

**Districts' Indices of
Multiple Deprivations for
Pakistan, 2011**

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ABSTRACT

Policy makers, international donors and development practitioners require an information system or database that can facilitate in drawing development policy relevant decisions, in providing criteria for allocation of resources and in selecting specific areas for safety net programmes and geographical targeted intervention.

This study analyses disparities among provinces and districts for the years 2011, 2009 and 2005 with respect to household socio-economic deprivations and could be used as a reliable base for provincial and district development policies. Analysis presented in this study is based on 17 variables, arranged into five groups of composite indicators, reflecting deprivation in education, health, housing quality, housing services and household wealth. At the second stage of aggregation, an overall index of multiple deprivations is developed for regions, provinces and districts of Pakistan.

JEL Classification: I31, I32

Keywords: Pakistan, Geographical Targeting, Deprivations, Measurement of District Indices of Multiple Deprivations (IMD)

1. Prologue

The assessment and mapping of spatial heterogeneity of poverty or deprivation is of prime value for effective planning and better resource allocation. Composite deprivation indices, which are based on non-monetary poverty correlates in diverse areas or sectors, provide an opportunity to map or rank geographical areas according to the level of deprivations. These indices are designed to quantify the proportion of poorest or socially excluded segment of the society in a particular territory in terms of household well-being indicators. Assessment of spatial deprivation levels is critical as the aggregated national level poverty data mask the sub-national variation and disparities in terms of socio-economic development.

The first national database of district multiple deprivations indices was compiled by Jamal et al (2003). These indices were based on data from the Population and Housing Census 1998. Jamal and Khan (2007) also updated district indices of multiple deprivations for 2005 using district representative nationwide Pakistan Social and Living Standards Measurement Survey (PSLM, 2004-05). Both these studies are now outdated and also deprivation in health and household assets (wealth) were not considered in these studies mainly due to paucity of comparative data. At provincial level, Strengthening Poverty Reduction Strategy Monitoring (SPRSM) projects of United Nations Development Programmes (UNDP) in Punjab, Khyber Pakhtunkhwa and Balochistan provinces sponsored studies¹ to develop composite Human Development Indices (HDI) and Indices of Multiple Deprivations (IMD) for districts of respective province using provincial Multiple Cluster Indicator Survey (MICS) data. Although the methodology for merging multiple deprivations is similar in these provincial studies, numbers as well type of indicators are not identical. Provincial MICS are conducted independently by provincial Bureaus of Statistics and hence the format of the questionnaires, quality of data and extent of information are not consistent and somewhat be different.

The purpose of this research is to provide an updated national database of district indices of multiple deprivations using latest available household survey (PSLM, 2010-11). Moreover, various comments have been received from bureaucrats, representatives of donors and students during the academic and consultative process of developing district composite indices with respect to methodology as well as choice of indicators. Based on these

¹ These three separate studies are conducted by this author. See reference for publication information.

feedbacks, a simple methodology² is adopted in this paper to produce transparent and comprehensible estimates of deprivation. Nonetheless, the options for choosing deprivation indicators are limited and the selection is entirely based on the availability of consistent data in PSLM surveys.

The study uses unit record household level data of PSLM survey conducted during the year 2010-11 which covers 77500 households across all provinces of Pakistan. National PSLM surveys collect household information on socio-economic indicators and the sample size of these surveys has been considered sufficient to produce reliable estimates at district level in respect of all provinces. Deprivation indices are also computed from household unit record data of PSLM 2008-09 and PSLM 2004-05 which also have similar sample size for the purpose of comparison and tracking.

The paper is structured as following. Section 2 defines sectoral deprivation and provides a brief description of variables or indicators used in the construction of sectoral and overall IMDs. Section 3 presents methodology for combining the selected indicators. The major findings are highlighted in section 4, whereas district-wise overall and sectoral IMDs are furnished in the Appendix. Concluding remarks are given in section 5.

2. Defining Deprivations

According to Townsend (1987), “people can be said to be deprived if they lack the types of diet, health, clothing, housing, household facilities, fuel and environmental, educational, working and social conditions, activities and facilities which are customary, or at least widely encouraged and approved, in the societies to which they belong”. Townsend also brought up the notion of different aspects of deprivation and of multiple deprivations, whereby individuals experience deprivation of more than one kind. Thus, the indices of deprivation are based on the premise that multiple deprivations are made up of separate dimensions or ‘sectors’. These sectors reflect different aspects of deprivations. Each sector (domain) is made up of a number of indicators, which cover aspects of this deprivation as comprehensively as possible. However, the selection of indicators is based entirely on the availability of consistent district-wise data.

² Due to change in methodology and indicators, earlier estimates of deprivation magnitudes described in the above mentioned studies are not comparable.

This study considers 17 indicators to cover a range of social, housing and economic deprivations. The selected sectors and indicators in constructing indices of multiple deprivations are described below, while a schematic view of indicators is furnished in Table-1.

Table – 1	
Indicators used to represent Sectoral Deprivations	
Education:	Illiteracy Rate (10 years and above) – Female Illiteracy Rate (10 years and above) – Male Out of School Children (5-9 Years) – Female Out of School Children (5-9 Years) – Male
Health:	Lack of Immunization No Prenatal Health Care No Postnatal Health Care Did not Receive Tetanus Toxoid Injection
Housing Quality:	Household with Inadequate Roof Structure Household with Inadequate Wall Structure Congested Household (Households with only one room) Households without latrine facility
Housing Services:	Households with no electricity Households using unsafe (not covered) water Households with no telephone connection (landline or mobile) Households using inadequate fuel for cooking (wood, coal, etc.)
Economic Deprivation:	Below Average Household Assets Score

2.1 Deprivation in Education

Deprivation in the education sector is represented by current and future levels of deprivation. Two measures, adult illiteracy and children out of school, are included in this sector. Literacy is defined³ as the “ability of a person to read a news paper or to write a simple letter in any language.” Illiteracy is measured in terms of ratio and computed as a percentage of illiterate persons among the population aged 10 years and above. Children between the ages of 5 to 10, who are not attending school, are taken to compute out-of-school children at the

³ Two questions related to literacy were asked in PSLM surveys: “Can this person write & read in any language with understanding?” and “Can solve simple Mathematics Questions?”. Illiteracy in this paper is measured with respect to the first definition.

primary⁴ level. The gender disparity is incorporated taking these measures separately for male/female and boys/girls.

2.2 Health Deprivation

The most widely used indicators of health deprivation are life expectancy or deprivation in longevity, which is measured as the percentage of people not expected to survive till age 40 and the Infant Mortality Rate (IMR). Relevant information to compute these two output indicators are not available in the datasets. Therefore some proxies (input indicators) are used to cover deprivation in term of health care and health care facilities.

Quality prenatal and post-natal care can contribute to the prevention of maternal mortality by detecting and managing potential complications and risk factors. Pre-natal care also provides opportunities for women to learn the danger signs of pregnancy and delivery, to be immunised against tetanus, to learn about infant care, and be treated for existing conditions, such as malaria and anaemia. Therefore three indicators related to maternal health are included: percentage of pregnant women with no prenatal care, no postnatal care and no tetanus Toxoid injection during last pregnancy. One of the primary objectives of the Government in health sector is to expand the coverage of immunisation. Therefore, lack of child (under 5 years) immunisation is also included to represent the household deprivation in health care facilities.

2.3 Deprivation in Housing Quality

The sector related to housing quality identifies people living in unsatisfactory and inadequate housing structures. It is represented by a series of indicators. The house structure is treated as inadequate if un-baked bricks, earth bound materials, wood or bamboo are used in the construction of a wall or the roof. To represent housing congestion, percentage of households with one room is included. Percentage of households which are lacking toilet facilities is also included in the deprivation index for this sector.

⁴ The primary age group is usually referred to as 5-9 years. However to capture education deprivation with respect to all members of household, age cohort of 10 plus for illiteracy and 5-10 age cohort for out-of-school children are used.

2.4 *Deprivation in Housing Services*

Access to basic utilities is an important aspect of everyday lives of people. Deprivation for this sector represented by: households with no electricity, households using wood or coal as cooking fuel, households with no safe (covered) water availability and households with no landline or mobile telephone connection.

2.5 *Economic Deprivation*

Economic Deprivation Index is represented through below average household wealth, which is estimated with the help of household assets⁵ (possessions) including house ownership and quality of housing. Categorical Principal Component Technique of Factor Analysis⁶ is used to combine these assets and utilities and to develop asset score (weighted factor score) for each household. The deprived households are defined as those which have asset score less than 50 percent of the median score⁷.

3. **Method for Composite Indexing**

Composite indices represent aggregate measure of a combination of complex development phenomena and summarise multidimensional issues to support policy decisions. One of the issues in the context of composite indexing is the substitutability among component indicators. High deprivation, for instance, in one sector may be fully compensated or counterweighted with the low deprivation in the other sector. This situation is not suitable in most cases where a minimum of all components are required for a combined index. The issue of substitutability may be resolved to some extent by taking geometric mean of deprivation indicators instead of combining indicators using simple average⁸. Although use of the geometric mean has been relatively rare in computing social statistics, starting from 2010 the

⁵ The list of assets and utilities are provided in the Appendix–B.

⁶ Very brief description of Categorical Principal Component is provided in the Appendix–B. For detail description of estimating wealth score, see Filmer and Pritchett (2001).

⁷ This is analogous to relative poverty measure. A measure of relative poverty defines "poverty" as being below some relative poverty threshold. For example, the statement that "households with an accumulated income less than 50% of the median income are living in poverty" uses a relative measure to define income poverty. The alternative is to use an absolute cut-off point for asset score to define poor households. However, to avoid subjectivity this option was not preferred.

⁸ In earlier studies by this author, mentioned in prologue, Principal Component Analysis (Factor Analysis) was used to combine indicators at sectoral level. However, following UNDP methodology for estimating HDI and also for simplicity, geometric mean is preferred for this study.

UNDP Human Development Index did switch to this mode of calculation for combining component indicators of HDI. UNDP argues that it better reflects the non-substitutable nature of the statistics being compiled and compared. According to UNDP (2010)⁹:

“The geometric mean reduces the level of substitutability between dimensions [being compared] and at the same time ensures that a 1 percent decline in say life expectancy at birth has the same impact on the HDI as a 1 percent decline in education or income. Thus, as a basis for comparisons of achievements, this method is also more respectful of the intrinsic differences across the dimensions than a simple average”.

Thus variables in each sector/domain are combined using the formulae of geometric mean¹⁰ at step 1 to create Sectoral composite deprivation indices. All variables are simple rates (percentage of the population affected by the type of deprivation) and may easily be combined.

At the second stage, the overall index of multiple deprivations is developed by combining sectoral indices. Again for the sake of simplicity and keeping uniformity with the UNDP-HDI methodology, geometric mean is preferred to combine sectors¹¹. Thus overall IMD in this study is the geometric mean of five sectors/domains described in Section 2.

⁹ Visit UNDP site: <http://hdr.undp.org/en/statistics/faq/>

¹⁰ Geometric mean is simply the nth root of the product of n numbers. More generally, if the numbers are x_1, \dots, x_n , the geometric mean G satisfies $G = \sqrt[n]{x_1 x_2 \dots x_n}$,

¹¹ In earlier studies by this author, the substitution issue among sectors was resolved by using the formulae of UNDP Human Poverty Index (HPI). Accordingly, the formula used to derive IMD was:

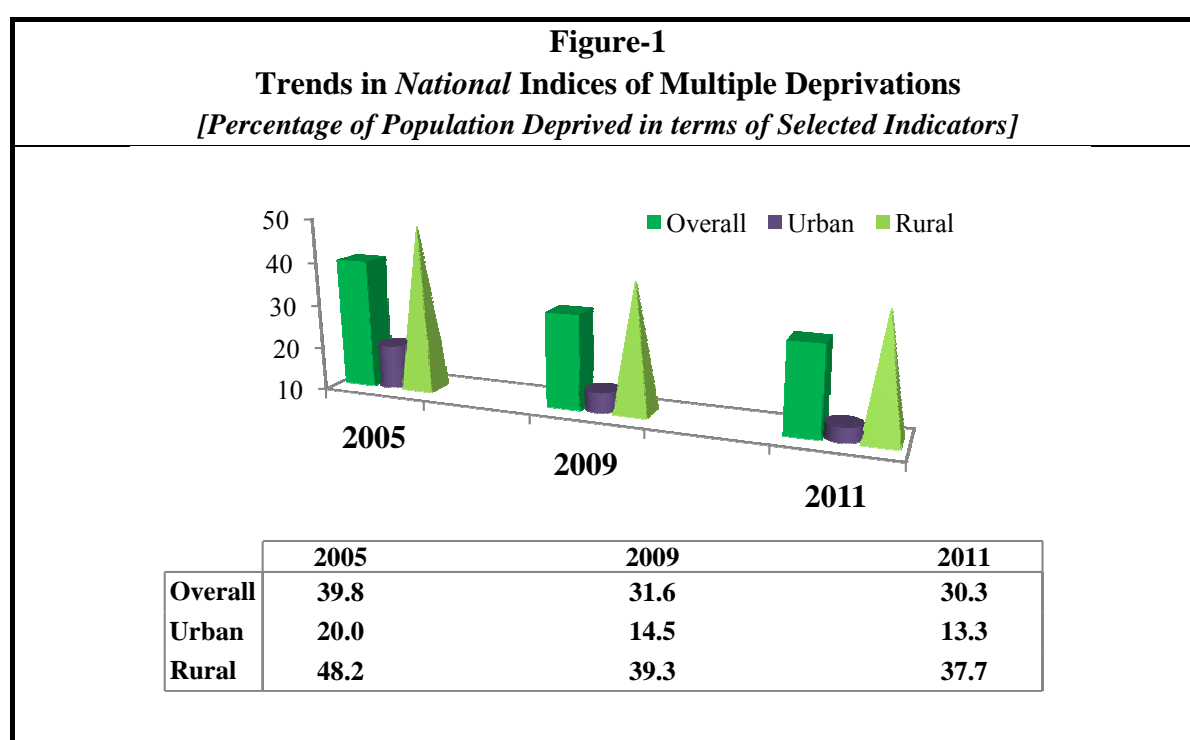
$$IMD = \left[\frac{1}{5} * \{(ED)^\alpha + (HL)^\alpha + (HQ)^\alpha + (HS)^\alpha + (EC)^\alpha\} \right]^{\frac{1}{\alpha}}$$

Sectors are represented by ED, HL, HQ, HS and EC notations in the above equation. The value of α in the formulae has an important impact on the value of the index. If $\alpha=1$, the IMD is the average of its components. As α rises, greater weight is assigned to the sector in which there is most deprivation. Following UNDP Human Poverty Index, the value of α was set at 3 to give additional but not overwhelming weight to the areas of greater deprivations. This gives an elasticity of substitution of 1/3 between any two indices and places more weight on those dimensions in which deprivation is higher.

4. Major Findings

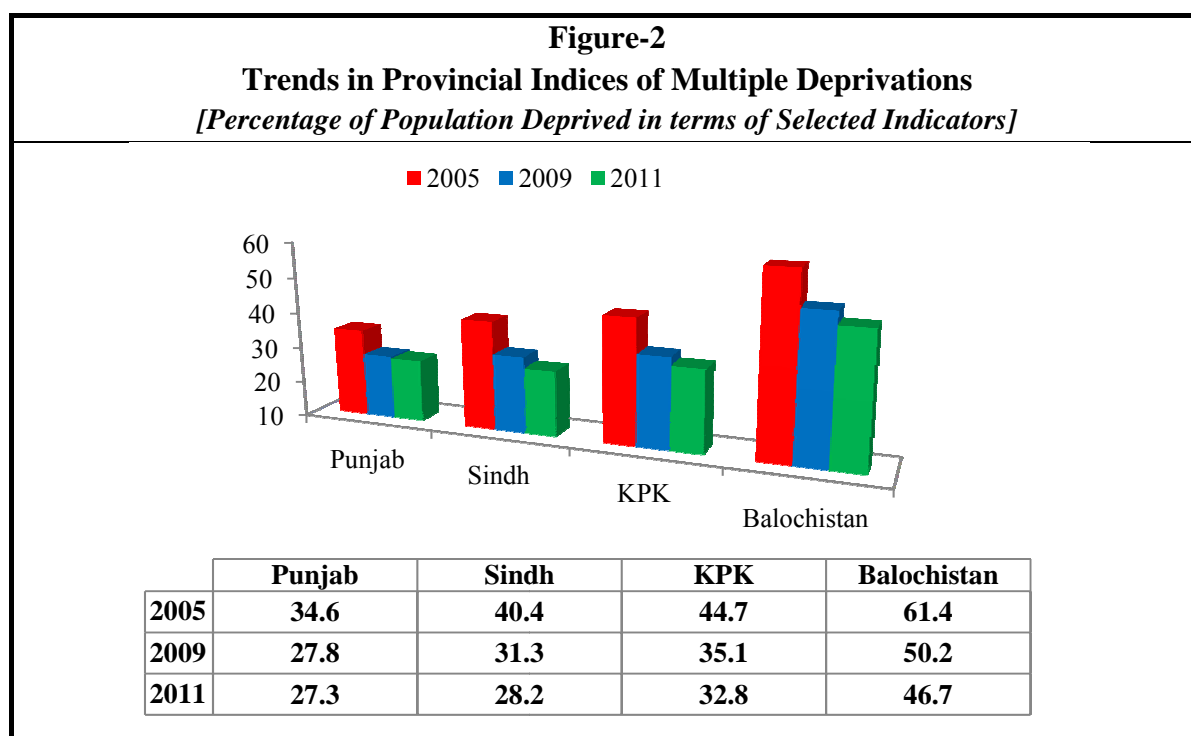
Overall and sectoral Indices of Multiple Deprivations for districts of Pakistan are assembled in the appendix (Tables A.1 through A.4) for the year 2011. This section summarises the major findings.

Figure-1 portrays trends in national and regional indices of multiple deprivations. National IMD is estimated at 30.3 for the year 2011. The estimated number indicates that about 30 percent population was deprived in 2011 with respect to the selected sectors and indicators. In terms of regional IMDs, rural IMD is estimated at 37.7 as compared with urban magnitude of 13.3. The figure also divulges an important finding. The levels of deprivations during 2009 and 2011 were almost stagnant as against significant decline in the magnitude of deprivations during 2005-2009.



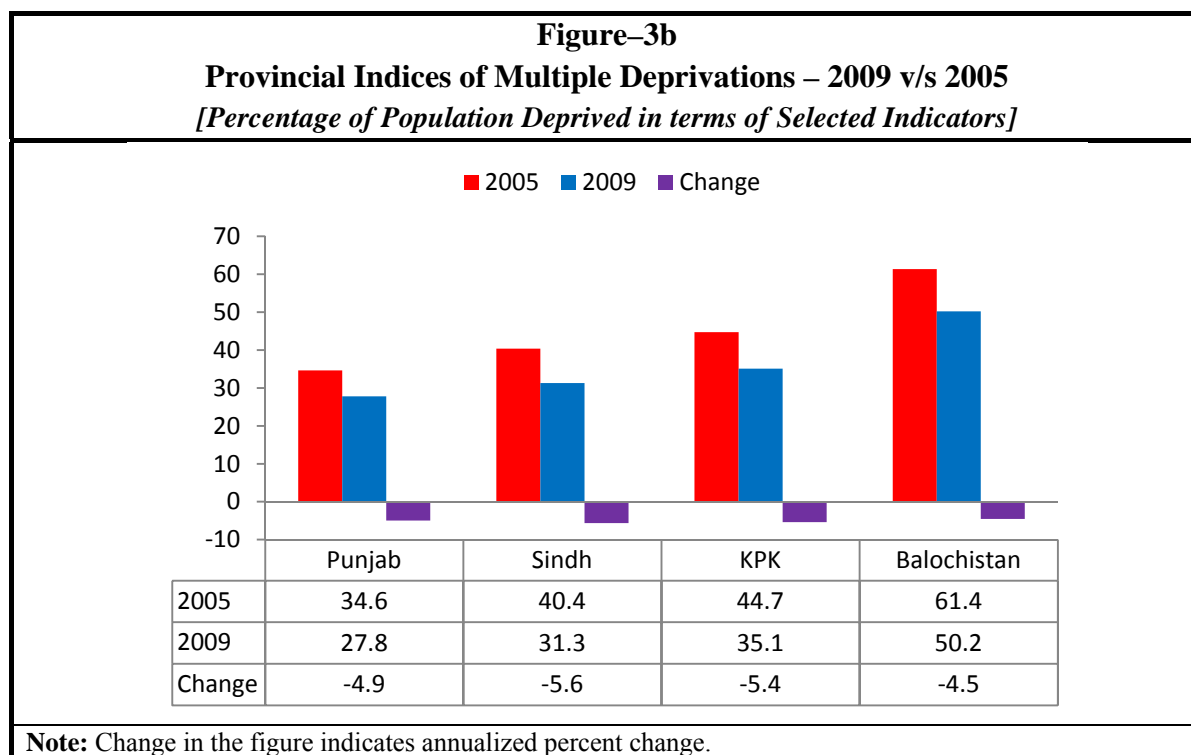
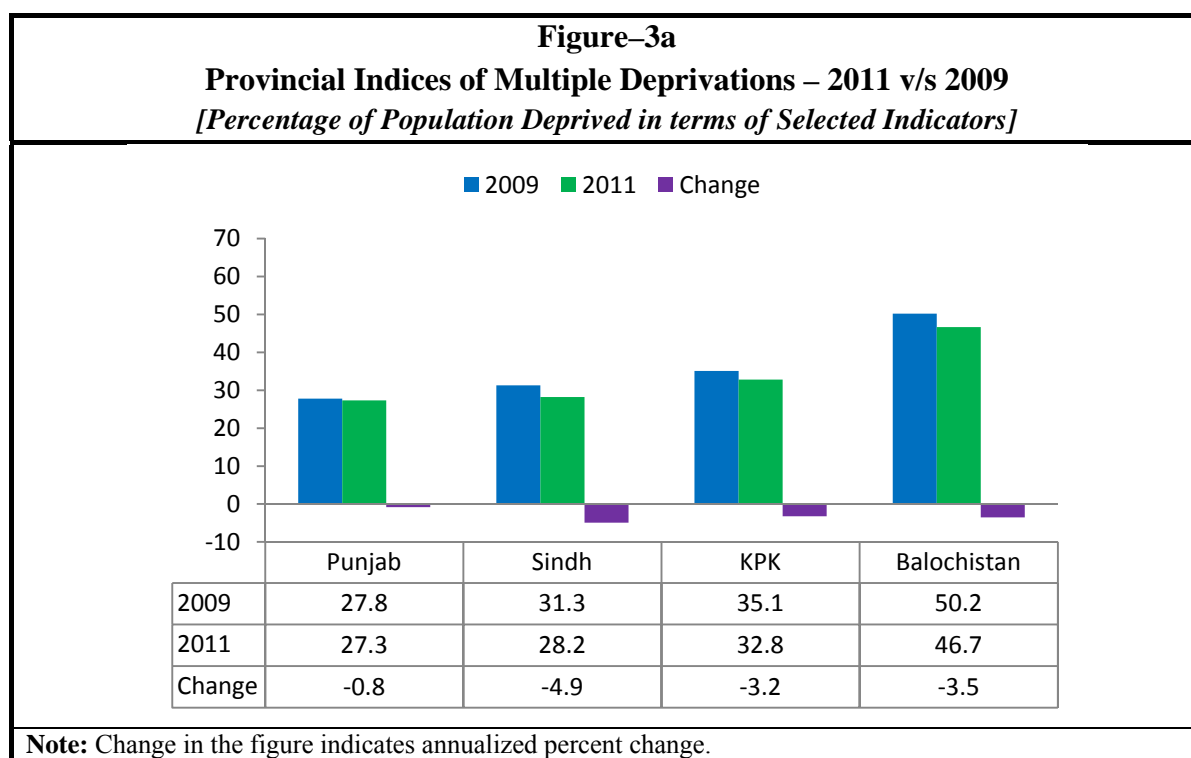
The dynamics of provincial IMDs are furnished in Figure-2. Significant inter-provincial disparities are evident in the figure. As expected in terms of level of deprivation, Punjab possesses the lowest, while Balochistan has the highest magnitude of IMD throughout the period of analysis. Surprisingly, the inter-provincial gap in terms of overall IMDs is somewhat reducing, mainly due to the fact that the rate of decline in Punjab IMDs is lower than other provinces. The phenomenon is however against the common perception. Generally

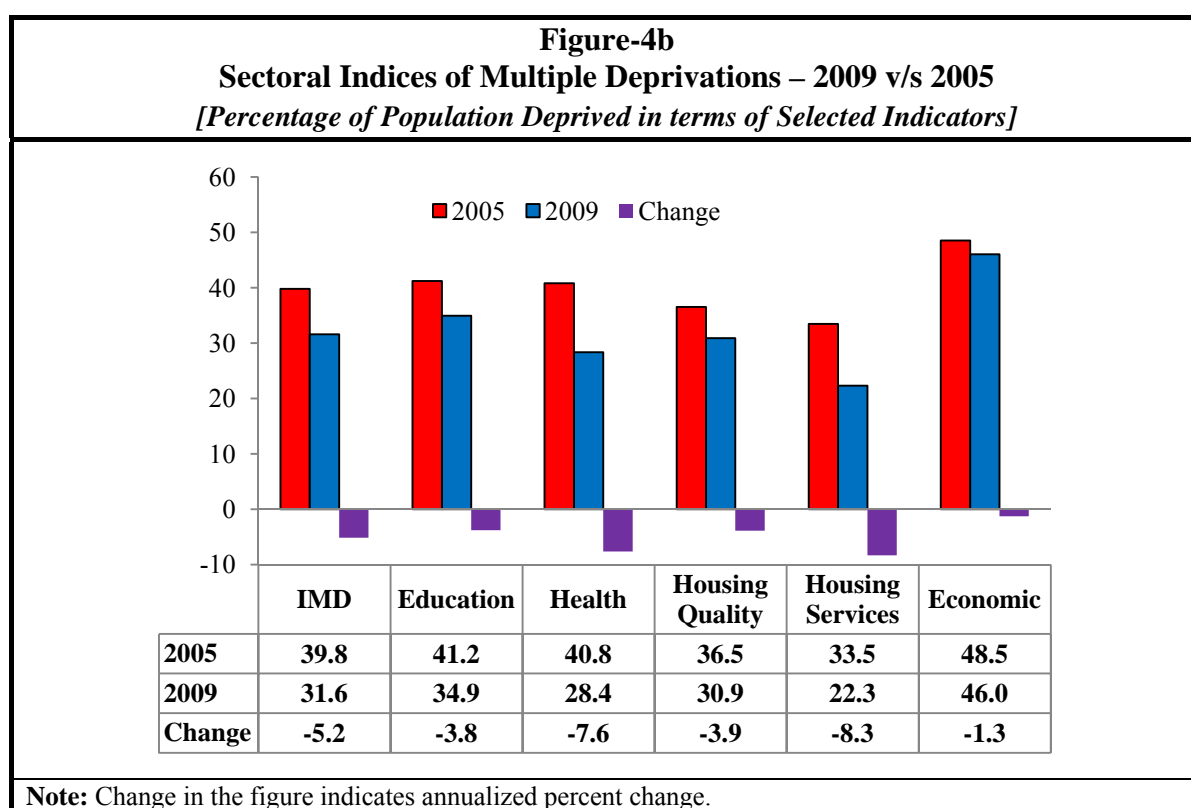
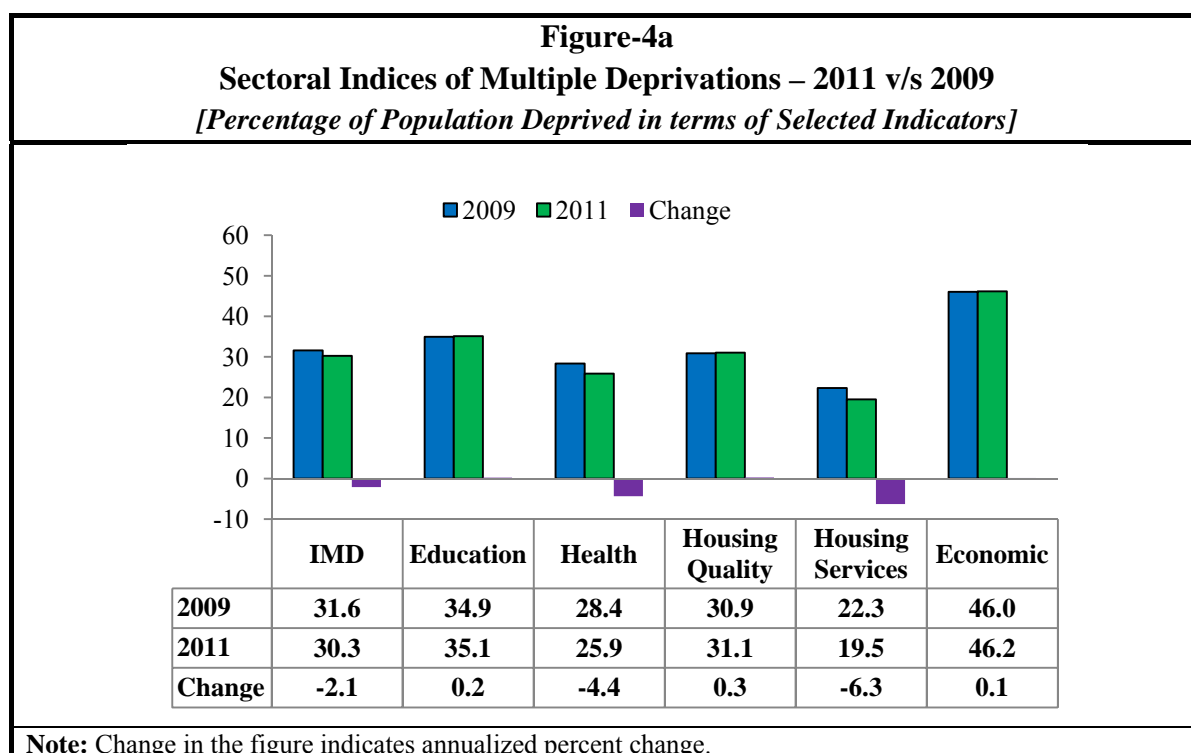
masses assume relatively good governance and more development in Punjab as compared with other provinces during the period of analysis.



To elaborate this point further, figures 3a and 3b are prepared which depict annualised percent changes separately for the period 2009-2011 and 2005-2009. According to Figure-3a which shows changes in IMD during 2009-2011, Punjab IMD is almost stagnant, while 3 to 5 percent decline is evident in other provinces. On the contrary during the period 2005-2009 (Figure -3b), almost similar drop (-5 percent) in provincial IMDs is evident.

Trends in sectoral IMDs are plotted in figures 4a and 4b for the period 2009-2011 and 2005-2009 respectively. In Figure-4a, no changes are evident in education, housing quality and economic sectors during 2009-2011 period. About 4 percent decline in health sector is observed, perhaps due to the immunisation campaign and larger coverage. Similarly, about 6 percent drop is evident in the housing services sector which includes telephone connections (mobile or landline). The growth of communication sector in this period is entrenched. Incidentally, decline or drop in IMD for housing service sector in the period 2005-2009 is highest (- 8 percent) as well. During the period 2005-2009, decline in IMD of health sector is also noteworthy. Economic sector in both periods remain stagnant with the IMD magnitude of 46 to 48 percent.





District ranking and classification into low, medium and high deprivation categories are presented¹² in Figures 5 through 8 for Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan provinces respectively for the year 2011. Instead of subjective or arbitrary classification, districts are distributed into three percentile groups after provincial ranking (low to high) with respect to magnitude of overall Index of Multiple Deprivations.

Districts Vehari, Khanewal, Bhakhar, Bahawalnagar, Jhang, Pakpattan, Bahawalpur, Lodhran, RahimYar Khan, Muzaffar Garh, D.G.Khan and Rajanpur are classified in the high deprived category. Geographically almost all districts lie at the south of Punjab. The estimated IMD for Rajanpur, which is the highest deprived district of Punjab, is 46. On the contrary, the IMD magnitude associated with the lowest deprived district (Lahore) is 10.

In Sindh province, districts which are placed in the category of high level of deprivations include: Kashmore, Jaccobabad, Jamshoro, Tando Muhammad Khan, Umer Kot, Badin, Thatta and Tharparkar. Intra-province disparities in Sindh province indicate a range of IMD from 9.3 (Karachi district) to 54.5 (Tharparker district).

Districts estimated in the high deprived category for Khyber Pakhtunkhwa province are; Upper Dir, Tank, D.I.Khan, Lakki Marwat, Karak, Shangla, Bonair and Kohistan. The IMD magnitudes associated with the lowest and highest deprived districts of KPK province are 16.6 (Haripur) and 70.8 (Kohistan) respectively.

The Estimated high deprived districts of Balochistan province are; Ketch/Turbat, Nushki, Qillah Saifuallh, Lasbella, Musakhel, Chagi, Barkhan, Lorali, Kohlu and Dera Bugti. Dera Bugti is the lowest deprived district of Pakistan with the magnitude of 74.69. Quite the opposite the magnitude of IMD for Quetta is 13.18, which is the lowest deprived district of the province.

¹² Provincial District ranking in these figures is appeared with the name of district, while the magnitude of IMD is shown just inside the bar.

Figure-5
Level of Deprivation (IMDs) and Provincial Rank Order – Districts of Punjab–2011

[Percentage of Population Deprived in terms of Selected Indicators]

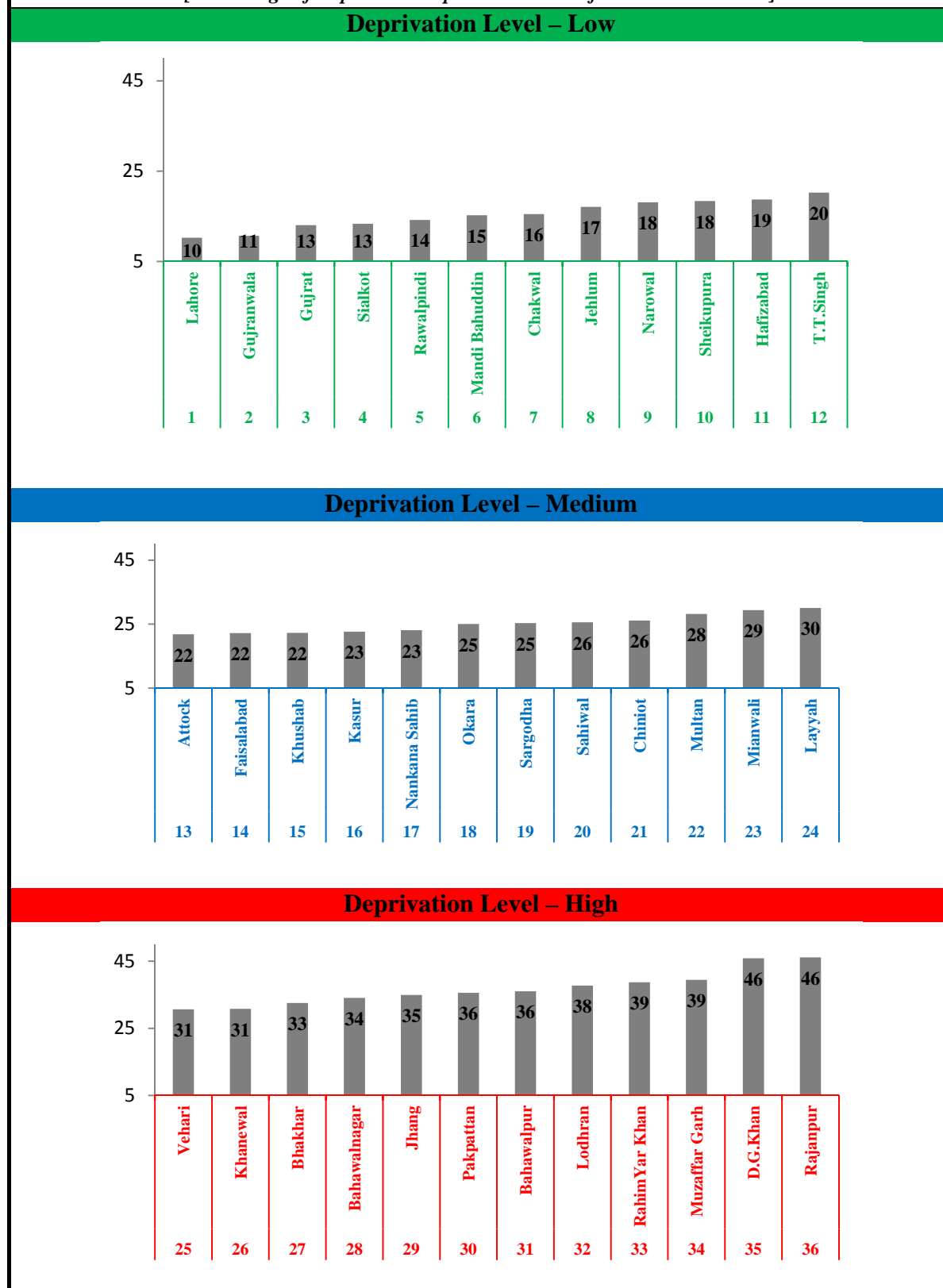


Figure-6
Level of Deprivation (IMDs) and Provincial Rank Order – Districts of Sindh–2011

[Percentage of Population Deprived in terms of Selected Indicators]

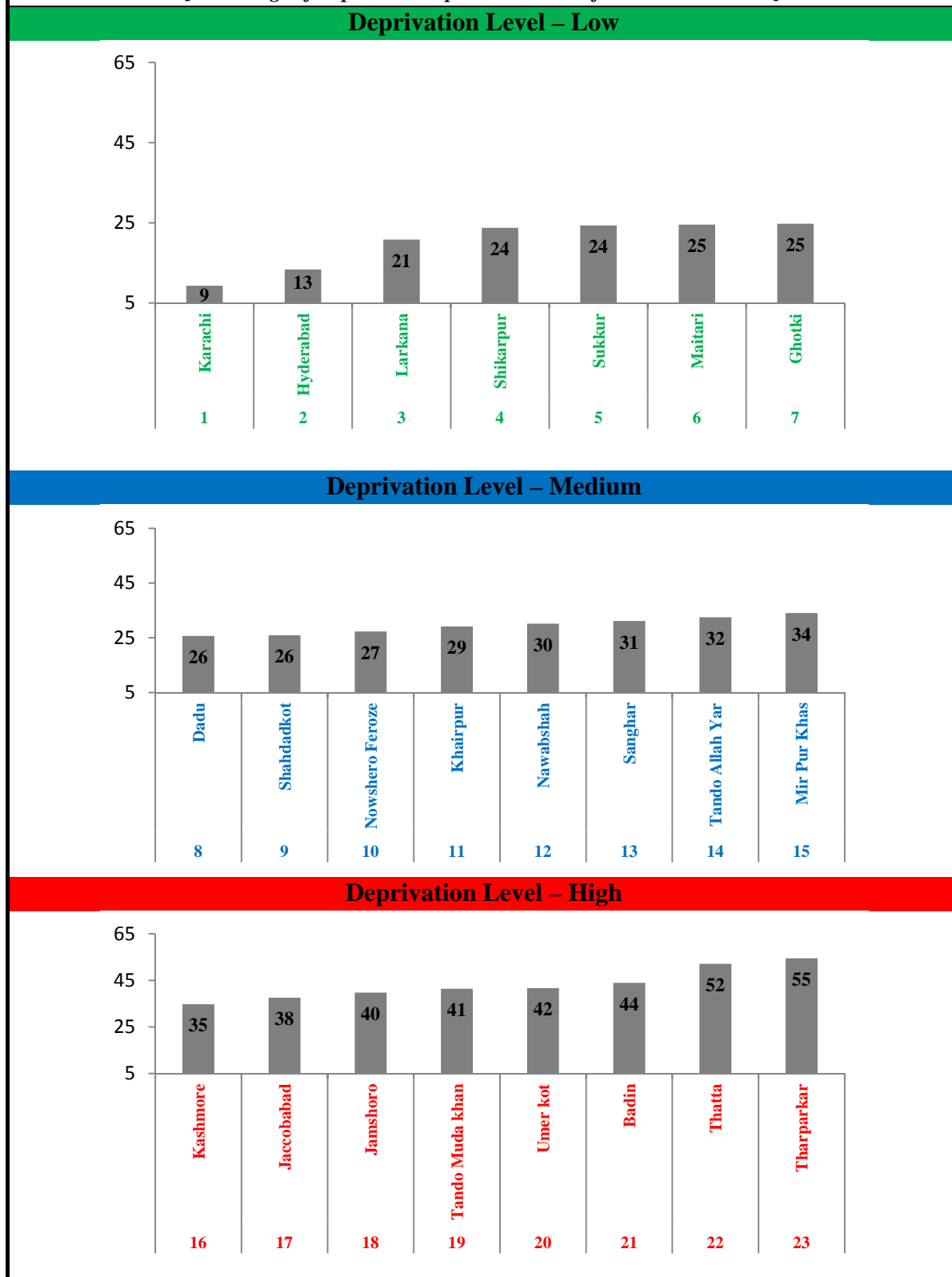


Figure-7
Level of Deprivation (IMDs) and Provincial Rank Order – Districts of
KPK-2011

[Percentage of Population Deprived in terms of Selected Indicators]

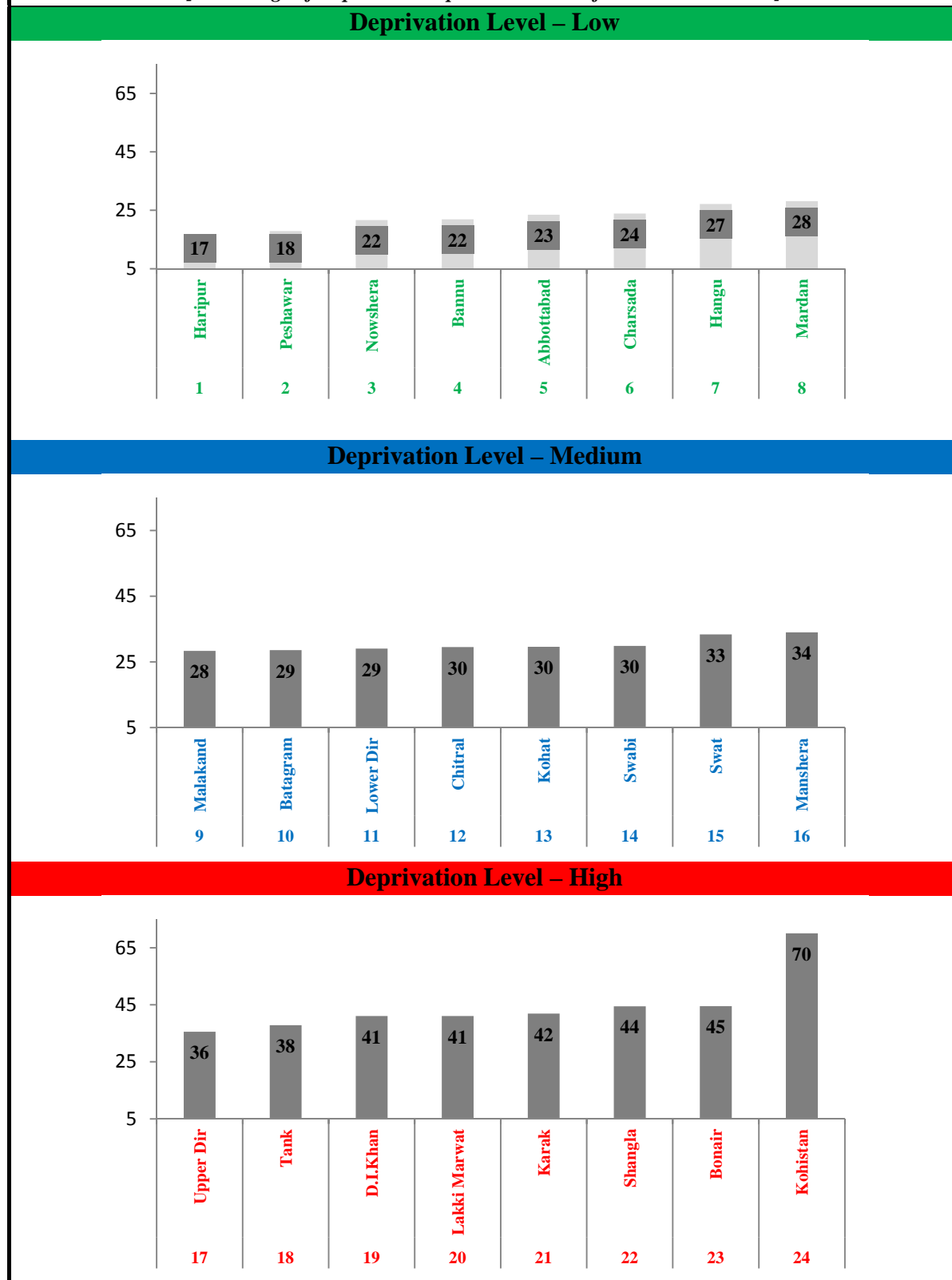
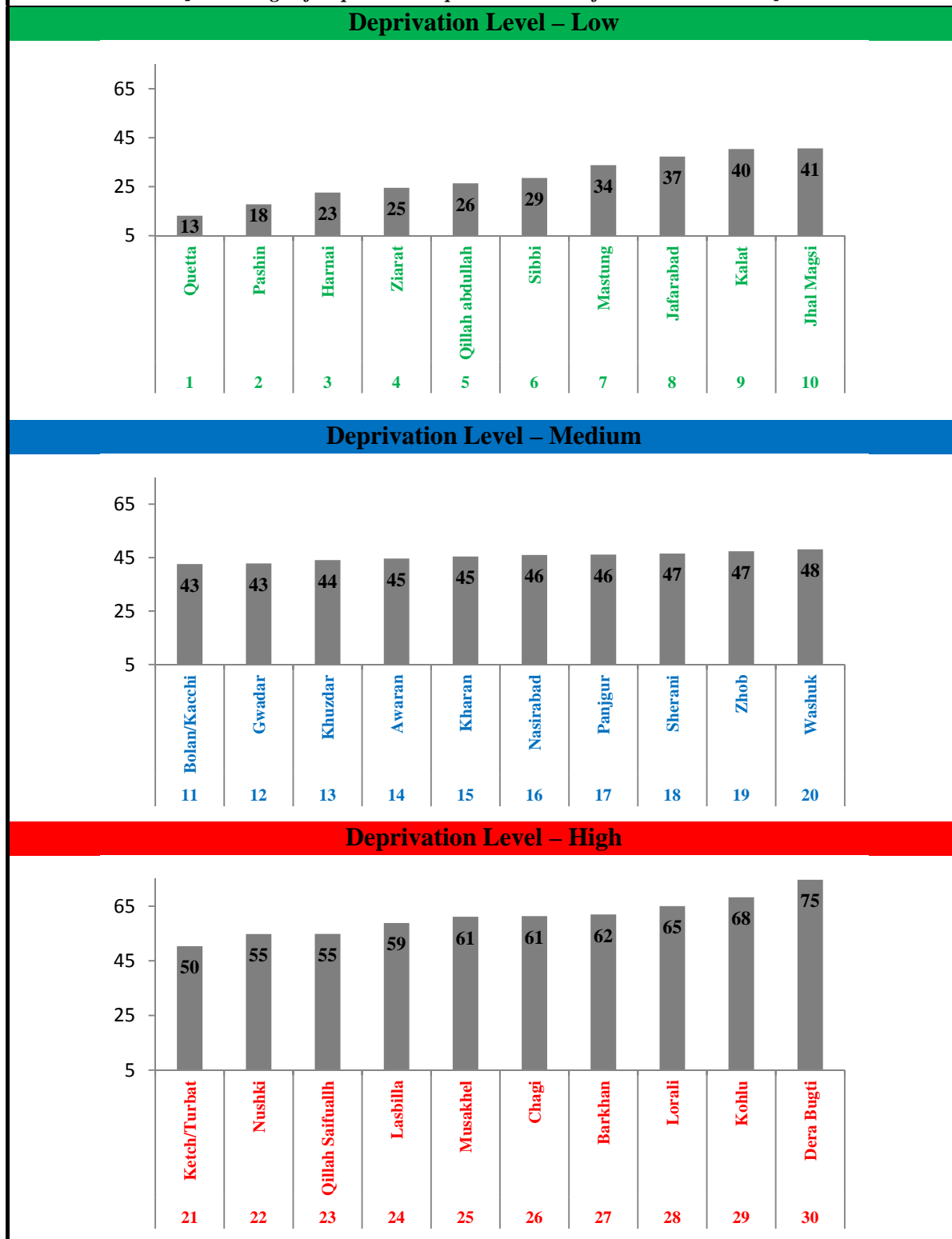


Figure-8
Level of Deprivation (IMDs) and Provincial Rank Order – Districts of
Balochistan-2011

[Percentage of Population Deprived in terms of Selected Indicators]



5. CONCLUDING REMARKS

This study provides an opportunity to understand the patterns and trends in national and regional development and disparities by providing inter-temporal Indices of Multiple Deprivations. These indices are worked out using similar source of data (PSLM), employing identical methodology with the same indicators for the years 2011, 2009 and 2005. The national PSLM surveys provide household welfare indicators with a sample size of about 77,000 households. Household information in terms of deprivation in education, health, housing quality, housing services and household wealth are aggregated for constructing sectoral and overall deprivation indices for districts, provinces, regions and for Pakistan. These indices may be used to make inter-district, intra-province and inter-province comparisons of populations that are deprived, with respect to the indicators chosen for this analysis.

Overall national IMD of 2011 is almost stagnant at the level of 2009. Due to worst macroeconomic scenario and low rate of economic growth, no significant decline in the level of deprivation during 2009-11 is comprehensible. Quite the opposite, the decline in the levels of deprivations during 2009 and 2005 is relatively large.

As expected, in terms of level of deprivation, Punjab possesses the lowest, while Balochistan has the highest magnitude of IMD throughout the period of analysis. Against the common perception, however relative low rate of decline in the level of deprivation is estimated for the Punjab province. Trends in sectoral IMDs show no significant changes in education, housing quality and economic sectors during the period of analysis. On the contrary, noteworthy decline is observed in health (immunisation) and housing services (telephone connections).

Mapping heterogeneity of poverty or identifying clusters of backwardness and deprivation facilitates in making decisions on regional and sectoral priorities, in targeting public interventions through special poverty alleviation programmes, in understanding the relationship between poverty and its causes and in assisting federal and provincial governments in determining financial awards. More importantly, the exercise may be used to address intra-provincial inequality by allocation of appropriate resources to backward districts.

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Appendix – A

Levels of Multiple Deprivations
Districts' Position and Value of Indices

Table – A.1 District Indices of Multiple Deprivations Punjab Province								
Overall Indices of Multiple Deprivations				Sectoral Indices of Multiple Deprivations				
District	Index Value	National Rank	Provincial Rank	Education	Health	Housing Quality	Housing Services	Economic
Attock	21.82	21	13	22.56	21.81	17.83	13.79	40.85
Bahawalnagar	34.08	66	28	35.47	31.97	40.16	16.52	61.14
Bahawalpur	36.05	71	31	45.81	22.81	43.09	20.92	64.62
Bhakhar	32.56	61	27	40.07	31.49	40.34	11.36	63.33
Chakwal	15.50	10	7	9.28	14.70	15.09	14.57	29.87
Chiniot	26.14	40	21	39.62	20.57	37.91	8.17	48.35
D.G.Khan	45.89	94	35	49.68	23.72	52.20	42.02	78.70
Faisalabad	22.21	23	14	24.08	29.95	19.67	14.36	26.52
Gujranwala	10.68	3	2	14.07	19.13	8.12	3.66	17.38
Gujrat	13.04	4	3	16.54	13.75	12.90	6.40	20.06
Hafizabad	18.74	17	11	20.90	21.40	23.86	7.15	30.29
Jhelum	17.11	12	8	14.39	12.31	18.42	15.70	28.69
Jhang	34.94	68	29	35.27	35.87	42.00	15.21	64.45
Kasur	22.63	26	16	29.09	26.57	19.73	8.04	48.39
Khanewal	30.81	58	26	32.13	28.26	38.03	13.81	58.23
Khushab	22.27	24	15	25.17	22.06	24.83	9.84	40.35
Lahore	10.26	2	1	17.75	17.27	6.47	4.24	13.50
Layyah	30.07	55	24	34.75	27.06	46.29	8.11	69.66
Lodhran	37.73	74	32	45.13	31.59	38.92	20.02	68.88
Mandi Bahuddin	15.24	9	6	17.83	14.98	17.02	7.99	22.63
Mianwali	29.39	51	23	24.79	27.10	34.27	18.16	52.43
Multan	28.18	45	22	33.81	25.37	35.17	11.88	49.61
Muzaffar Garh	39.44	77	34	49.46	27.35	54.36	16.82	77.18
Nankana Sahib	23.11	27	17	25.01	21.73	29.74	9.55	42.68
Narowal	18.10	15	9	19.34	24.91	19.93	4.64	43.57
Okara	25.04	35	18	32.81	22.79	36.30	6.39	56.77
Pakpattan	35.57	70	30	40.86	27.69	50.14	15.40	65.18
RahimYar Khan	38.72	76	33	45.41	33.85	44.40	20.32	62.75
Rajanpur	46.14	97	36	57.08	24.31	59.02	33.62	75.98
Rawalpindi	14.21	8	5	13.36	14.30	14.67	9.79	21.08
Sahiwal	25.56	37	20	34.64	23.97	30.03	9.56	45.81
Sargodha	25.32	36	19	26.08	26.31	26.68	13.50	42.11
Sheikupura	18.39	16	10	24.86	19.45	18.79	6.71	34.45
Sialkot	13.37	6	4	15.99	17.61	11.02	7.29	18.89
T.T.Singh	20.25	18	12	20.85	21.76	21.98	10.17	33.60
Vehari	30.68	57	25	36.88	21.13	36.05	15.93	60.66

Table – A.2								
District Indices of Multiple Deprivations								
Sindh Province								
Overall Indices of Multiple Deprivations				Sectoral Indices of Multiple Deprivations				
District	Index Value	National Rank	Provincial Rank	Education	Health	Housing Quality	Housing Services	Economic
Badin	43.91	88	21	56.61	21.88	47.61	34.61	79.98
Dadu	25.67	38	8	29.10	21.52	18.63	17.64	54.15
Ghotki	24.79	34	7	49.68	14.54	30.74	6.26	67.43
Hyderabad	13.39	7	2	27.27	11.52	11.74	5.39	21.65
Jacobabad	37.55	73	17	54.76	28.36	28.81	21.54	77.50
Jamshoro	39.74	78	18	51.15	23.01	41.21	30.94	66.06
Karachi	9.31	1	1	19.75	12.22	4.28	5.43	12.49
Kashmore	34.76	67	16	55.39	23.12	38.60	14.42	71.23
Khairpur	29.16	50	11	39.84	18.51	32.23	13.10	67.66
Larkana	20.83	19	3	44.48	21.18	20.49	3.42	59.51
Maitari	24.56	33	6	46.64	14.94	34.35	6.22	60.03
Mir Pur Khas	34.04	65	15	44.05	19.27	33.70	26.77	59.67
Nawabshah	30.15	56	12	48.18	23.46	34.65	11.18	56.87
Nowshero Feroze	27.30	43	10	40.15	31.43	22.42	9.03	59.36
Sanghar	31.14	59	13	44.04	23.50	32.23	14.38	61.03
Shahdadkot	25.91	39	9	53.64	22.12	11.25	13.02	67.19
Shikarpur	23.77	29	4	48.43	17.14	25.80	5.16	68.75
Sukkur	24.36	31	5	39.60	15.03	25.50	10.43	54.22
Tando Allah Yar	32.49	60	14	52.65	39.71	25.11	13.73	50.26
Tando Muda khan	41.38	83	19	63.78	29.90	34.12	23.44	79.60
Tharparkar	54.50	103	23	47.31	34.77	52.20	62.26	89.93
Thatta	52.10	102	22	63.07	31.62	54.01	42.81	83.22
Umer kot	41.65	84	20	45.36	19.68	44.59	40.63	77.47

Table – A.3 District Indices of Multiple Deprivations Khyber Pakhtunkhwa Province								
Overall Indices of Multiple Deprivations				Sectoral Indices of Multiple Deprivations				
District	Index Value	National Rank	Provincial Rank	Education	Health	Housing Quality	Housing Services	Economic
Abbottabad	23.47	28	5	20.09	16.04	34.05	16.93	38.35
Bannu	21.92	22	4	39.86	22.84	19.83	6.05	46.34
Batagram	28.58	48	10	37.43	41.28	30.56	6.68	60.55
Bonair	44.52	91	23	40.98	37.33	40.46	37.22	75.90
Charsada	23.86	30	6	35.49	18.01	28.01	9.74	44.33
Chitral	29.52	52	12	32.52	18.01	20.23	24.67	76.73
D.I.Khan	41.06	81	19	58.86	27.42	43.74	25.03	66.03
Hangu	27.16	42	7	39.79	26.97	19.49	14.47	48.85
Haripur	16.60	11	1	16.92	9.94	24.72	8.31	36.50
Karak	41.93	85	21	31.90	38.69	39.22	37.93	70.61
Kohat	29.58	53	13	37.97	21.91	29.86	22.55	40.44
Kohistan	70.08	112	24	73.67	50.41	63.89	71.97	99.00
Lakki Marwat	41.08	82	20	45.04	39.90	33.94	27.28	70.31
Lower Dir	29.06	49	11	35.31	22.66	23.38	19.87	55.75
Malakand	28.35	46	9	33.73	23.29	26.45	17.76	49.57
Manshera	33.97	64	16	30.79	27.33	36.66	27.76	52.86
Mardan	28.11	44	8	36.37	20.68	34.93	13.65	48.97
Nowshera	21.63	20	3	30.59	16.82	20.92	10.55	41.72
Peshawar	17.87	14	2	34.73	20.15	17.23	5.86	25.74
Shangla	44.48	90	22	57.23	34.09	39.08	29.39	77.69
Swabi	29.88	54	14	29.79	24.17	27.69	24.08	49.58
Swat	33.37	62	15	38.65	28.69	25.70	26.03	55.82
Tank	37.82	75	18	56.94	37.18	36.86	15.08	65.74
Upper Dir	35.57	69	17	38.20	28.06	27.88	26.50	71.86

Table – A.4 District Indices of Multiple Deprivations Balochistan Province								
Overall Indices of Multiple Deprivations				Sectoral Indices of Multiple Deprivations				
District	Index Value	National Rank	Provincial Rank	Education	Health	Housing Quality	Housing Services	Economic
Awaran	44.65	92	14	35.55	34.99	22.13	69.85	92.26
Barkhan	61.96	109	27	78.55	51.25	53.31	50.45	84.31
Bolan/Kacchi	42.56	86	11	44.18	30.32	26.51	51.03	77.11
Chagi	61.37	108	26	61.87	41.34	48.80	78.90	88.41
Dera Bugti	74.69	113	30	85.62	62.88	52.74	84.25	97.18
Gwadar	42.84	87	12	42.75	35.40	30.56	45.69	68.30
Harnai	22.61	25	3	41.76	19.38	14.85	27.37	17.96
Jafarabad	37.32	72	8	65.32	16.92	41.71	18.14	86.61
Jhal Magsi	40.66	80	10	45.21	17.50	41.97	42.67	78.47
Kalat	40.38	79	9	36.62	30.67	29.12	44.36	74.01
Ketch/Turbat	50.36	101	21	52.36	30.41	39.72	64.72	79.17
Kharan	45.42	93	15	45.11	27.66	30.84	57.21	87.81
Khuzdar	44.06	89	13	36.44	50.02	23.31	52.09	75.02
Kohlu	68.27	111	29	65.57	77.06	53.08	58.09	95.16
Lasbilla	58.84	106	24	66.47	45.98	48.17	57.19	83.79
Lorali	65.03	110	28	75.39	52.92	61.69	52.77	89.56
Mastung	33.80	63	7	29.13	33.47	20.21	40.23	55.68
Musakhel	61.14	107	25	80.09	36.49	49.56	64.54	91.44
Nasirabad	45.97	95	16	67.38	25.94	38.07	33.56	91.95
Nushki	54.83	104	22	58.14	32.42	52.93	61.70	80.51
Panjgur	46.11	96	17	45.86	25.47	29.51	69.14	87.44
Pashin	17.83	13	2	37.85	26.43	14.66	5.50	22.36
Qillah abdullah	26.38	41	5	44.67	37.60	19.53	11.80	32.99
Qillah Saifuallah	54.87	105	23	66.88	39.09	45.81	44.76	92.78
Quetta	13.18	5	1	25.24	33.50	9.23	4.49	11.35
Sherani	46.50	98	18	52.88	22.12	49.80	44.00	84.85
Sibbi	28.57	47	6	34.84	42.76	17.96	23.63	30.08
Washuk	48.09	100	20	46.34	28.17	30.31	68.05	95.52
Zhob	47.36	99	19	66.79	20.70	40.14	48.78	88.05
Ziarat	24.54	32	4	42.27	25.69	30.71	12.69	21.02

Appendix – B

Estimation of Household Wealth Score

Use of Principal Components Analysis (PCA) for indexing multidimensional phenomena has been well-established. Principal component analysis is simply a variable reduction procedure that (typically) results in a relatively small number of components that account for most of the variance in a set of observed variables. This technique reduces the number of relationships by grouping or clustering together all those variables which are highly correlated with each other into one factor or component. PCA produces components in descending order of importance, that is, the first component explains the maximum amount of variation in the data, and the last component the minimum. Thus, the first few components (Principal Components) account for a sizeable part of the variation in the data and subsequent components contribute very little.

However traditional PCA is best for continuous and normally distributed data as the technique assumes linear relationship between numeric variables. For category indicator variables, a team of Leiden University has developed Categorical Principal Components Analysis (CATPCA)¹³. The technique is now available in SPSS and may be applied for data reduction when variables are categorical (e.g. ordinal) and the researcher is concerned with identifying the underlying components of a set of variables (or items) while maximizing the amount of variance accounted by the principal components. The primary benefit of using CATPCA rather than traditional PCA is the lack of assumptions associated with CATPCA. CATPCA does not assume linear relationships among numeric data nor does it require assuming multivariate normal data. Furthermore, optimal scaling is used in SPSS during the CATPCA analysis and allows the researcher to specify which level of measurement (nominal, ordinal, interval/ratio, spline-nominal, & spline-ordinal etc.) in the optimally scaled variables is required.

After having a representation of the data in the component form, every household is ascribed a 'score' on each derived principal components/object using factor loading (variance in the individual attribute) as a weight and then multiplying this score with the standardized value of

¹³ Data Theory Scaling System Group (DTSS), Faculty of Social and Behavioral Sciences, Leiden University, The Netherlands.

variables. To obtain an overall score (OS) for household, scores of all principal components are summed up after applying statistical weights (shares in eigenvalues)¹⁴.

CATPCA was performed by using information on household assets and utilities, assigning weights to each asset and thus obtaining wealth scores. The assets used in these calculations were: house ownership, pacca house structure, iron, fan, sewing machine, Radio, Chairs, watches, TV, VCR, Refrigerator, air cooler, air conditioner, computer, bicycle, motor cycle, car, mobile phone, Cooking range, burners and washing machine.

The wealth index is assumed to capture long-term wealth through information on household assets, and is intended to produce a ranking of households by wealth, from lowest to highest. The wealth index does not provide information on absolute poverty, current income or expenditure levels. Wealth scores are applicable for only the particular data set they are based on. Further information on the construction of the wealth index can be found in Filmer and Pritchett, 2001.

¹⁴ It is a statistical term. The eigenvectors of a square matrix are the non-zero vectors that, after being multiplied by the matrix, remain parallel to the original vector. For each eigenvector, the corresponding eigenvalue is the factor by which the eigenvector is scaled when multiplied by the matrix.



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