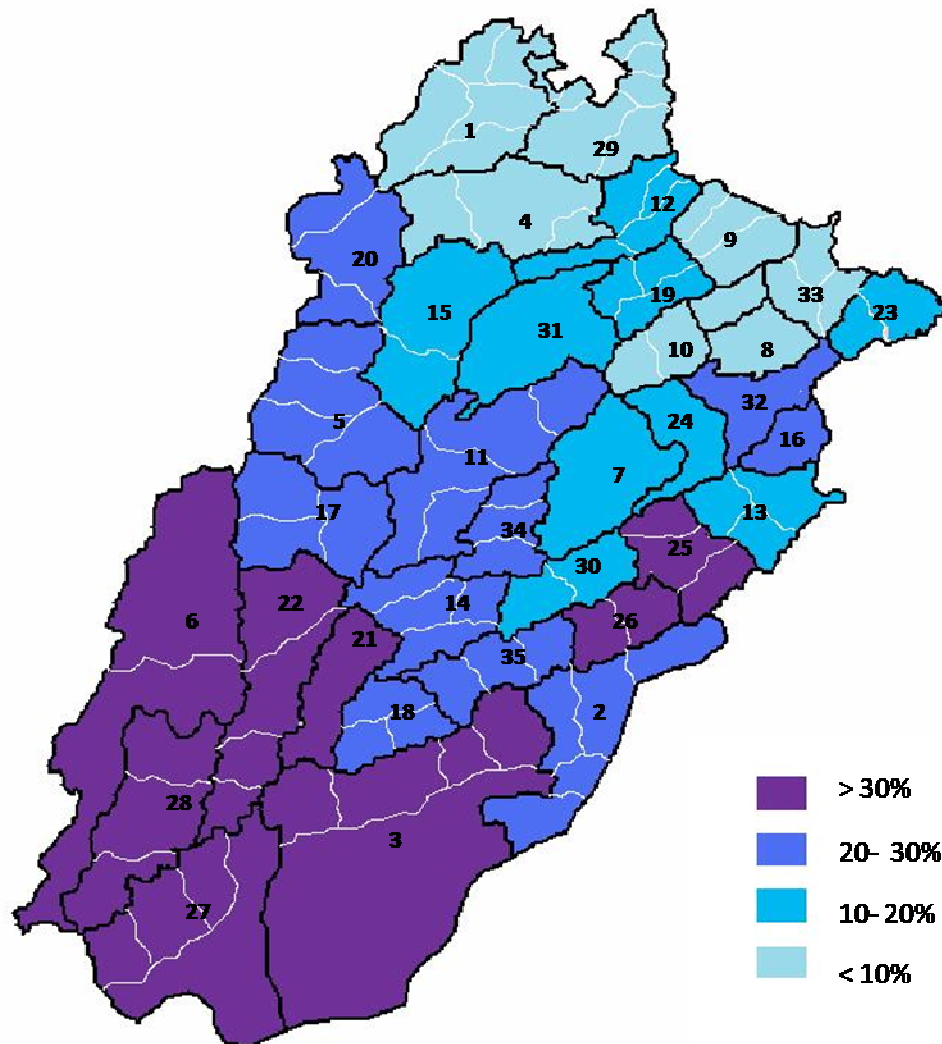
Figure 6 - Literacy Age Profile
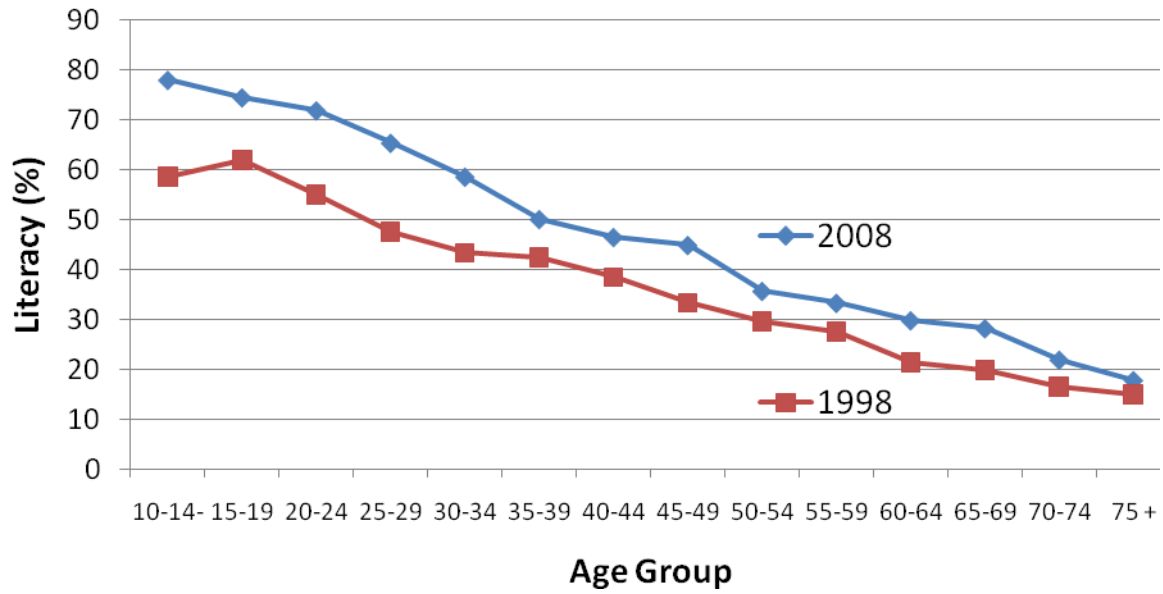
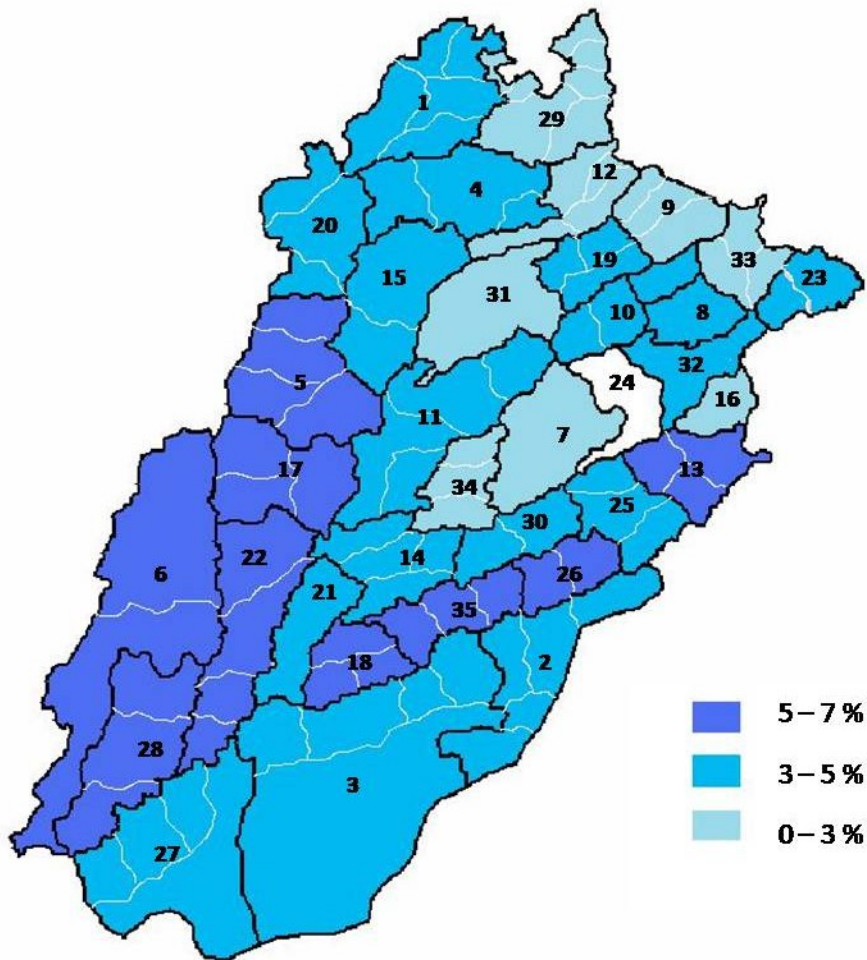# Figure 7 – Annual Growth Rate in Education Index

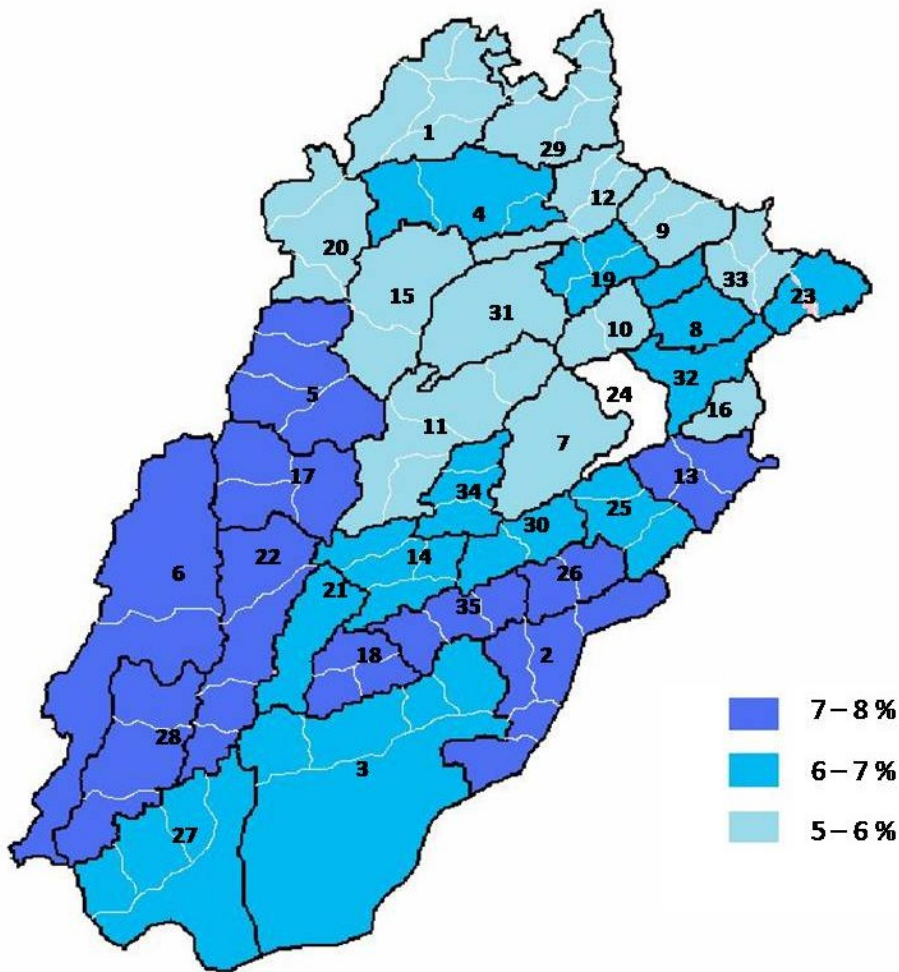Figure 8 – Annual Growth Rate in Education Index - Males

Figure 9 – Annual Growth Rate in Education Index - Females