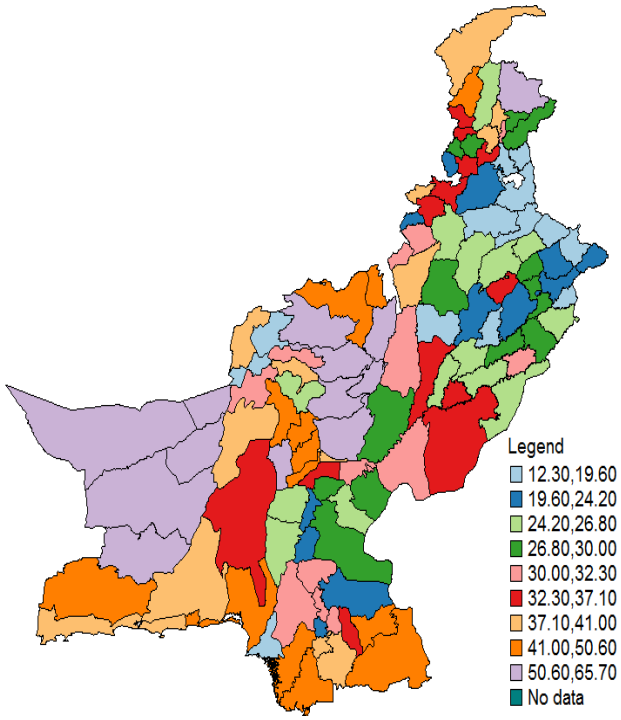
The Livelihood and Poverty Mapping Analysis at Regional Level in Pakistan



MSc Development Economics Thesis code: DEC 80433

By

Shazia Begum

Development Economics Group

Supervisor

Dr. Marrit van den Berg

August, 2015

Wageningen University and Research Centre

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Shazia Begum

751220-045-030

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Supervisor WUR

Dr. Marrit van den Berg

MSc International Development Studies

Specialization: Economics of Development

DEC-80433

ACKNOWLEDGMENT

This research has been quite an exploratory event in my life that took me back to my home country. Despite all the obstacles in the way I sailed through with the help of some of the most inspiring personalities that I ever came across in my life during this research. Firstly, I must record my deep sense of gratitude for my wur supervisor Dr. Marrit van den Berg for her guidance. Her supervision and timely suggestions made it possible for me to complete this research work. I am also grateful to World Bank Joint Japan Graduate Scholarship Program (JJ/WBGS) that financially supported me. Special thanks for the co-operation of Pakistan Social Living Standard Measurement Survey Section of Pakistan Bureau of Statistics for providing the datasets required for my research. It would be injustice if I do not mention about my father, my sister, my brothers, and especially my deceased mother whose prayers still overshadow in all the events of my life. Similarly, I am so very much indebted to my friends and fellow colleagues, Rayke Berendsen , Pauline van Pommeren and Banchayehu Tessema Assefa for their countless advices and suggestions without which the quality of this project as it is now would have been a distant dream.

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ABSTRACT

An attempt has been made to map the incidence of uni-dimensional and multi-dimensional poverty simultaneously arguably for the first time in Pakistan. While multi-dimensional poverty map is calculated using PSLM 2010-11; small area estimation technique is utilized to map uni-dimensional poverty using both nationally representative HIES (Household Integrated Economic Survey) and district-level representative PSLM (Pakistan Standard of Living Measurement) for the same year of 2010-11. The result indicates the existence of spatial distribution of poverty pockets in each of the four provinces of Pakistan. Furthermore, it is also observed that these pockets of poverty are more concentrated in the desert and mountains regions of the country. Along with this, the poverty mapping exercise has shed light on the fact that poverty has a negative feedback effect implying that underdevelopment breeds further underdevelopment. Moreover, one overwhelming pattern observed is that extent of poverty exuberates when attention is turned to multi-dimensional poverty from uni-dimensional poverty measure. This hints towards a largely underdevelopment social sector in the country. However, as mentioned above, the performance of the social sector also has a geographical character with Punjab having a relatively stronger social sector track-record. Resultantly, Sindh, KPK, and Balochistan are lagging behind drastically in terms of social sector performance. Subsequently, it is found that Balochistan and KPK are the poorest regions multidimensionally along with Southern Sindh. In light of this, it is suggested that nationally representative policies for poverty alleviation integrate need for geographical poverty targeting.

Keywords: *Poverty mapping, Small Area estimation technique, multi-dimensional poverty, spatial distribution of poverty ,poverty alleviation.*

Chapter 1

Introduction

The reality of poverty and its reduction has been an integral policy parameter in any standard development policy agenda. This assertion can be well attested to by the fact that both Millennium Development Goals (MDGs) that were promulgated at the turn of the 21st century and the recently announced Sustainable Development Goals (SDGs) made concerns for poverty reduction as a Primus inter pares. Since any poverty reduction approach is incomplete without an apt assessment of the scale of poverty, a torrent of literature has spawned to measure its extent in different countries.

Present trend in research on poverty assessment has also emphasized on geographical targeting of poverty highlighting the fact that such targeting of small administrative areas can help address neglected areas. Hyman *et al*., (2005) have also suggested that poverty targeting on geographical grounds can enhance cost effectiveness of public development expenditures. Srivastava (2009), working on poverty mapping in India, contends that it can facilitate micro planning as well. Such viewpoints are also shared by Baker and Grosh, 1994; Bigman and Fofack, 2000 and Elber *et al*., 2007.

Geographical targeting of poverty necessitates measurement of poverty at the lowest possible disaggregated level and subsequently some methodological developments have also been made in this stead. Such methodologies attempt to establish linkages between some small but nationally representative survey data with a large census data through robust statistical techniques (Ghosh and Rao, 1994; Rao, 2003). It is observed that application of such methods is particularly popular among developing countries (Minot, 2000; Farrow *et al*., 2005; Kam *et al.*, 2005; Amarasinghe *et al*., 2005 Bellon *et al*., 2005; Haslett *et al*., 2008; Cuong *et al*., 2010; Pathak & Mishra, 2011).

Poverty mapping is mostly confined to uni-dimensional measures of poverty which are based on standard money-metric measures of welfare. It is now widely held that non-income indicators are stronger measures of welfare (Chakravarty, 2008). This assertion is based on Sen's capabilities approach which compares poverty to human inabilities such as lack of freedom (Sen, 1985). Subsequently, it is further emphasized that poverty assessment based on money-metric measures of welfare does not capture the gist of poverty (Duclos, J. Y., Sahn, D. E., & Younger, S. D. 2006). This debate has ensued methodological advances that measure poverty using deprivations in non-income dimensions of human welfare like lack of sanitation facilities (Petras & Veltmeyer, 2007; Costa, 2003). The most popular measure of this multidimensional poverty is developed by Oxford Poverty & Human Development Initiative which is called Alkire & Foster multidimensional measure of poverty (Alkire & Foster, 2007). Despite scarcity of multidimensional poverty mapping, some of the studies have attempted to map multidimensional poverty using Alkire and Foster method like Neubourg *et al*., 2010; Cobo *et al*., 2013; Stats SA, 2014.

In Pakistan's perspective, the poverty reduction policies have usually recorded lackluster performance. It is observed that such policies in Pakistan are marked by disregard for spatial distribution of poverty. Arif (2012) evaluating Pakistan poverty reduction strategies historically in the context of China's experiment with poverty reduction also substantiate this argument stating that "no attempt has, so far, been made to target poor regions for development and poverty reduction". IMF (2013) also mentions the fact that some of poverty reduction strategy tools like micro credit is also not extended keeping in mind the geographical pockets of poverty in Pakistan. This, however, is not hard to understand, since the poverty assessment literature in Pakistan has not disaggregated poverty measures at the lowest possible level on consistent basis.

There are few exceptions to this case. Jamal (2007) combined HIES 2004-05 and PSLM 2004-05 using small area estimation technique for the first time in the country to measure the incidence of poverty among all the districts of Pakistan's provinces. However, Jamal (2007) failed to paint a clear picture of poverty spread across the country as it only concluded that rural Balochistan and small towns or cities are most vulnerable. Furthermore, it is also observed that Small Area Estimation technique is not used in its true spirit in this study since it does not calculate probabilities by using standard error to obtain district level poverty estimates. Davis (2003) outlines at length that standard errors are used to calculate sub-regional poverty incidence. Jamal (2013) updated his previous estimates using nationally representative HIES 2010-11 survey and district-level representative PSLM 2010-11. However, the same methodological pitfalls are retained in this study as well. Another drawback noted is that both of these studies models consumption expenditure at rural and urban level only despite the fact that HIES survey data in Pakistan is representative at provincial level. Similarly, Cheema *et al*., (2008) using Multiple Indicators Cluster Survey (2003-2004) mapped poverty incidence for Punjab province only. Said *et al*., (2011) disaggregated poverty at district level using PSLM 2008-09 through Asset Index and Basic Need Index. Burki *et al*., (2015) also used asset index to map poverty but only in case of Punjab. In the same vein, Naveed & Ali (2012) mapped multidimensional poverty in districts of Pakistan using PSLM 2008-09. While Jamal (2012) estimated district level multidimensional poverty estimates using Alkire and Foster method but its choice of dimensional indicators seems arbitrarily and not based on any specified reference like MDGs.

In the context of these limitations noted in the literature internationally and nationally in Pakistan, the present study attempts to bridge these gaps by first updating the multidimensional poverty maps for each province of Pakistan and for Pakistan as a whole at district level using latest available data of PSLM 2010-11 and adopting Alkire and Foster method. It must be noted here that choice of dimensional indicators and their respective cut-offs points are compared to and based on the Sustainable Development Goals mostly while partial comparison is also made to Millennium Development Goals. Uni-dimensional maps of poverty are also made using Small Area Estimation. The district level estimates for each district of Pakistan are calculated by fitting consumption model for each of the four provinces of the country along with incorporating

standard error in calculating probability of being poor. Finally, in contrast to other studies in Pakistan the present study also estimates poverty at divisional level. Moreover, the present study is arguably first of its kind in Pakistan that maps both uni-dimensional and multi-dimensional poverty estimates at district level for each province and Pakistan as a whole simultaneously. It is expected that this study can contribute in enhancing the understanding regarding the spatial distribution of poverty and hence, may facilitate in geographical poverty targeting in Pakistan. The study can also highlight districts in which social sector requires attention of policy makers and districts in which standard income-promoting measures can stand in good stead. It is contended that in this way social dividend of national policies can be increased. The pertinent research objectives are delineated as hereunder:

1. To map the multidimensional and uni-dimensional poverty of the four provinces of Pakistan i.e. Punjab, Sindh, Khyber Pakhtoonkhwa and Baluchistan at division and district level.

2. To compare the multidimensional poverty index to uni-dimensional poverty in each district and division of Punjab, Sindh, Khyber Pakhtoonkhwa and Baluchistan.

The report is divided into five chapters. Second chapter covers the conceptual framework of the study while third chapter elaborates in detail the methodology used for analysis. Fourth chapter explains the empirical results of the study and the final section concludes.

Chapter 2

Conceptual framework

This chapter tackles the conceptual building blocks on which the ensuing chapter of methodology is based. Since, the study also measures multidimensional poverty which relies on non-income approach to welfare section 2.1 presents a detailed discussion on wellbeing. Similarly, section 2.2 presents the framework of small area estimation while the final section 2.3 covers Alkire and Foster measure which is used for multidimensional poverty calculation.

2.1 The concept of wellbeing

World Bank (2000) relates poverty to well-being in the most succinct way by regarding deprivation in well-being as poverty. The subsequent question that hails from this is what constitutes well-being (Haughton & Khandker, 2009). The conventional answer revolves around control-over-commodities/resources argument which subsequently uses monetary indicators like income or consumption expenditure as a proxy of well-being. This argument is further based on the pretext that most of the non-income indicators like health, education, and assets etc. are positively correlated with income (Bourguignon & Chakravarty, 2002). However, Sen (1987) augments this parochial argument by defining well-being in a broader sense relating it to functional capability of any individual in a society. Based on this, in spite of income well above poverty line an individual can be poor if he can't discharge basic functioning in a society due to certain incapability's like lack of education or health. Hence, poverty is regarded as a state of impotency.

Some other studies like Ravallion & Chen, 1994; Bourguignon & Chakravarty, 2003; Caroline, 2003; and Maltzahn and Durrhiem ,(2008) also criticize income as a measure of well-being in poverty measurement. Sen (1985, 1987, 1992, 1993, 1994, and 1997) distinguishes between commodities, human functioning/ capability and utility as follows:

Commodity → Capability (to function) → Function(ing) → Utility (e.g. happiness).

Sen(1992) says commodities are the goods and services that can be used for functioning while capabilities relate to the functions and freedom of choice of living. Such deprivations can be lack of food, housing, education, and health facilities, land, etc.

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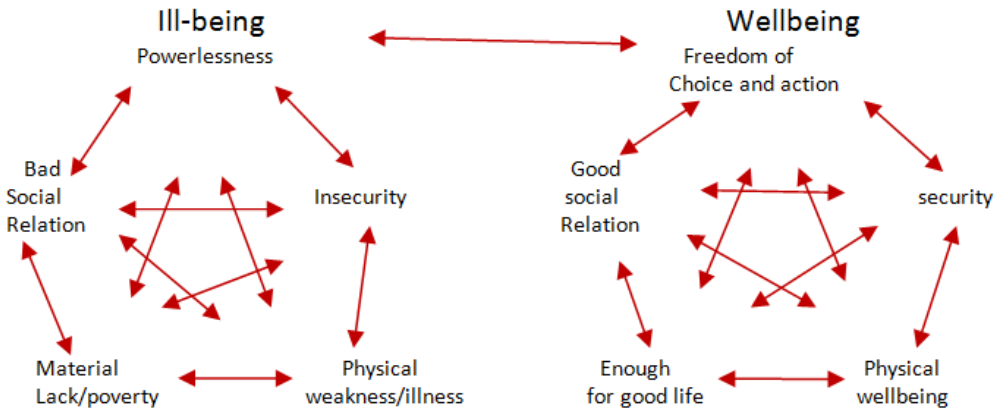


Figure 2. 1: Development as good change from ill being to wellbeing[1]

2.2 Poverty Mapping

In monitoring the performance of different countries towards MDGs, World Bank relied on poverty mapping approach using income-poverty as the measure of poverty. Nevertheless, poverty mapping is not only restricted to income-poverty mapping and can be categories into four major groups.

- **Economic.** Monetary indicators of the well-being of the household which include consumption and non-consumption expenditure and the household income. These measures are mostly used for the poverty analysis. The well being is also analyzed by taking the non-monetary proxies such as the productive household assets.
- **Social.** Other none-monetary indicators of the household like the access of quality of education, health, basic needs of life etc.
- **Demographic.** The demographic indicators of the household like the age, gender, household size etc.
- **Vulnerability.** This include the capability of household to shocks that can affect the livelihood such as the food insecurity ,political stability, environmental change and the alternatives of the livelihood etc

Such techniques estimate poverty at "small area" levels representing subset of a larger population. The term small area refers to small geographical units such as districts and municipalities. Census usually provides limited information on required variables and the survey data usually have the coverage problem. The "direct method" to measure such estimates is based on some national survey data. However, such approaches eventuates poverty measures with large standard errors and hence, are unreliable. This is overcome by the so-called "indirect method" of small area estimation which enhances the reliability of the poverty estimates by linking the variable of interest with a large census data through a model (Ghosh & Rao, 1994; Rao 1994;

[1] 1 Poverty in Focus, International Poverty Centre United Nations Development Programme , December ,2006

Rao, 2003; and Jiang and Lahiri, 2006). These methods are model-based and have been well developed in the literature (Marker, 1999 and Noble *et al*., 2002; Elbers *et al*., 2003).

Small area estimation is one of the techniques for poverty mapping. This technique requires two datasets; one is used to estimate the function of the target variable while the other data set is used to estimate the target variable among a larger proportion of the population. The first step is to estimate the model statistically representative at regional level with explanatory variables common in both data sets. The following equation is estimated using the ordinary least square.

$$\ln(C) = \alpha + \beta_1 X + \beta_2 V + \varepsilon \quad (1)$$

Where the C is the per-adult consumption, X is the vector of household level characteristics and V is the geographical characteristics.

$$F_{ij} = 1 \; if \; lnC_{ij} < lnz; \quad (2)$$

$$F_{ij} = 0 \; otherwise$$

Where F in equation (2) above nominates a household poor or non-poor, if its per capita adult equivalent consumption expenditure is below or above the poverty line z respectively. Following Hentschel *et al.,* (2000), household level explanatory variables are multiplied by the corresponding parameter estimate i.e.β_i for each ith variable obtained from the equation (1). This gives the simulated log of per capita adult equivalent consumption expenditures for each household in the census data. The estimated value of indicator, represented by $X_i'\beta$ in equation (3), is used to be determining the probability of a household being poor in terms of a given threshold based on per capita adult equivalent consumption.

$$E\left(\frac{F_i}{X_i}, \beta, \sigma\right) = \emptyset\left[\frac{lnz - X_i'\beta}{\hat{\sigma}}\right]^2 \quad (3)$$

Where $\emptyset$ the standard normal distribution and z is poverty line in money metric units. Similarly, β is the vector covariates while $\hat{\sigma}$ is the estimated error from the model in equation 1. This equation gives the probability that a household is poor.

$$F_i^* = E\left(\frac{F_i}{X_i} = i, \hat{\beta}, \hat{\sigma}\right) = \emptyset\left[\frac{lnz - X_i'\hat{\beta}}{\hat{\sigma}}\right] \quad (4)$$

Regional poverty, F is found with

$$F = \frac{1}{N}\sum_{i=1}^{N} F_i \quad (5)$$

N is the number of household in the specific region. Expected poverty is found with:

[2] Davis, B. (2003). Choosing a method for poverty mapping. Food & Agriculture Org.

$$E\left(\frac{F}{X},\beta,\sigma\right) = \frac{1}{N}\sum_{i=1}^{N} E\left(\frac{F_I}{X_i},\beta,\sigma\right) \quad (6)$$

The mean probability of households being poor is calculated as:

$$F^* = E\left(\frac{F}{X},\widehat{\beta},\widehat{\sigma}\right) = \frac{1}{N}\sum_{i=1}^{N} \emptyset\left[\frac{lnz - X_i'\widehat{\beta}}{\widehat{\sigma}}\right] \quad (7)$$

2.3 Conceptual framework for multidimensional poverty

In the present multidimensional poverty is assessed using Alkire and Foster methodology. The method is based on two steps only i.e. aggregation and identification. The aggregation steps involve how seemingly different indicators measured in different units are aggregated. This step is accomplished using matrix *y* of list of indicators as the one mentioned hereunder. Where y_{1j} means *j* indicator of human welfare for household 1 and y_{1c} means that observations from household 1 is taken for upto *c* indicators. Similarly, observations are taken from *n* households on indicators *j* to *c*. These indicators of welfare may be years of schooling or access to some facility like health.

$$y = \begin{bmatrix} y_{1j} & \cdots & y_{1c} \\ \vdots & \ddots & \vdots \\ y_{nj} & \cdots & y_{nc} \end{bmatrix}$$

$$z = \begin{bmatrix} z_j & \ldots & z_c \end{bmatrix}$$

Furthermore, depending on the specified poverty line or cut-off point for each indicator labeled z_j in the above row-vector z a censored matrix is obtained. Matrix z is the vector of such cutoff points. As for censored matrix it is measured by replacing 1 against each household who is deprived in any indicator while non-deprived household are coded as 0. It is denoted by g^0 of zeros and ones and looks like following:

$$g^0 = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$

The ones and zeroes are entered in this case just to show how it looks like. Row-wise additive operation is carried out on this matrix to obtain another vector *c* which shows the sum of indicators in which a certain household is deprived. Henceforth, using dual cutoff point which assigns a value to *k* that is less than total number of indicators households are further screened that are below this value of *k* as only those households are retained with non-zero value that has an aggregated sum of deprived well over or equal to *k*. The column vector *c* is now label as *c(k)*. This vector is further divided by the number of total indicators and averaged across each household to get average deprivation A which is then multiplied by headcount ratio H to estimate adjusted headcount *M(z,y)*.

Chapter 3

Target Area

The study area of this research is Pakistan bearing coordinates 33.6667° N, 73.1667° E. It is situated in the South Asian region and is sixth most populous country with a geographical area that is 36th largest in the world[3]. It is bordered by India in the east, Iran in the south west, Afghanistan in the north east, China in the north east and Arabian ocean in the south. A neighborhood of this sort has given Pakistan a tactical and strategic importance in the geo-political arena. Moreover, this significance is not new as the region comprising Pakistan has been a frequent gateway to some of the major conquerors of the Indian subcontinent. In modern times, Pakistan's prized vicinity has also borne notable implication on its economy and hence, its sub-regions. These sub-regions referred to as province - Punjab, Sindh, KPK, Balochistan – have economic dynamics of their own and since the present study also focuses on these provinces it would be worthwhile to conduct a situation analysis of these provinces and Pakistan on a whole.

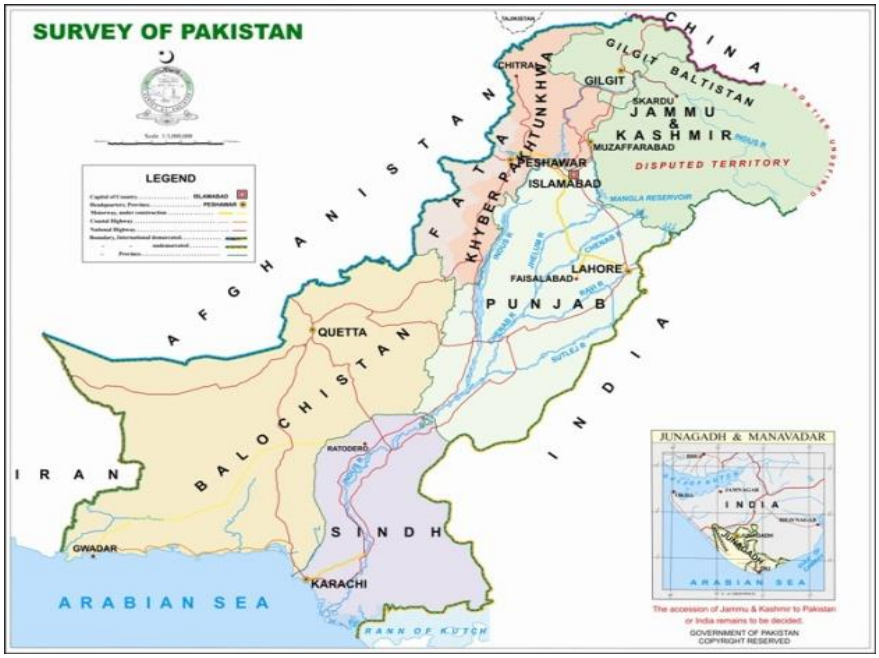


Figure 3.1: Pakistan Map[4]

[3] https://en.wikipedia.org/wiki/Pakistan

[4] http://www.surveyofpakistan.gov.pk/images/map.jpg (accessed on 26-07-2015)

3.1 Situation analysis for Pakistan

The socio-economic realities of Pakistan have undergone drastic changes since its inception in 1947. However, it is observed that some have been incessant. One of these is that agriculture still retains its significance in the socio-economic life of the people of Pakistan. While its share in GDP is no longer what it was four decades ago it still is the largest employer of labor force in the country. However, other sectors like manufacturing and particularly services have witnessed marked improvements. These changes installed Pakistan on a growth trajectory that has established Pakistan as the one of the Next Eleven economies earmarked by Goldman Sachs as the ones having most potential to be among world's largest economies[5]. However, the recent macro challenges like energy shortages, corruption, and poor performing public services like train transportation have dinted the economy and intercepted its growth trajectory. Along with this, Pakistan has also borne its share of shocks like terrorism and floods. It must be noted here that specter of political instability has been a recurrent problem of Pakistan, so much so, that despite being its more than a half century of history, Pakistan still remains a nascent democracy. Such trends have resulted in weak institutions which perpetuate the already entrenched nuisance of rent seeking. All of these factors have resulted in a high incidence of poverty in the country. By one measure, using a benchmark of 2 dollars a day, about two-thirds of the population is stuck in poverty[6].

3.2 Situation analysis for Punjab Province

Punjab is Pakistan's bread basket catering for a better share of the population of the country. This mainly is a result of well-irrigated landscape of the province. Moreover, its cash crops like wheat, cotton and sugarcane Along with this, Punjab is also the major contributor to the national pool of professionals as well as technical man power. Punjab is the most populated province of the country with 56 percent of the total national population living in it (Livingston and O'Hanlon, 2011). Punjab's share in the economic pie of the country is 57 percent of gross domestic product in the year 2010 up marginally from 54.7 percent in 2000[7]. This marginal increase can be attributed to the massive power crisis that rocked the nation during the late 2000s and still persists at the time of writing and is assuming significance of mammoth proportions. One estimate claims that this energy crisis cost Punjab 2 to 3 percent of GDP[8]. Resultantly, the income per capita in the province also declined which is also the second largest in the country behind Sindh[9]. Similarly, floods, poor agriculture performance and terrorism remain some the

[5] Goldmand Sach's MIST Toppling BRICs as Smaller Market Outperforms. http://www.bloomberg.com/news/articles/2012-08-07/goldman-sachs-s-mist-topping-brics-as-smaller-markets-outperform

[6] Where population growth poses the greatest challenge. https://www.populationinstitute.org/external/Final-DVI-report.pdf

[7] Punjab's lost growth momentum. http://www.dawn.com/news/719999/punjabs-lost-growth-momentum

[8] Punjab's economic performance. http://tribune.com.pk/story/436058/punjabs-economic-performance/

[9] Punjab's economic importance. http://tribune.com.pk/story/378252/punjabs-economic-importance/

major challenges facing the economy of Punjab. Nevertheless, Punjab remains the most industrial area of the country with sub-regions noted for production of sports and surgical instruments like Sialkot, IT production like Lahore and textile production in case of Faisalabad.

3.3 Situation analysis for Sindh Province

The economy of Sindh is geared mostly by Karachi which is sole operative coastline of the country while partial contribution from Hyderabad is also noted. One the major reason for reliance on Karachi is due to the fact a better part of the province is covered by the notorious desert of Thar which is the 17th largest in the world. In spite of this, agriculture is an important part of the province with cotton, rice, wheat, sugar cane, bananas, and mangoes being some of the major crops in the region. However, Sindh's main economic challenge is that of a lagging social sector which is exuberated by the political instability in the province especially Karachi. Sindh is marked by low enrollment rate of children aged 4-9, a high infant mortality rate of 95 per 1000 births, and only 10 percent of rural areas have access to potable water[10]. A major point of concern is the problem of social instability as events of sectarian and religious clashes have frequent marred and dented the performance of the country.

3.4 Situation analysis for KPK Province

KPK is home to the oldest city in South Asia i.e. Peshawar, and its Khyber Pass has witnessed rumbling sounds of armies arguably more than any other city in South Asia. As a result, the people of the region have assumed a warlike demeanor clouded behind the cover of conservatism. Its proximity with Afghanistan which has been the centre of geo-political show-down since the invasion of Soviet Union has caused unprecedented damage to its economy. Terrorism and militancy is so much embedded in the province that despite being accounting for 13.7 percent of the nation's population, it only contributes 8 percent to its GDP[11]. KPK's situation as of late has turned into a fiscal crisis of its own because the brunt of military response to militancy has been borne by provincial and national exchequer[12]. Subsequently, this comprises the efforts of the province to reinvigorate to an already poor side of its social sector performance especially in health sector. So much so, that as per World Health Organization, Peshawar which is the capital of the province is the world's largest reservoir of Polio[13].

[10] Sindh's Development: Issues and Agenda. http://siteresources.worldbank.org/PAKISTANEXTN/Resources/Pakistan-Development-Forum/Sindh.pdf
[11] Economics and extremism. http://www.dawn.com/news/844412/economics-and-extremism
[12] Pakistan's Taliban fight threatens key economic zone. http://www.wsj.com/articles/SB124237648756523343
[13] WHO declares Peshawar world's largest reservoir of Polio. http://www.dawn.com/news/1080926

3.5 Situation analysis for Balochistan Province

Balochistan has become synonyms with underdevelopment and natural gas in the context of Pakistan. Separatist movements in the province are active. As a result of this, efforts to tap into the province's resource base have been undermined. This is well gauged by the fact that the installation of Gwadar port – which will be the largest of the country – didn't start until 2000s. Among other resources present in the province are coal, copper, lead, gold, and other minerals. As in case of KPK, Balochistan's social sector is well below the acceptable limits of human development. Along of this, some of the major challenges facing the province are: 1) low growth; 2) low urbanization; 3) low labor productivity; 4) low quality jobs; 5) high population growth; and 6) gender-gaps[14]. However, as in case of other provinces of the country, agriculture and livestock sector are dominant in the province.

[14] Pakistan Balochistan Economic Report. http://siteresources.worldbank.org/PAKISTANEXTN/Resources/293051-1241610364594/6097548-1257441952102/balochistaneconomicreportvol2.pdf

Chapter 4

Methodology and data

This chapter outlines the procedures related to the application of small area estimation and multidimensional poverty estimation in case of Pakistan. Data description is chalked in section 3.1. Section 3.2 deals with model formation and also outlines how small area estimation technique is conducted in the context of the present study for calculating poverty at division and district level. Section 3.3 provides information on how Alkire and Foster method for multidimensional poverty estimation is carried out using PSLM data for the year 2010-11. Finally, section 3.4 covers how estimated disaggregated poverty measures are displayed on maps.

4.1 Data

The SAE is implemented on Pakistan's *Household Integrated Economic Survey* (HIES) which is representative at national and provincial level and *Pakistan Social and Living Standards Measurement (PSLM*) data which is representative at district level. These datasets are taken for the same year of 2010-11 both of which were complied by Pakistan Bureau of Statistics (PBS). HIES basically covers the income and expenditure profile while PSLM focuses more on social facets of households.

4.1.1 Description of HIES & PSLM

The Household Integrated and Economic Survey (HIES) was conducted in 1963 and since then it has been issued irregularly. HIES is representative at provincial and national level. The data collection technique employed is two-stage stratified random sampling with all urban and rural areas constitute the universe apart from military restricted areas. The sampling frame in case of urban areas consists of enumeration blocks that includes cities and towns with about 200-250 households in each enumeration block. These enumeration blocks are further divided into low, middle, and high income categories. It must be mentioned here that cities with population greater than or equal to half of a million are considered an independent stratum while the other small urban areas are clustered together into an independent stratum. However, contrary to this each village is regarded as an independent stratum in case of rural areas. This, however, is not so in case of Baluchistan where administrative divisions are regarded as stratum. Subsequently, as for urban areas from each stratum enumeration blocks are randomly selected which are called primary sampling units. Furthermore, households are picked from each sampled PSUs. The households are treated as Secondary Sampling Units (SSUs).In urban area 12 and in rural areas 16; SSUs are selected by systematic sampling technique. As for PSLM, all the details from enumeration blocks in urban areas to sampling technique used are same as that in HIES. However, the only difference is in how strata are defined. In case of PSLM, apart from large cities like Islamabad, Lahore, Gujranwala, Faisalabad, Rawalpindi, Multan, Bahawalpur,

Sargodha, Sialkot, Karachi, Hyderabad, Sukkur, Peshawar, and Quetta all the other urban districts are considered as independent stratum. While the same also goes for rural districts. This is in contrast to HIES, where large cities and clustered of small cities/towns are bundled to from stratums and villages are deemed as stratum in case of rural areas. Hence, the number of sampled households as a result of this procedure in HIES and PSLM are shown in table 4.1.

As for coverage, the major purpose for the HIES survey was to chart the economic aspects of households which are incorporated in its consumption module. In this way, HIES is mostly used in ascertainment of monetary poverty in the country. However, information of demographics, education, health, and employment/income are also collected. On the other hand, assessment of social sector performance in the country is the main reason for compiling PSLM and hence, calculation of non-income poverty is one of the major uses of this data.

Table 4. 1: Coverage of Households in HIES & PSLM

	HIES		PSLM	
Province	**PSUs**	**SSUs**	**PSUs**	**SSUs**
Punjab	512	6952	2344	32380
Sindh	296	4097	1407	19622
KPK	208	2954	849	12479
Balochistan	164	2335	813	12065
Total	1180	16338	5413	76546

Source: PSLM, 2010-11

4.2 Model formation and SAE

This section deals with the specification of the consumption model outlined in chapter 2 in the context of the present study. The set of explanatory variables belong to varied categories and represent households-level characteristics along with some characteristics pertinent to household head. Moreover, some of the covariates are also selected as auxiliary or control variables. The choice of these variables is not arbitrary and hails directly from the review of literature on modeling of consumption function based on survey data (Parker, 1999; Filmer, 2000; Jayaraman and Findeis, 2005; Chaudhry & Rehman, 2009; Fidrmuc & Senaj, 2012; Moaz & Neeman, 2008; Sewanyana, 2009; Kudebayeva and Barrientos, 2013.

The list of covariates is tabulated in table 4.3 along with their detailed description. Furthermore, unless otherwise stated, no serious correlation is found between the covariates that are continuous. This is adjudged by using Pearson correlation matrix which measures correlation among continuous variables only. The results of this matrix are presented in table 4.2. Since consumption function is estimated on survey data of HIES, the selected correlates are picked from different sections of HIES survey and merged to form one independent file to enhance operation convenience. The STATA do-file used to serve this purpose is illustrated in Appendix B.1. It is noted here that this do-file is also valid for PSLM since definitions as well as names of relevant variables and their respective files are consistent with that of HIES.

As for the dependent variable, consumption expenditure per adult equivalent is used. The rationale for using adult equivalent consumption is that members of a household with different

ages have different consumption requirements while the reason for opting for consumption expenditure is that consumption expenditure are deemed more reliable than income estimates especially in case of developing countries which are marked by a dominant agriculture sector. Haughton and Khandker (2009) also emphasis the invalidity of income estimates noting that capital gains which constitute income measurement like increase in the worth of fixed assets and farm animals are difficult to calculate. In calculation of consumption, expenditure on food items and non-durable goods and services are used. Appendix B.2 presents the STATA do-file for aggregation of these consumption components and appendix B.3 constitutes do-file for calculating household size by incorporating the economies of scale in consumption expenditure among household's members. It also shows how adult equivalent consumption expenditure is calculated and merged with datasheet of covariates complied earlier. Furthermore, the dependent variable is transformed into log scales and subsequently merged with covariates file to set up the final file on which log-linear consumption model is estimated as specified in equation 1 in chapter 2.

Having finalized the covariates and the consumption expenditure per adult equivalent, survey regression is used to estimate equation 1 in chapter 2 with the aim to account for the weighting structure of HIES for each province. Moreover, robust standard errors of beta coefficients are used and no additional command has to be specified for it since; survey regression in STATA displays robust standard errors for estimated beta coefficients by default. This constitutes the first step in Small Area Estimation. As standard error of the model is used to estimate poverty incidence at district and division level it is noted that survey regression in STATA does not calculates standard error of the model. Subsequently, this non-availability is overcome by calculating standard error of the model for each log-liner consumption equation i.e. for each province. In the second step, the beta coefficients thus obtained are interpolated to district sheet of variables to simulate consumption expenditure at district as well as division level which forms the second step of the method. In contrast to other studies in Pakistan, standard errors are used to first find z-scores for each household which are then used to calculate probability of being poverty of each household using STATA normal function. These probabilities are found using equation 4 in chapter 2 where z i.e. the poverty line is the official poverty line Rs. 1745 for the understudy year 2010-11 (PBS, 2014).

Table 4. 2: Pearson Correlation Matrix

	HH size	Proportion of adults	Proportion of females	Proportion of children	Assets	No of rooms	Age
HH size	1						
Proportion of adults	-0.1095	1					
Proportion of females	-0.0083	0.0586	1				
Proportion of children	0.27	-0.2062	0.0568	1			
Assets	0.1061	-0.0028	0.025	-0.1986	1		
No of rooms	0.3337	0.0432	0.0014	-0.1382	0.4537	1	
Age	0.1866	0.3681	-0.0474	-0.3709	0.1569	0.2463	1

Source: Author's Calculation using PSLM 2010-11

Table 4. 3: Description of Covariates for consumption function

Category	Variable	Variable type
Household Profile	Household size	Continuous
	Proportion female (fraction)	Continuous
	Proportion of children	Continuous
	Proportion of adults	Continuous
Household head characteristics	Head no spouse	**Dummy Variable** Widow/Unmarried/Head=1 Otherwise = 0
	Head is female	**Dummy Variable** Female = 1 Male = 0
	Age of household head.	Continuous
	Education of household head	**Categorical Variable** Illiterate = 1 Primary Education =2 Secondary Education = 3 Degree education = 4
	Type of employment of household head	**Categorical Variable** 1. Not employed 2. Head has employed < 10 3. Head has employed >10. 4. Head is self employed. 5. Paid employee. 6. Unpaid family worker 7. Head is own cultivator. 8. Head is share cropper. 9. Head is contract cultivator.
Household characteristics	House ownership status	**Dummy Variable** Personal residence (hired or not hired), without rent. (not-deprived) = 1 Deprived otherwise = 0
	Source of fuel	**Dummy Variable** Firewood, Sticks, Coal, and Wooden Coal dung cake (Deprived) = 0 Gas, Kerosene oil and electricity (Not deprived)= 1
	Variable	**Variable Type**
	Source of lighting	**Dummy Variable** Electricity, gas, kerosene oil (not deprived) = 1 Otherwise deprived = 0
	Source of drinking water	**Dummy Variable** Open well, river, tanker, and others (deprived) = 0 Open well, river, tanker, mineral water = 1
Household Characteristics	Type of toilet	**Dummy Variable** Digged ditched, Flush system connected to sewerage, flush system connected to septic tank. (not deprived) = 0 Otherwise deprived = 1
	Type of roof	**Dummy Variable** RCC/RBC, iron & cement (not-deprived) = 1 Deprived Otherwise = 0
	Number of rooms	Continuous

Category	Variable	Variable type
Assets	Household has the Agriculture land	**Dummy Variable** Yes = 1 No = 0
	Household has livestock	**Dummy Variable** Yes = 1 No = 0
	Household has car	**Dummy Variable** Yes = 1 No = 0
	Household the television	**Dummy Variable** Yes = 1 No = 0
	Household has Refrigerator	**Dummy Variable** Yes = 1 No = 0
	Household has Motorcycle.	**Dummy Variable** Yes = 1 No = 0
	Household has A/C	**Dummy Variable** Yes = 1 No = 0
	Household has Washing Machine	**Dummy Variable** Yes = 1 No = 0
	Household has Sewing Machine	**Dummy Variable** Yes = 1 No = 0
	And the number of other assets.	**Continuous**

Source: Author's Calculation

4.3 Multidimensional Poverty

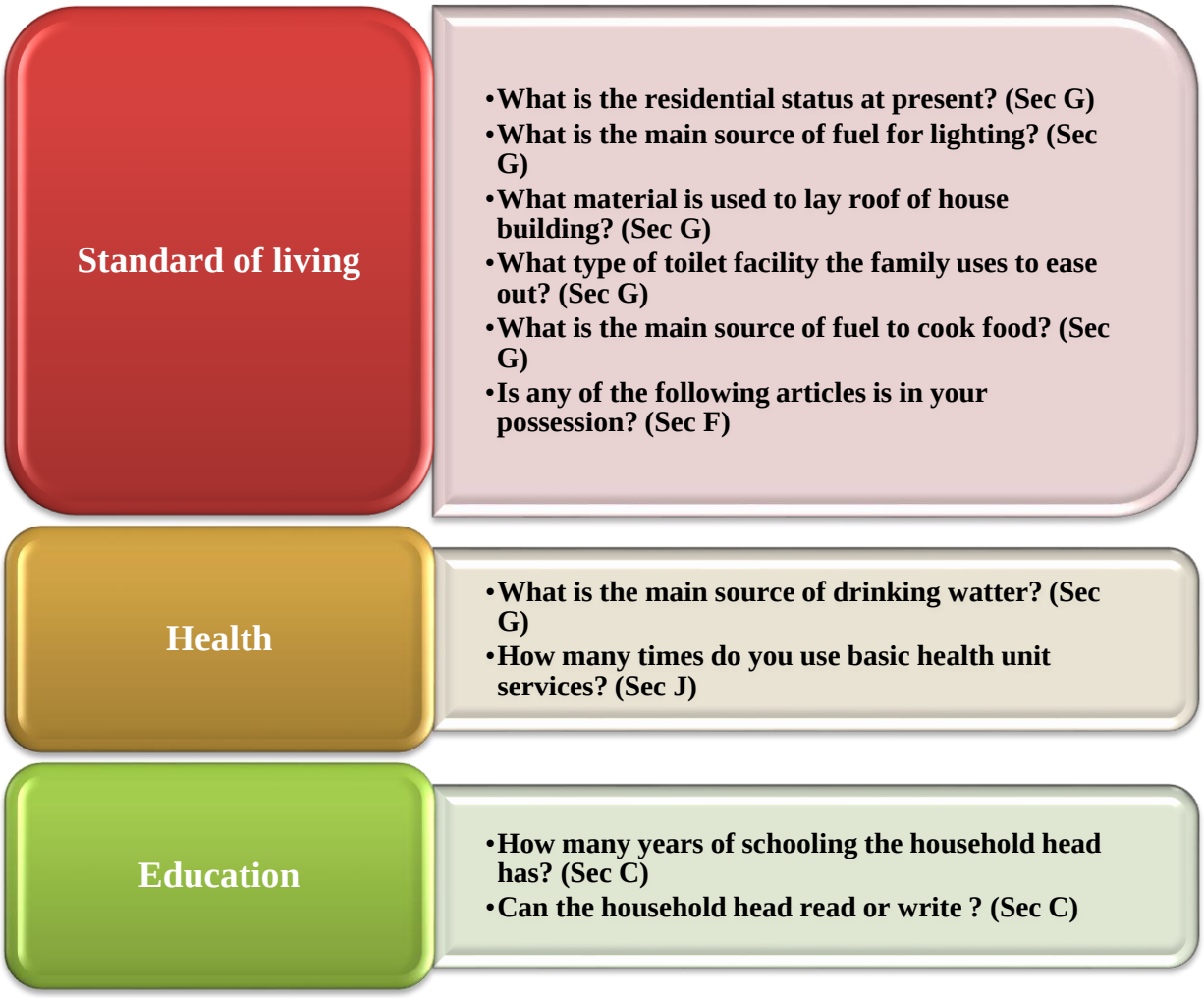
The non-income indicators for measuring multidimensional poverty using alkire and foster method take most of the variables from section G of PSLM 2010-11 at district level. However, some of the non-income indicators are also taken from section J and section C & section F. The relevant questions in their standard HIES forms taken up from different sections are shown in figure 4.1. The 10 non-income indicators are bundled into three dimensions of standard of living, health and education. There is dual cut off approach is used. The deprivation cut-off is based on the MDGs and SDGs (Appendix C) In case of first indicator of standard of living those households are deemed deprived if they are living on rent or subsidized rent. In STATA this variable is recoded accordingly and new labels are subsequently attached to that variable to designate whether the household has ownership or no ownership. Similarly, as for the second indicator in living standard of source of fuel lighting is adjusted in STATA by labeling electricity, gas, and kerosene oil as improved electricity sources while the remaining like candle, fire-wood, and other sources are regarded as not improved. The roof indicator is recorded by naming those households as having an improved roof type who have roof made up of RCC/RBC,

Iron/Cement sheets or other while not improved in case of wood/bamboo. The fourth indicator in this dimension is recoded in STATA by considering those households deprived whose toilet facility is not available, or uses a digged ditch, or a flush connected to open drain, or other sources of easing out while those using flush system (linked to sewerage), flush system (linked to septic tank), or privy seat are considered not deprived. The fifth indicator in this dimension of source of fuel for cooking is recorded by considering households having an improved source of cooking fuel who are using electricity, gas, or kerosene oil as a source of fuel of cooking while other sources like cow-dung cakes, coal/wooden coal, fire-wood, sticks etc. or other sources are labeled as not improved. Another non-income indicator taken from this section G is that of water source which comes under the health dimension. It considers households as having safe water drinking source if they use tap (in home), tap (outside home), hand pump, water motor, covered well, tanker truck/water fetcher, or mineral water. Similarly, those using open well, river/stream/pond etc. or any other sources coded as not using safe drinking water.

The last indicator in standard of living dimension related to assets assigns a value of 1 to household if it possesses one of the following assets: 1) agriculture land; 2) car; 3)television; 4) refrigerator; 5) motorcycle; 5) AC; 6) washing machine or; 7) sewing machine. In order to accomplish this Sec F of PSLM 2010-11 at district is used. As for the other indicator of health dimension of frequency of visits to basic health units by household, Sec J is used. The relevant question in PSLM2010-11(district level) has a total of four options; 1) not at all; 2) once a while; 3) often; and 4) always. This question is recorded by giving a value of 1 to household who visit basic health units often or always while the remaining is assigned a 0 value. This adjustment is further labeled according and those households who visit basic health units always or often are deemed not deprived.

Finally the last dimension of education is based entirely on Section C where three questions are considered. Firstly, the maximum education achieved is taken as number of the years of schooling of the household head as the numeric values assigned in this question by PSLM are consistent with the years of schooling. Household head with less than 6 years of schooling are deemed as deprived in the present study. The other indicator of education dimension is whether household head can read, write, and is able to conduct basic arithmetic operations simultaneously is deemed as literate and illiterate otherwise. The resultant files are merged together with hhcode as the identifier and afterwards Alkire and Foster method of multidimensional poverty is used calculated summary index of multidimensional poverty i.e. adjusted headcount ratio (M_0). Appendix B.5 illustrates the do-file for the entire process. Furthermore, the categories of understudy indicators for each dimension that are deemed poor are shown in table 4.4 where categories that are considered deprived are bolded. Furthermore, equal weights are assigned to each dimension in calculation of Alkire and Foster adjusted headcount i.e. one-thirds. Similarly, each indicator within a dimension is given equal weight. The weight for each indicator is calculated by multiplying the total number of indicators with the weight of dimension in which that indicator is and sub-weight of each indicator within the dimension as shown in table 4.5.

Figure 4. 1: Dimensions for multidimensional poverty estimation



Source: Author's Calculation

Table 4. 4: The cut-off point for each indicator of dimensions

Dimensions	Question/Indicators	Indicators' cut-off
Standard of Living	Residential Status (SDG 9)	**On rent, subsidized rent**, personal residence (self-hired), personal residence (hired), without rent
	Energy Source for electricity (SDG 7)	**Candle, Fire-wood, other**, electricity, gas , kerosene oil.
	Type of roof (SDG 11)	**Wood/Bamboo, other**, RCC/RBC, Iron/Cement
	Type of toilet facility (SDG 11/7, MDG 7.9)	**Facility not available, digged ditch, flush (connected to open drain, other,** privy seat, flush (linked to septic tank), flush (linked to sewerage)
	Cooking fuel (SDG 7, MDG 7)	**Fire-wood, sticks etc, cow-dung cakes, coal/wooden coal, other, gas**, kerosene oil, electricity.
	Assets (SDG 1, MDG 1)	**Doesn't possesses any of the following: Tv, ac, refrigerator, sewing machine, washing machine, motor cycle, agriculture land,** does posses these assets.
Health	Water source (SDG 11/3, MDG 7.8)	**Open well,river/stream/pond etc, other**, tanker truck/water fetcher, water motor, covered well, mineral water, tap (outside home), tap (in courtyard), hand pump.
	Basic Health units (SDG 3)	Visits: **not at all, once in a while,** always, often.
Education	Read/Write (SDG 4, MDG 2)	**Can't read/write, can't conduct arithmetic operations,** can read/write, can conduct arithmetic operations
	Years of schooling (SDG 4, MDG 2)	**Less than 6 years of schooling,** greater then equal to 6

Source: Author's Calculation

Table 4. 5: Weighting scheme for each dimension and indicator

Dimensions	Question/Indicators	Dimension Weights	Indicators Weights
Standard of Living	Residential Status	0.33	(0.33)*(1/6)*10 = 0.55
	Energy Source for electricity		(0.33)*(1/6)*10 = 0.55
	Type of roof		(0.33)*(1/6)*10 = 0.55
	Type of toilet facility		(0.33)*(1/6)*10 = 0.55
	Cooking fuel		(0.33)*(1/6)*10 = 0.55
	Assets		(0.33)*(1/6)*10 = 0.55
Health	Water source	0.33	(0.33)*(1/2)*10 = 1.67
	Basic Health units		(0.33)*(1/2)*10 = 1.67
Education	Read/Write	0.33	(0.33)*(1/2)*10 = 1.67
	Years of schooling		(0.33)*(1/2)*10 = 1.67
Total		1	10

Source: Author's Calculation

4.4 Poverty Maps

The disaggregated poverty estimates can be best shown on a map in which the intensity of the color conveys the relative severity of poverty. In present study, poverty maps are built using Adept maps that can be used within STATA user-interface using amap command which loads the adept map console in STATA. The whole process hinges on shapefiles and database files which can be obtained through the internet and these files include x and y coordinates for the regions that need to be mapped. In case of Pakistan xy coordinates are downloaded from Geocommons at district level for each province and for the country as a whole. However, since Adept map is option based once amap command is typed in STATA its do-file can't be shown. Nevertheless, it is noted that amap command is used on the file with variable on uni-dimensional and multidimensional poverty against each district.

Chapter 5

Results and Discussions

5.1 Regression Analysis

This section presents the estimates of log of consumption regression model on each of the four provinces of Pakistan for the same set of covariates and the results are indicated in table A.1 in appendix A. The estimated coefficients from these regressions are further used to simulate per capita consumption expenditure at district level. One major advantage of using four regression models using same set of covariates is that robustness of the estimated coefficients in sign may be partially established. It must be noted here that the dependent variables is in log terms i.e. log per adult equivalent consumption expenditure.

5.1.1 Household profile

It can be seen that family size bears negative influence on consumption expenditure and this result is consistent across all provinces with almost same magnitude (Lanjouw and Ravallion, 1995). Increase in proportion of children that are below 15 and adults that are above 65 increases the dependency burden on the household. Household in which there are more member per worker to cater for usually experience less consumption expenditure on average. This is not hard to understand since fewer workers per persons experience significant strains especially to earn for the dependent in developing countries. Higher dependency may also impact consumption expenditure in the long run through its regressive influence on savings (Hyung, 2013). In the context of present study, it is found that increase in proportion of children significantly reduces the per capita consumption across each province of Pakistan. Meanwhile, the same can't be said for proportion of adults as its coefficient is statistically insignificant across each province. However, the sign of its coefficient is in line with theoretical expectations Examine the coefficient of proportion of female in the household shows that it is significantly negative across each province. Furthermore, it is also noted that the magnitude of the coefficients for proportion of children and female are highest among the covariates especially in case of proportion of children. Such findings are consistent with Libois and Somville, 2014.

5.1.2 Household Head Characteristics

The head of household plays a crucial role in determining its welfare and following this argument household head characteristics are also used in the model. The results indicate that female headed households are more likely to have higher consumption that those headed by male households. Although this may appear baffling in developing country context it may have a ring to it. For example, quoting Smith (2006) female is "adept at economics, often better household managers than their male counterparts …." Following Khan & Khalid (2012), female headed households tend to allocate a higher share of expenditure on human capital formation and this

ultimately increases consumption also through enhanced employment chances. The correlate is found to be significant in all provinces except Sindh. The age of the household head is estimated to be positive and significant in case of Punjab, Sindh, and Balochistan. The positive relationship in case of Punjab and Sindh might be explained in terms of the role that experience plays in enhancing the employability of an individual which help secure a stable consumption pattern. Recognizing the importance of age of household head as a major determinant of consumption expenditure, Radivojevic & Vasic (2012) have referred to the family life-cycle hypothesis. The result for the age variable is also supported by Caglayan and Astar (2012). Contrarily, the negative relationship between consumption and age of household head found in case of Balochistan may be explained by the fact that household head having crossed a certain threshold of age may find their employability diminished as employers prefer younger and more energetic workers to old.

The types of employment of household head and consumption expenditure tend to have an intricate relationship. While most types bear a positive sign except few types in some provinces; most of them are consistently insignificant across each province. However, most of them are significant in no more than two provinces like employer greater than 10, owner cultivator, share cropper, contract cultivator, and livestock. Moreover, it is observed that employer of less than 10 is significant in three provinces i.e. Sind, KPK, and Balochistan. Furthermore, the significance of different categories in different provinces might hint towards the relative importance of that particular employment type for increasing consumption in the respective province. For example, owner cultivator and share cropper can increase consumption expenditure in Sindh and Balochistan while the same can be said for contract cultivator in case of Punjab. Another vivid observation is that most of employment sources are significant and relevant in case of Balochistan and an unpaid family worker bears no significant impact on consumption. The last variable of household head characteristics is education of head. The estimated coefficients are positive in case of primary education they still is insignificant implying no empirical relevance. However, any further increases in education can increase consumption expenditure proportionally. In case of this research, the estimated coefficients tend to be higher for degree education dummy than for secondary and primary education dummy. This suggests that any form of education greater than primary can be pivotal for increasing consumption expenditure. There exists a bulk of literature that addresses the importance of education in increasing welfare (Roos et al., 2001; Caglayan, E., & Astar, M.,2012); Gounder, 2012; Talukder & Chile, 2013).

5.1.3 Household Welfare Characteristics

Moving towards the household welfare characteristics, only number of rooms is found to be significantly exerting positive influence on consumption expenditure with slight variation in magnitude of estimated coefficient across provinces. Similarly, roof type is significant in three provinces except Balochistan while cooking source is significant and positive in Punjab only. The relationship between most of the non-income indicators and consumption expenditure seem perplexing. However, one way to explain such insignificant relationship in case of most variables can be that consumption expenditure calculation in Pakistan does not take into account expenses incurred on durables. It may be possible that household that purchase their personal home or start using an expensive albeit safe drinking water source as well as improved toilet facility may have to compromise their consumption of non-durable goods which are used in consumption calculation. In this case, such expenditure may become substitute of each another. Yang (2005) suggests that household do compromise non-housing expenditure to build stock of housing. This can be the basis of the argument mentioned above in explaining insignificant relationship between some of the household welfare characteristics and consumption expenditure. However, a stronger explanation for this can be in terms of correlation. Since, estimated beta coefficients can also be interpreted as a shadow measure of correlation between the consumption expenditure and the concerned variable it won't be wrong to state that contrarily to often quoted believe that non-income indicators are correlated to income gains they are actually not as no statistical linkage between the two can be established.

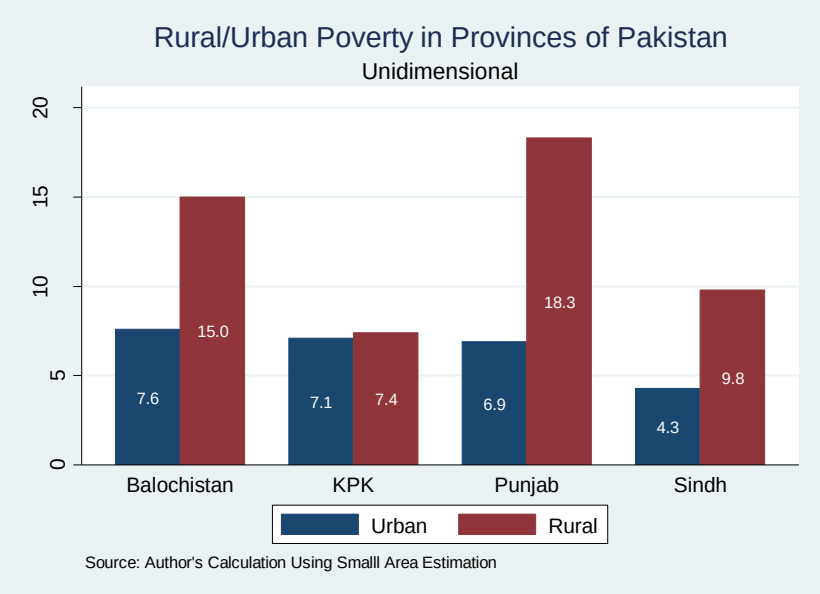
5.1.4 Assets

Finally, assets seem to have a strong overall relationship with consumption expenditure. In order to shed light on these results, one must understand that assets like a/c, refrigerator, car, and motorcycle to some extent don't fall in low-income category. For example, only those households can afford such articles that already enjoy a high level of consumption. However, in case of agriculture and livestock ownership it is safer to use the value-addition argument of such assets since they can be a catalyst of high consumption. As opposed to the relationship between non-income indicators of household welfare and consumption expenditure the relationship between consumption expenditure and assets seem consistent. This may imply that income poverty go hand in hand with asset poverty. Resultantly, the sensitivity of assets to gains in income is more than that of non-income welfare indicators. In order to use the estimated coefficients for simulating consumption expenditure per head it is a must to have a model that exhibits an improved fit. This is assessed by the fact that adjusted R-square is reasonably high for each province. Some of the variables are also deliberately added in a way that improves the fit.

5.2 Uni-dimensional poverty across sub-regions of Provinces

The poverty estimates at the provincial level in figure are based on HIES survey data since it is representative at provincial level. Further disaggregation of poverty at division and district level is carried out by using small area estimation which is addressed in the later section of this chapter. One of the over-riding conclusions in poverty analysis of Pakistan is the fact that poverty has been and still remains a rural phenomenon in the country (UDNP, 2011; Arif & Farooq, 2011; and Cheema & Sial, 2014.) This pattern is also consistent when one compares the urban and rural incidence of poverty across each province of Pakistan as seen in figure 5.1. However, the extent of the diversion in rural and urban poverty varies across each province. The difference between rural and urban poverty in case of Punjab is highest followed by that in Balochistan, Sindh and KPK. However, the incidence of rural poverty is highest in Punjab and least in KPK. As for urban poverty, Sindh posts the lowest rate mainly because it includes the financial hub of the country i.e. Karachi which is the most representative district among Sindh province's sampled households. The lower-than-expected figures of poverty in Balochistan and KPK may be due to the fact that these regions are conflict prone which hinders the data collection efforts and also impacts the quality of the data. Resultantly, easy-to-access and relatively rich areas are covered in the data collection. This assertion is also recognized in the latest report by Federal Bureau of Statistics (FBS, 2015). It is also observed that rural poverty in Punjab is highest than Sindh, KPK, and Balochistan. This is due the fact that Punjab is home to two out of four deserts of Pakistan and its southern region is notoriously poor. This assertion can be supplemented by the findings of Cheema and Sial (2014) using HIES, 2010-11.

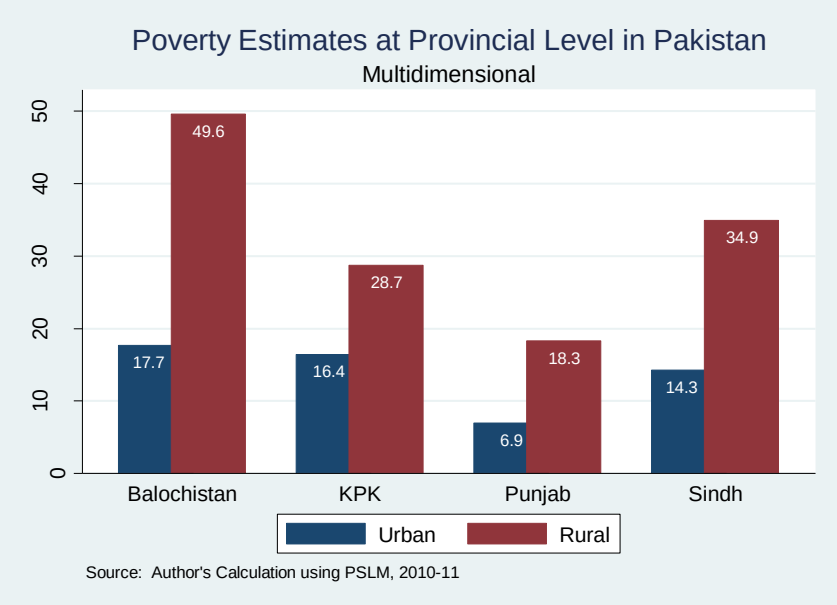
Figure 5. 1: Poverty estimates - Uni-Dimensional



5.3 Multidimensional poverty across sub-regions of Provinces

The section presents the estimates of multidimensional poverty using Alkire and Foster adjusted headcount ratio. The figure 5.2 shows that rural and urban sector of Balochistan is most poor followed by KPK, Sindh, and Punjab. Comparing these results with uni-dimensional poverty measures in figure 5.1 shows that apart from urban sector of Punjab, adjusted headcount ratio is higher across each provinces and across each sector. This lays down that uni-dimensional approach to poverty assessment underestimates the relative extent of deprivation in well-being. Further comparison makes the polarizing results clearer. For instance, Punjab's rural sector was most poor using consumption as well-being measure. However, when non-income indicators are used the situation is reversed completely with Punjab's rural sector being the least poor relative to other provinces' rural sector. Similarly, Sindh's urban sector also undergoes positional change as it now becomes the second least poor urban sector of the country with reference to other provinces' urban sector. However, some of the patterns are similar. Sindh's rural sector is still less poor than KPK's rural sector while Balochistan's urban sector is also poorer than KPK's, Punjab's, and Sindh's urban sector.

Figure 5. 1: Multidimensional Poverty



5.4 District/Division level Poverty Rates using simulated consumption

This section presents the district and division level poverty estimates using both uni-dimensional and multi-dimensional approach to poverty. It is mentioned here that division is an administrative region in Pakistan which comprises of few districts. Furthermore, results are mapped to shed light on the spatial distribution of poverty estimates – both uni-dimensional and multi-dimensional.

5.4.1 Punjab

In case of Punjab, districts in the northern part of the province like Rawalpindi, Chakwal, and Jhelum are least poor while Rajan Pur is the poorest district followed by Muzaffar Garh, D. G. Khan, and Rahim Yar Khan as shown in table 5.1. Similarly, the big cities of the province which are spread unevenly across the province record minimum poverty incidence uni-dimensionally (multidimensionally) like Lahore which records a poverty rate of 9.65 (14) percent, Sialkot 10.24 (19.1), Gujranawala12.78 (19.6), Sargodha 15.35(24.2) percent. By comparing multi-dimensional poverty incidence with uni-dimensional poverty incidence, the adjusted headcount ratio record higher figures consistently for each district except Rajan Pur, Muzaffargarh, D.G. Khan, Layyah, and Jhang. Among the ten poorest districts of the province uni-dimensionally seven are situated in the southern part of the province while the remaining three belong to central region. The same pattern is also observed in case of multidimensional poverty as six districts are located in south Punjab among ten most poor districts. Similarly, eight and seven districts belong to north Punjab among least poor districts uni-dimensionally and multi-dimensionally respectively. This suggests the South Punjab is poorer than central and north Punjab. Hence, a spatially skewed incidence of poverty in the province is quite evident as shown in figures A.2 in Appendix A., Interestingly; a cursory look on the map can reveal that districts constituting the Thall Desert region in Punjab like Bhakkar, Layyah, Muzaffargarh, and Jhang are marked by high or high extreme poverty both uni-dimensionally and multi-dimensionally. Similarly, districts constituting Cholistan Desert like Bahawalnagar and Bahawalpur are also among the poorest.

5.4.2 Sindh

Sindh's state of disaggregated poverty shows a pattern closer to that of Punjab in terms of geographical spatial setting of poverty pockets. It is no wonder that Karachi is the least poor district of the province; in fact it is one the least poor district of the entire country excluding the capital territory. In terms of uni-dimensionl poverty rate Jacobabad, Larkana, Tharparkar and Kashmore are the most poor districts of the province with poverty rate of 22.97 percent, 22.66 percent, 22.65 percent, and 21.71 percent respectively as shown in table 5.2. However, a comparison with multidimensional adjusted headcount ratio reveals that all districts and divisions of the province register high incidence of multidimensional poverty. This is opposite to what is viewed in Punjab where five districts were found to be less multidimensionally poor and more uni-dimensionally poor. This can hint towards the fact that Sindh's achievement in non-income indicators may have been rather dismal relative to that of Punjab. Another observation from table 5.2 is that with reference to Punjab the adjusted headcount ratios are higher on average than that for the districts and divisions of Punjab. Sindh's ten most poor districts are evenly balanced among south and north regions with six and four in north and south respectively when uni-dimensional poverty estimates are assessed. This may result from the fact that districts in north Sindh are attached with South Punjab which as mentioned above is a hotbed of poverty

in Punjab province. The situation is reserved in case of multi-dimensional poverty estimates which record six districts of south Sindh among ten more poor districts. Nevertheless, the five poorest districts are all located in the southern part of the province when adjusted headcount is observed. This is self-evident since districts in the south of Sindh like Thatta and Tharparkar are notorious for incidence of droughts and famines. It is noted that Tharparkar is currently famine-stricken at the time of writing. This is not hard to understand since these districts form part of Thar Desert which is the 17th largest desert in the world. In fact, it won't be wrong to say that districts forming the whole of Thar Desert are among poorest. Therefore, it can be concluded that Northern and Southern tip of the province are marked by high rate of deprivation uni-dimensionally while the incidence of multi-dimensional poverty is higher in case of latter as illustrated in figures A.3 in Appendix A.

5.4.3 KPK

KPK as a province can lend valuable lessons in the context of geography of poverty since it is a combination of agrarian lands, mountains, and steppes in some cases. In terms of uni-dimensional poverty, table 5.3 shows that Bonair has highest incidence of poverty in the province with a poverty rate of 23.79 percent. Karak clocks in at 23.11 percent as the second poorest district followed by Lakki Marwat at 20.97 percent. Surprisingly, KPK has the second least poor district of the country i.e. Abottabad with a predicted headcount ratio of 6.97 percent. Districts closer to Islamabad and Rawalpindi Division are least poor districts of the province like Haripur and Abbottabad as a result of positive spatial externality. Hence, a clear difference between these two districts and the other districts of the province is clearly visible. Subsequently, among ten most poor districts four belong to south KPK while three each belong to north and central KPK. The districts with mountains like those in Malakand division are among most poor when adjusted headcount is observed and so are the southern districts in Kohat and Bannu divisions as they mostly constitute dry mountains region. The southern D. I. Khan and Kohat divisions are poorer with adjusted headcount ratio of 37.5 percent and 35 percent respectively. As in Sindh, all of the districts in KPK are poorer when attention is changed to multidimensional poverty from its uni-dimension counterpart. It is noted that among the ten poorest districts of the province multidimensinoally, five are in the northern mountain region while one is in the southern mountain region. As a result, it can be safely said that poverty incidence among mountain regions be it snow-capped in the north or parched-tipped in the south is high. Subsequently, a geographically spaced distribution of poverty is quite vivid as shown in figures A.4.

5.4.4 Balochistan

Balochistan's northwestern districts post low poverty level uni-dimensionally as table 5.4 reads. Some of the least poor districts of Balochistan are Ziarat, Sibbi, Harnai, Kahlu, Quetta, Pashin, Qilla Abdullah and Mashtung. Apart from Awaran all of these districts are situated just below

the northern part of the province as presented in figures A.4 in appendix A.. These surprisingly low estimates of unidimensional poverty do not seem sound as it is believed that Balochistan is the most destitute province of the country. Explanation for this can be direct to the fact that quality of data for Balochistan is of rather dubious research and this is not the first time that such low estimates are obtained for Balochistan (Anwar & Qureshi, 2002; Saboor, 2004; Malik, 2005; Arif, 2006) However, when attention is directed to multi-dimensional poverty estimates a rather gloomy picture is painted. The concept of first-city bias is so much evident in case of Balochistan that apart from its capital i.e. Quetta and its adjacent district Pashin all of the districts have adjusted headcount ratio of no less than 30 percent. This augur that Balochistan will remain under-privileged part of the country unless and until non-income indicators are addressed since monetary yardstick understates the poverty incidence by a wide margin. Even in case of Quetta and Pashin the poverty rates jumps from 4.18 to 17.4 and 3.48 to 18.9 percent respectively when uni-dimensional approach to poverty is substituted with multidimensional poverty. It can be observed that districts adjoining south Punjab and north Sindh like Dera Bugti, Loralai, Kohlu, and Barkhan show extreme poverty in terms of uni-dimensional and multi-dimensional. Furthermore, it also observed district of Chagai which encompasses the Kharan Deseart is extremely poor both uni-dimensionally and multi-dimensionally as shown in figures A.5 in appendix A.

5.4.5 Pakistan

Provincial distribution of poverty incidence is skewed and the same pattern is also valid for the country as well. In nutshell, while south Punjab districts clustered together are the poorest regions of the country unidimensionally the picture turns drastically reverse when multidimensional poverty map is viewed in figure A.5 in appendix A.. In multidimensional poverty assessment the poorest regions are now situated in Balochistan, Southern KPK and Southern Sindh. A close look of the map reveals that not a single district of Punjab appears among the poorest district of Pakistan multidimensionally. However, middle-high poverty is still retained in the districts covering the Thall and Kohistan Deserts.

Table 5. 1: Punjab poverty estimates

		Uni-dimensional Poverty		Multidimensional Poverty	
Division	**Districts**	**H0***	**H0****	**M0*****	**M0******
Rawalpindi Division	**Attock**	13.37	8.90	23.1	17.6
	Rawalpindi	7.11		15.9	
	Jhelum	9.56		15.4	
	Chakwal	8.02		18.3	
Sargodha Division	**Sargodha**	15.35	17.16	24.2	25.4
	Bhakkar	22.60		29.3	
	Khushab	13.24		24.8	
	Mianwali	18.99		24.3	
Faisalabad Division	**Faisalabad**	13.02	16.46	20.2	22.3
	Jhang	24.67		23.6	
	T.T. Singh	14.47		19	
	Chiniot	18.68		32.3	
Lahore Gujranwala Division	**Gujranwala**	12.78	12.96	19.6	21.8
	Gujrat	11.00		18.3	
	Sialkot	10.24		19.1	
	Hafizabad	15.43		27.6	
	Mandi Bahuddin	11.03		25.4	
	Narowal	18.25		24	
Lahore Division	**Lahore**	9.65	14.58	14	18.8
	Kasur	23.06		25.3	
	Sheikupura	19.30		23.2	
	Nankana Sahib	19.36		27	
Multan Division	**Vehari**	24.99	23.50	25.8	26.6
	Multan	22.32		24.8	
	Khanewal	22.75		26.5	
	Lodhran	25.16		32.6	
D.G.Khan Division	**D.G. Khan**	32.58	33.60	30.8	28.7
	Rajan Pur	36.03		28.8	
	Layyah	29.25		19.4	
	Muzaffar Garh	35.77		33.3	
Bahawalpur Division	**Bahawal Pur**	25.29	25.69	33.3	30.4
	Bahawlnagar	22.57		25.4	
	Rahimyar Khan	28.58		31.7	
Sahiwal Division	**Sahiwal**	19.99	21.73	27.6	29.4
	PakPattan	25.43		31.5	
	Okara	20.78		29.4	

Source: Author's Calculation.using PSLM 2010-11 *Headcount Ratio at District level ** Headcount Ratio at Division level *** Adjusted Headcount Ratio at district level **** Adjusted Headcount at Division Level

Table 5. 2: Sindh poverty estimates

		Uni-Dimensional Poverty		Multidimensional Poverty	
Divisions	**Districts**	**H0***	**H0****	**M0*****	**M0******
SUKKUR DIVISION	**Khairpur**	14.46	15.84	27.7	25.9
	Sukkur	16.00		24.2	
	Nawabshah	13.85		31.2	
	Nowsheroferoz	17.06		20.1	
	Ghotki	17.85		26.8	
LARKANA DIVISION	**Jacobabad**	22.97	21.58	34.6	28.2
	Kashmore	21.71		30.9	
	Shikarpur	19.65		28	
	Larkana	22.66		23.4	
	ShahdatKot	21.36		25.4	
HYDERABAD DIVISION	**Dadu**	12.46	15.19	24.2	32
	Jamshoro	16.85		31.2	
	Hyderabad	9.22		19.9	
	Matiari	14.30		30.4	
	Tandoallahyar	12.86		30	
	Tandomuhdkhan	17.63		37.4	
	Badin	18.40		37.9	
	Thatta	19.04		42.5	
MIRPURKHAN DIVISION	**Sanghar**	14.45	17.72	22.9	34.6
	MirphurKhas	16.02		33.1	
	Umerkot	19.05		42.2	
	Tharparkar	22.65		44.4	
KARACHI DIVISION	**Karachi**	4.35	4.35	12.3	12.3

Source: Author's Calculation.using PSLM 2010-11 *Headcount Ratio at District level ** Headcount Ratio at Division level *** Adjusted Headcount Ratio at district level **** Adjusted Headcount at Division Level

Table 5. 3: KPK poverty estimates

		Uni-Dimensional poverty		Multidimensional Poverty	
Divsions	**Districts**	**H0***	**H0****	**M0*****	**M0******
Malakand Division	**Swat**	17.20	17.88	26.5	37.2
	Upper Dir	18.41		49.2	
	Lower Dir	16.45		32.6	
	Chitral	14.58		39	
	Shangla	17.84		38.9	
	Malakand	17.17		36.6	
	Bonair	23.79		40.6	
Peshawar Division	**Peshawar**	14.73	15.79	23.5	27.5
	Charsada	16.03		29.8	
	Nowshera	17.49		32.6	
Kohat Division	**Kohat**	11.75	17.54	35.2	35.5
	Karak	23.11		34.2	
	Hangu	19.11		37.4	
D.I.Khan Division	**D.I.Khan**	16.69	17.50	37.5	35
	Tank	18.63		31.6	
Hazara Division	**Manshera**	9.13	9.97	29.6	30.6
	Abottabad	6.97		18.2	
	Batgram	11.54		29	
	Kohistan	16.71		65.7	
	Haripur	7.42		18.6	
Bannu Division	**Bannu**	14.72	17.82	24.1	27.3
	Lakki Marwat	20.97		30.6	
Mardan Division	**Mardan**	17.38	15.45	29.6	31.7
	Swabi	13.20		34	

Source: Author's Calculation.using PSLM 2010-11 *Headcount Ratio at District level ** Headcount Ratio at Division level *** Adjusted Headcount Ratio at district level **** Adjusted Headcount at Division Level

Table 5. 4: Balochistan poverty estimates

Divsions	Districts	Unidimensional		Multidimensional	
		H0*	H0**	M0***	M0****
Quetta Division	Quetta	4.18	9.06	17.4	33.9
	Pashin	3.48		18.9	
	Qilla Abdullah	3.89		37.9	
	Chagi	19.26		56.8	
Sibbi Division	Nushki	17.84	7.71	52.3	43.2
	Sibbi	3.59		26.2	
	Ziarat	3.91		30.1	
	Kohlu	6.62		57.6	
	Derag Bugti	19.42		65.7	
Kalat Division	Harnai	5.19	11.24	38.6	43.6
	Kalat	9.38		39	
	Mastung	7.52		30.9	
	Khuzdar	11.70		36.8	
	Awaran	7.93		40.3	
	Kharan	15.09		53.5	
	Washuk	11.35		52	
	Lasbilla	13.91		48.8	
Mekran Division	Ketch/Turbat	13.50	12.37	44.5	43.9
	Gwadar	10.88		37.1	
	Panjgur	12.51		50.6	
Zhob Division	Zhob	12.35	15.47	43.4	51.2
	Lorali	19.77		52.6	
	Barkhan	14.38		60.3	
	Muskhel	29.13		53.5	
	Qillah Saifullah	9.58		50.9	
	Sherani	8.39		48.2	
Nasirabad Division	Nasirabad	20.88	16.72	49.4	46.6
	Jafarabad	18.81		41	
	Jhal Magsi	13.21		53.9	
	Bolan/Kacchi	13.35		43.2	

Source: Author's Calculation.using PSLM 2010-11 *Headcount Ratio at District level ** Headcount Ratio at Division level *** Adjusted Headcount Ratio at district level **** Adjusted Headcount at Division Level

5.5 Reliability of the maps

To ascertain whether the estimates obtained using SAE are reliable; z-score is calculated for selected set of divisions in each province. These divisions are selected on the basis of coverage of households in the survey. While the application of this test may have been more informative if carried out for each district; it is reiterated here that HIES is not representative at district level. Based on this, divisions are selected since each division comprises of some districts and resultantly, a reasonable amount of households can be covered in it. Three divisions are selected from Punjab while only two divisions each are picked from remaining three provinces. Subsequently, the z-score value should not exceed 2 if both poverty estimates are to represent the same poverty incidence. The results in table 4.5 show that values of z-score are well within the accepted bounds for each division; thus establishing the reliability of the maps. The Survey Data Estimates in the table 5.5 below are based on HIES dataset while Predicted SAE Estimates are taken from tables 5.1 to 5.4 against the relevant division.

Table 5. 5: Reliability Test

Divisions		Survey Data Estimates		Predicted SAE Estimates		Z-score
		No. of households	H0	No. of households	H0	
Lahore	Mean	848	0.146	4900	0.145	-0.042
	Std. Error		0.012		0.003	
Multan	Mean	575	0.249	3561	0.235	-0.729
	Std. Error		0.018		0.004	
Bahawalpur	Mean	591	0.245	3212	0.257	0.624
	Std. Error		0.018		0.005	
Karachi	Mean	822	0.057	4414	0.043	-1.678
	Std. Error		0.008		0.002	
Hyderabad	Mean	873	0.166	5203	0.152	-0.748
	Std. Error		0.013		0.003	
Malakand	Mean	511	0.200	3424	0.178	-1.190
	Std. Error		0.018		0.003	
Pewhawar	Mean	487	0.175	2211	0.157	-0.971
	Std. Error		0.017		0.004	
Quetta	Mean	488	0.117	2332	0.091	-1.745
	Std. Error		0.015		0.003	
Nasirabad	Mean	287	0.157	1571	0.167	0.500
	Std. Error		0.021		0.005	

Note: z-score = $(H0(SAE) - H0(Survey))/[(SE(SAE))^2 + (SE(Survey))^2]^{0.5}$

Source: Author's Calculation

Chapter 6

Conclusion

In an attempt to map unidimensional poverty in Pakistan at disaggregated level in Pakistan; small area estimation technique is used using HIES and PSLM data for the same year i.e. 2010-11. Furthermore, unidimensional poverty maps are supplemented with multidimensional poverty maps. It is observed that unidimensional poverty estimates consistently underestimate poverty when its results are compared against multidimensional poverty. However, exceptions to this pattern are few. This emphasizes that poverty exuberates when social sector performance in the districts of the country is evaluated which permits the conclusion that Pakistan's achievement in social sectors is dismal. Similarly, monetary poverty in Pakistan is observed to be more clustered in the Southern region of Punjab and the districts of other provinces adjacent to South Punjab. This indicates that poverty in Pakistan has the characteristics of spilling over to other regions adjoining it which implies existence of negative spatial externality. This reiterates that geography as a determinant of poverty has serious implication on poverty. However, the same can't be said for multidimensional poverty as its incidence is more specific to the geography of the regions like deserts and mountains. Poverty is also observed to have a location characteristic in Pakistan especially in Punjab. Districts located in the south of Punjab, North/south of Sindh, South of KPK, and west/east of Balochistan are poorer in nature. Therefore, it can be concluded that as poverty is not equally spread among countries; the same is also true within country.

6.1 Recommendations

Based on these observations, it can be concluded that a spatial distribution of poverty is evident in Pakistan and subsequently necessitates the need to incorporate concerns for geographical targeting of poverty. On the same lines, it is emphasized that regional-specific policies give more consideration towards conflict-ridden provinces of Balochistan and KPK to tackle the lagging social sectors in these provinces. This can be accomplished by delegating administrative powers to districts and removing any political bottlenecks that hinders it because problems can be best sorted out by the population indigenous to it. Furthermore, it is suggested that PSLM data to be complied every time HIES survey is conducted so that poverty mapping using methods like small area estimation is carried out frequently. Finally, as opposed to district level poverty mapping conducted in the present study; country-wide poverty mapping at tehsil level which forms the lowest tier in the administrative hierarchy of the Pakistan can also be informative. In this way, updated information on disaggregated poverty will be available to policy makers which can help them to not only gauge performance of their policies but also identify regions that are lagging behind persistently.

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APPENDIX A

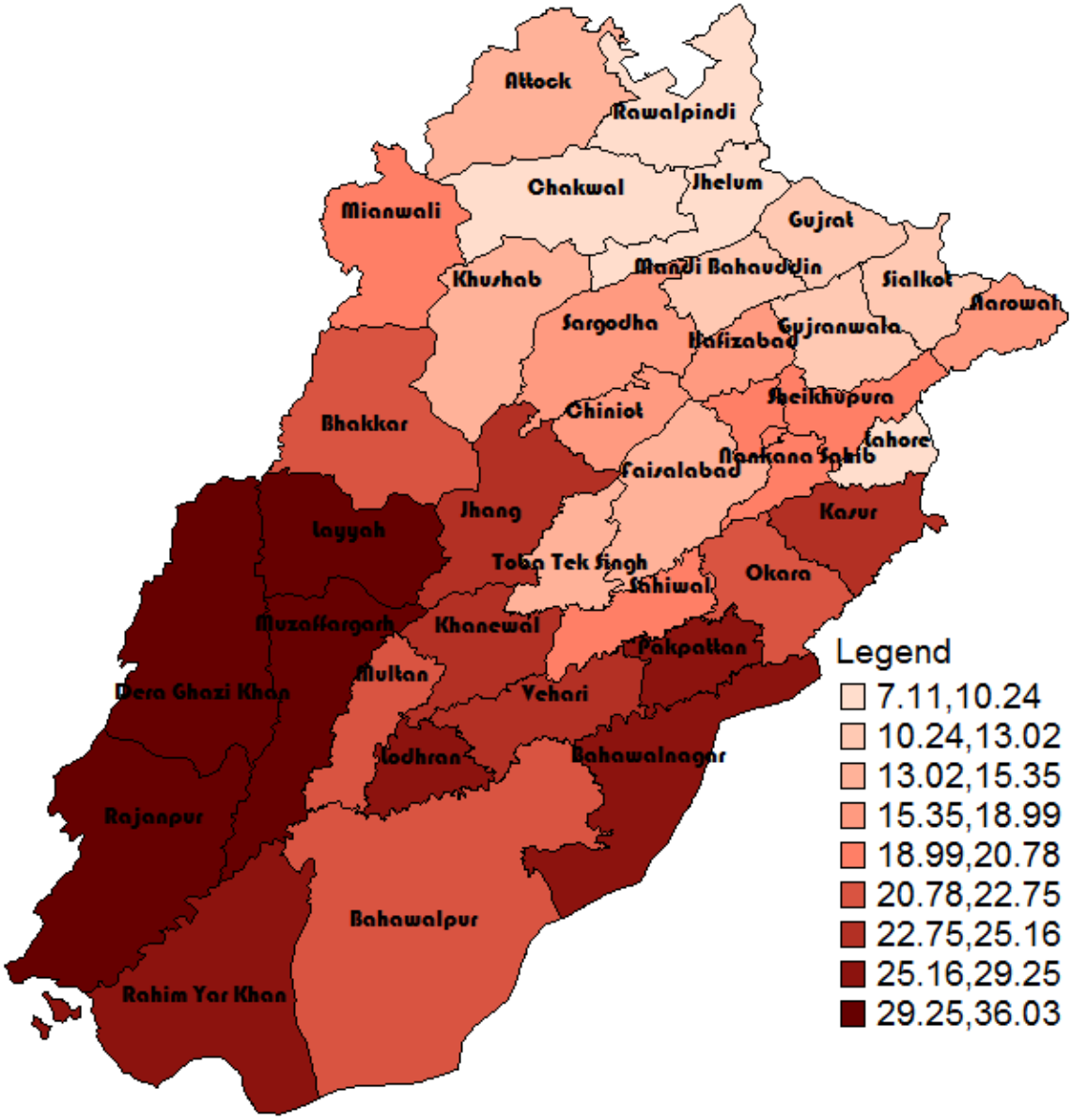
Table A.1: Regression of log consumption expenditure per adult equivalent

Category of variables	Covariates	Punjab	Sindh	KPK	Balochistan
		Coeff.	Coeff.	Coeff.	Coeff.
Household Profile	Family size	-0.18***	-0.15***	-0.13***	-0.13***
	Proportion adults	-0.04	-0.17	-0.08	-0.27
	Proportion of female	-0.10***	-0.10**	-0.11**	-0.14**
	Proportion of children	-0.26***	-0.22**	-0.29***	-0.33***
Household Head Characteristics	Head is female	0.05**	0.02	0.06*	0.20***
	Age of household head	0.01***	0.01*	0.003	-0.01*
	Head has no spouse	0.05	0.02	0.12*	0.06
	Head is employer < 10	0.07	0.39***	0.30***	0.66***
	Head is employer > 10	0.12	0.75***	0.24*	0.17
	Head is self-employed	-0.002	0.05	0.01	0.21***
	Head is paid employee	-0.01	0.04	-0.001	0.10**
	Head is unpaid family worker	0.17*	0.10	0.05	0.01
	Head is owner cultivator	0.03	0.13***	0.04	0.22***
	Head is share cropper	0.03	0.18***	0.04	0.23***
	Head is contract cultivator	0.12***	0.18**	0.04	-
	Head is works in livestock	-0.01	0.10	0.30***	0.29***
	Head has primary education	0.02	0.003	0.04*	-0.01
	Head has secondary education	0.06***	0.07***	0.04*	0.07***
	Head has degree education	0.25***	0.19***	0.17***	0.16***

Category of variables	Covariates	Punjab	Sindh	KPK	Balochistan
		Coeff.	Coeff.	Coeff.	Coeff.
Household Welfare Characteristics	**Household owns personal house**	-0.03	0.02	0.04	-0.07**
	No. of rooms	0.06***	0.06***	0.05***	0.03***
	Household has improved roof type	0.04***	0.06***	0.09***	0.01
	Household has safe drinking water source	-0.02	0.08*	0.02	-0.01
	Household has improved toilet	0.01	-0.05*	-0.04	-0.03
	Household uses improved source of fuel for cooking	0.07***	0.03	0.01	0.01
	Household has improved lighting type	0.02	0.03	-0.12*	0.07
Assets	**Household owns livestock**	0.08***	0.10***	0.07***	0.07***
	Household owns agri land	0.06***	0.08***	0.08***	0.06
	Household owns car	0.35***	0.42***	0.24***	0.20***
	Household owns washing machine	0.005	-0.03	0.01	0.06**
	Household owns tv	-0.03**	0.02	0.03	0.01
	Household owns a/c	0.24***	0.14	0.24***	-0.01
	Household owns refrigerator	0.09***	0.05*	0.04**	-0.01
	Household owns motorcycle	0.10***	0.08***	0.02	0.11***
	Household owns sewing machine	-0.05***	-0.05*	-0.01	0.02
	Number of assets	0.05***	0.05***	0.04***	0.03***
Auxiliary Variables	**Family size squared**	0.005***	0.004***	0.003***	0.004***
	Age squared	-0.0001***	-0.00005	-0.00002	0.0001**
	Constant	7.99***	7.85***	8.17***	8.43***
	Adj R-squared	71	75	60	58
	N. of cases	6952	4097	2954	2335

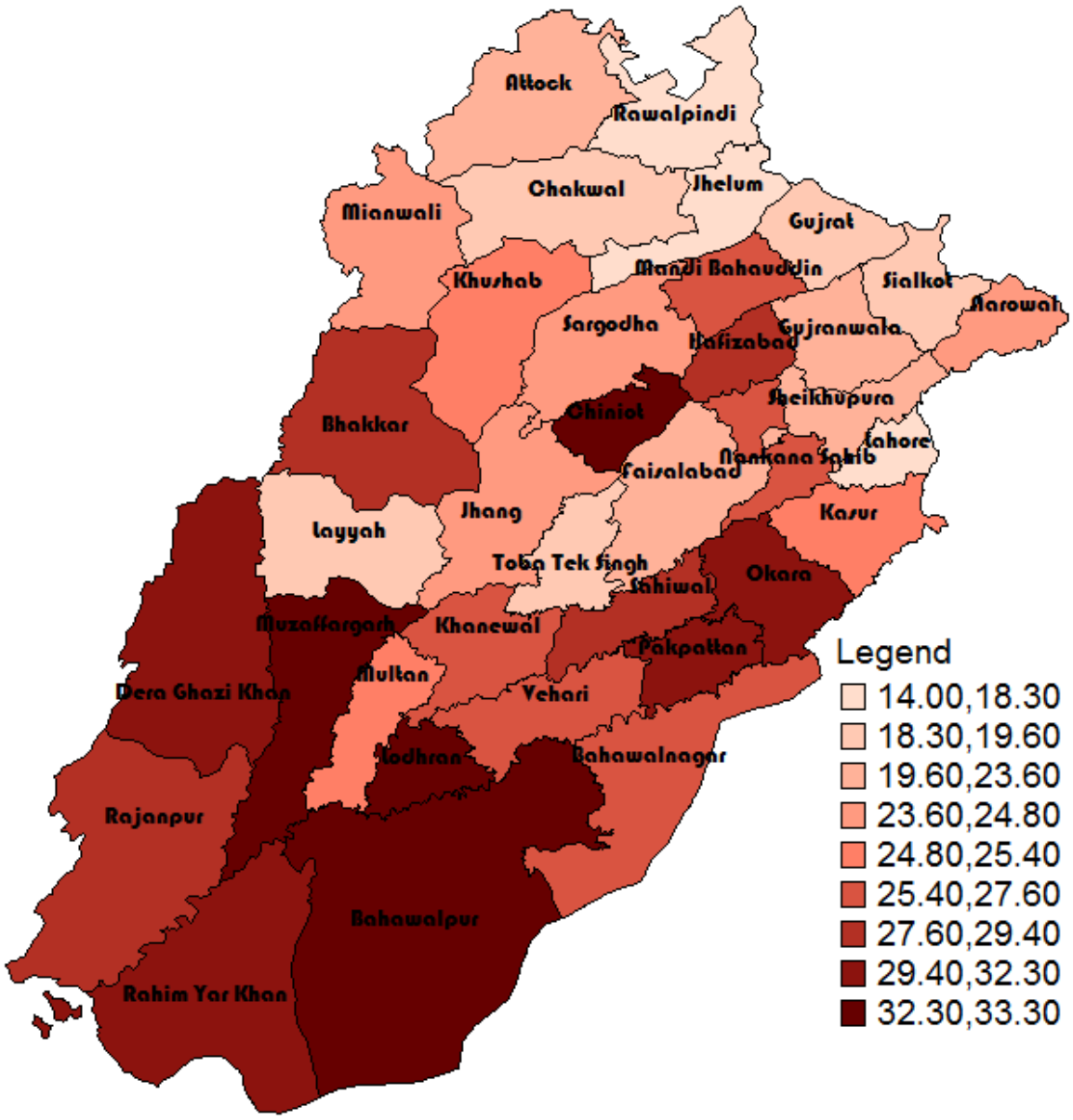
Source: Author's Calculation Using PSLM, 2010-11 * p<0.05, ** p<0.01, *** p<0.001

Figure A.2a: Spatial Poverty Incidence-Punjab Unidimensional Poverty



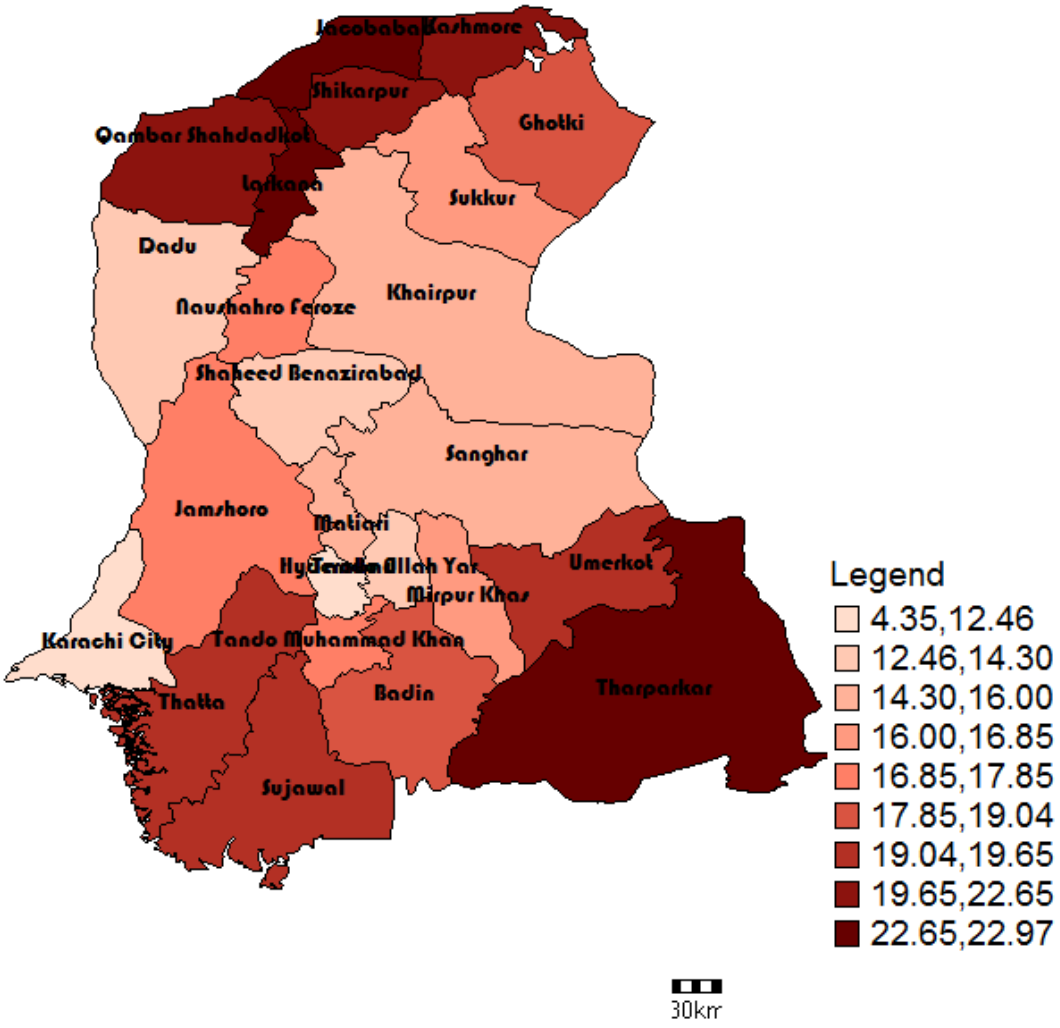
Source: Author's Calculation Using PSLM, 2010-11

Figure A.2b: Spatial Poverty Incidence -Punjab Multidimensional Poverty



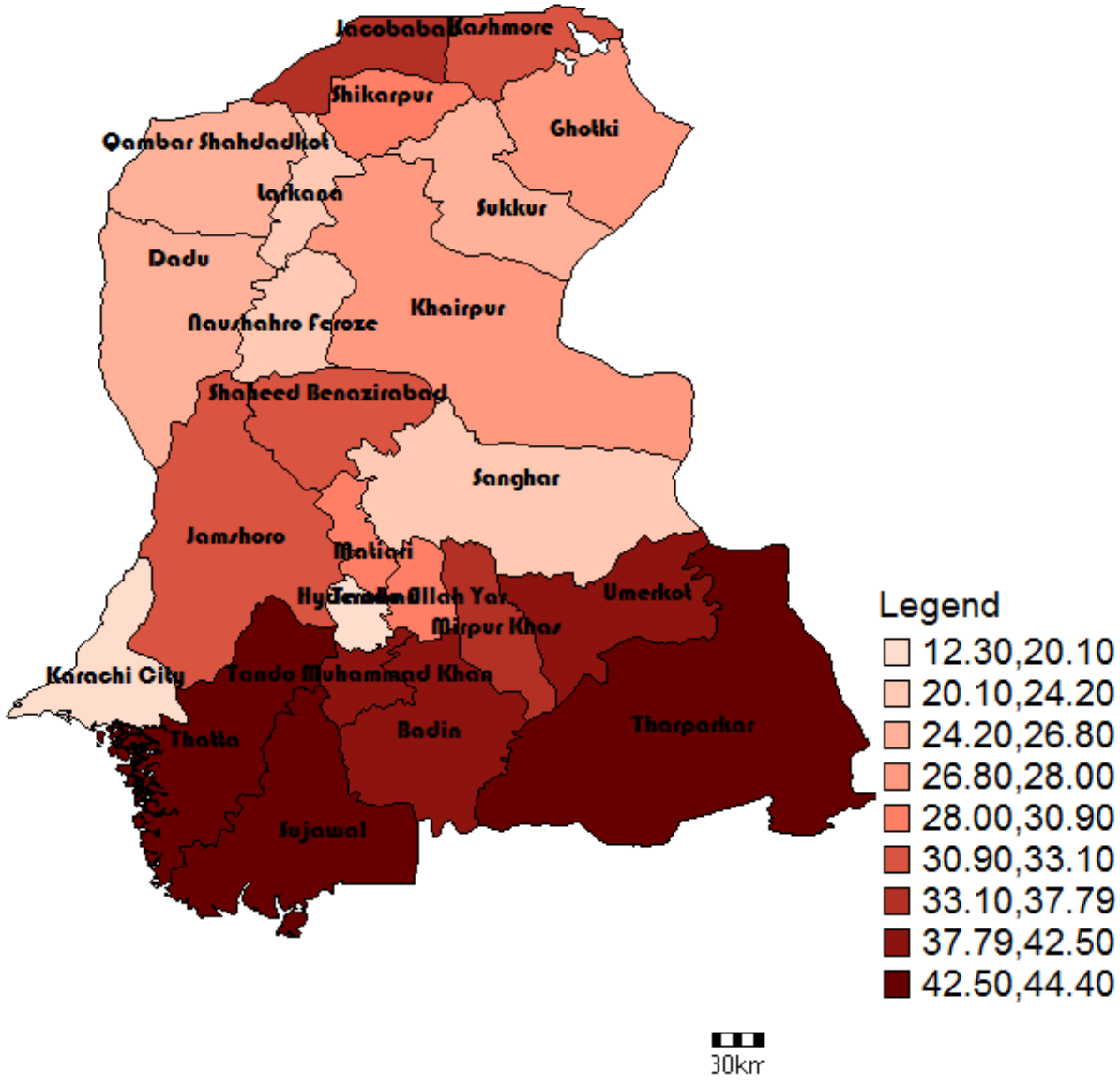
Source: Author's Calculation Using PSLM, 2010-11

Figure A.3a: Spatial Poverty Incidence - Sindh Unidimensional Poverty



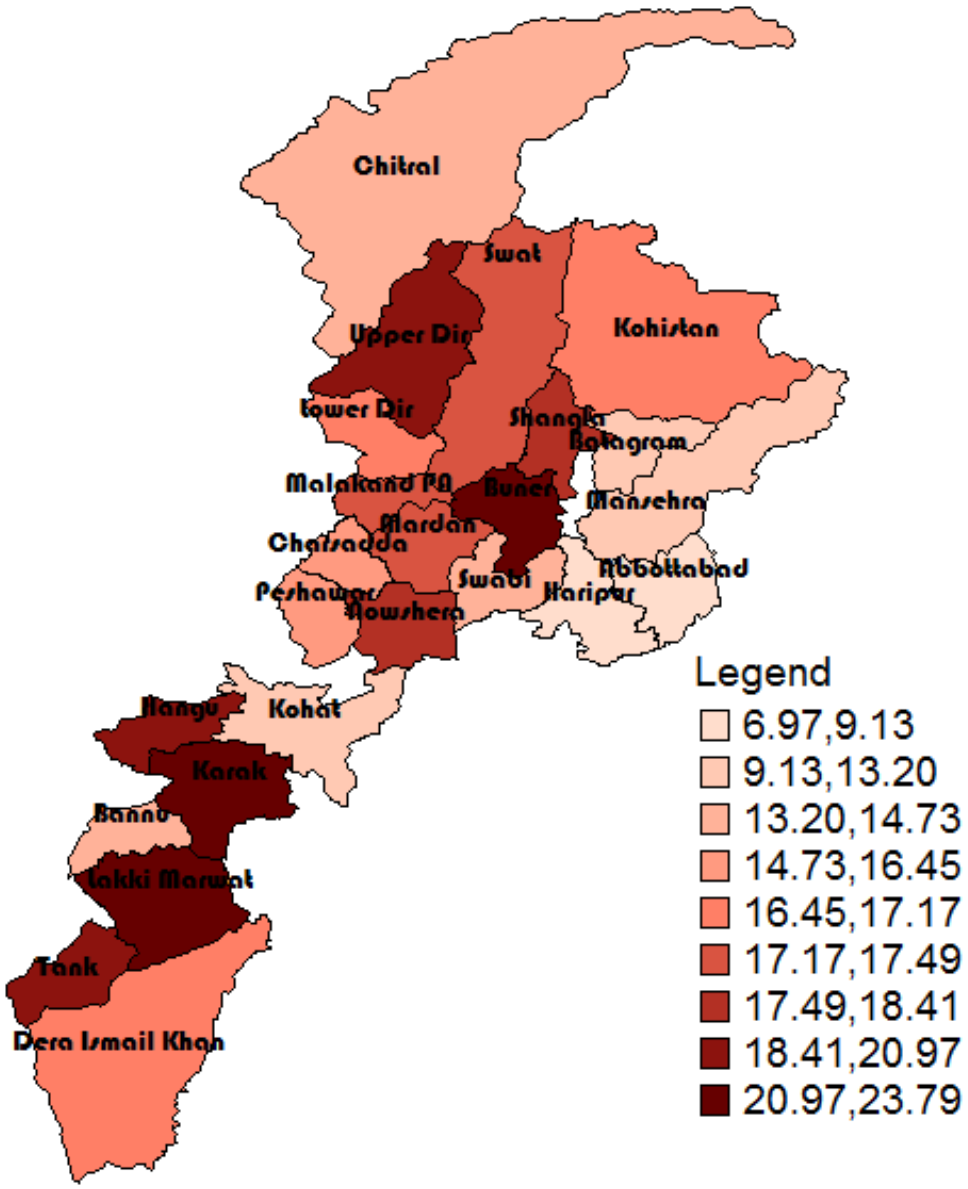
Source: Author's Calculation Using PSLM, 2010-11

Figure A.3b: Spatial Poverty Incidence - Sindh Multidimensional Poverty



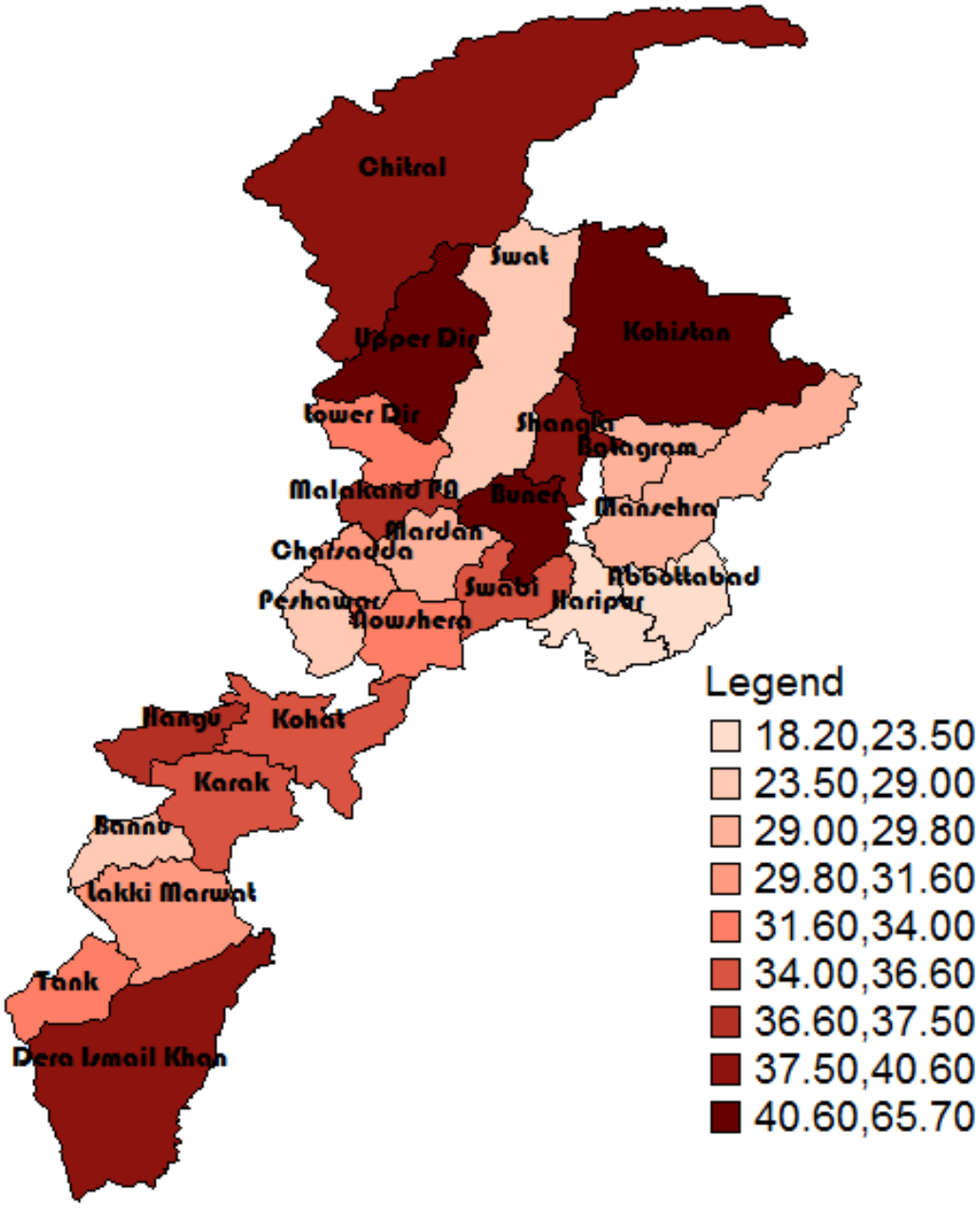
Source: Author's Calculation Using PSLM, 2010-11

Figure A.4a: Spatial Poverty Incidence - KPK Unidimensional Poverty



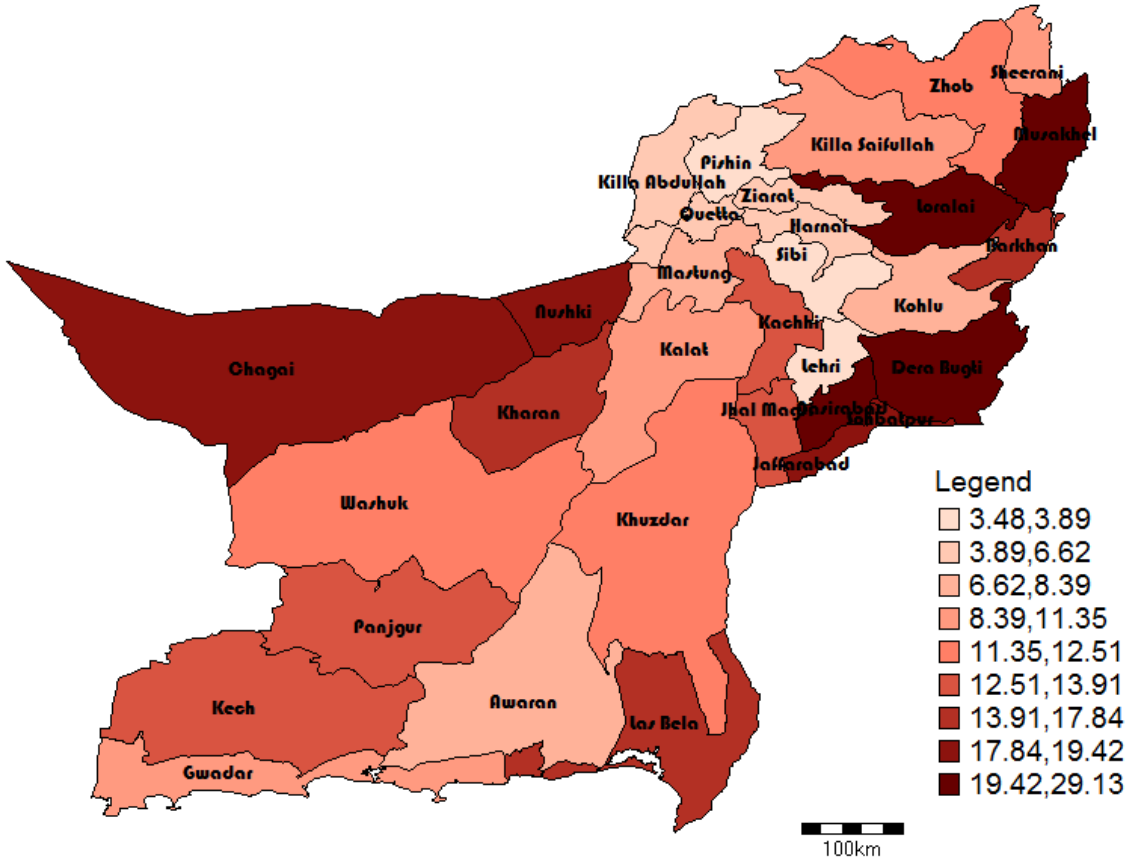
Source: Author's Calculation Using PSLM, 2010-11

Figure A.4b: Spatial Poverty Incidence - KPK Multidimensional Poverty



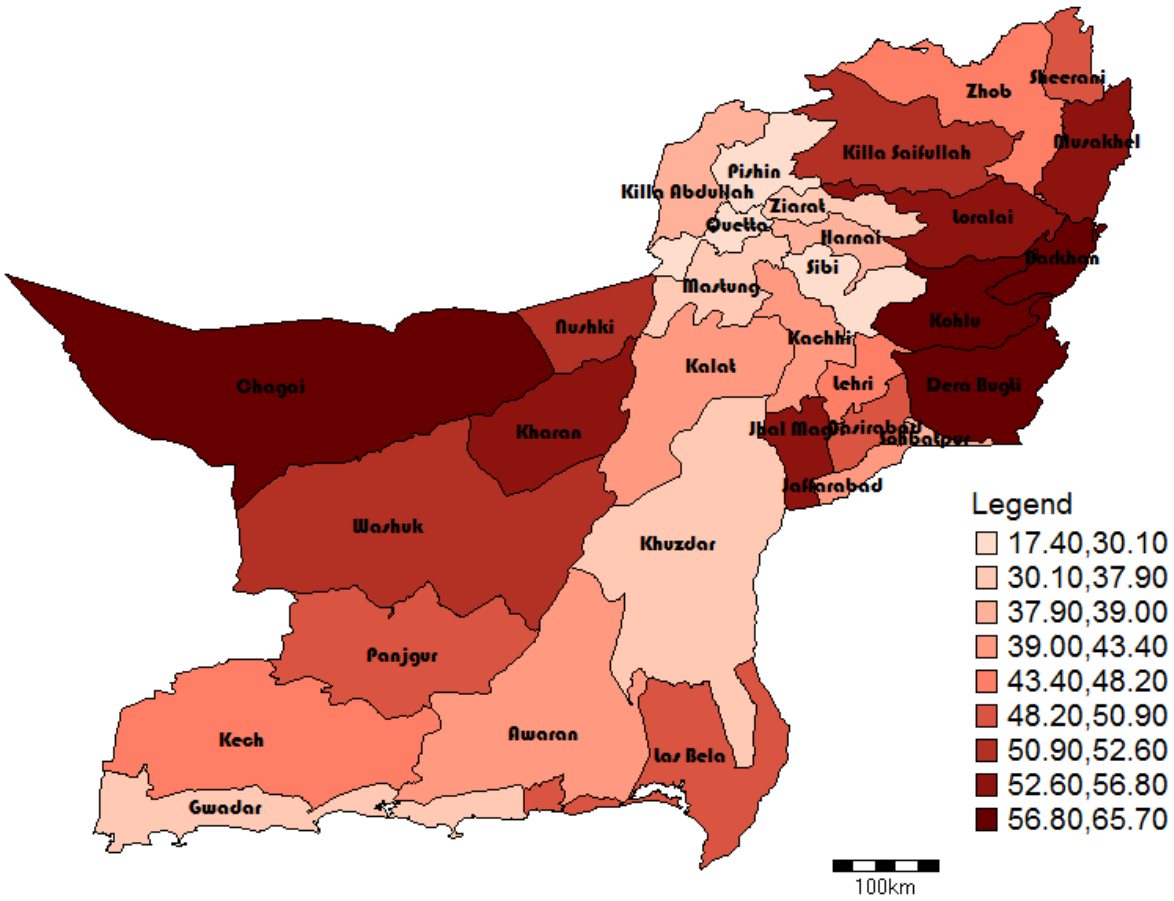
Source: Author's Calculation Using PSLM, 2010-11

Figure A.5a: Spatial Poverty Incidence - Balochistan Unidimensional Poverty



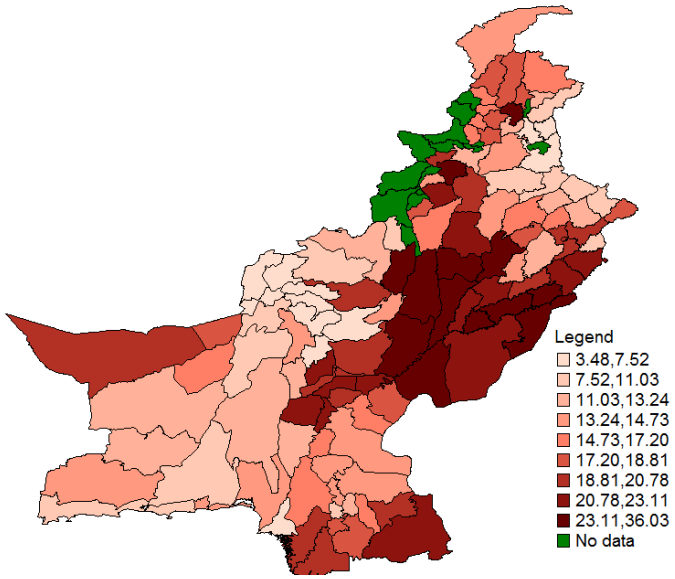
Source: Author's Calculation Using PSLM, 2010-11

Figure A.5b: Spatial Poverty Incidence -Baluchistan Multidimensional Poverty



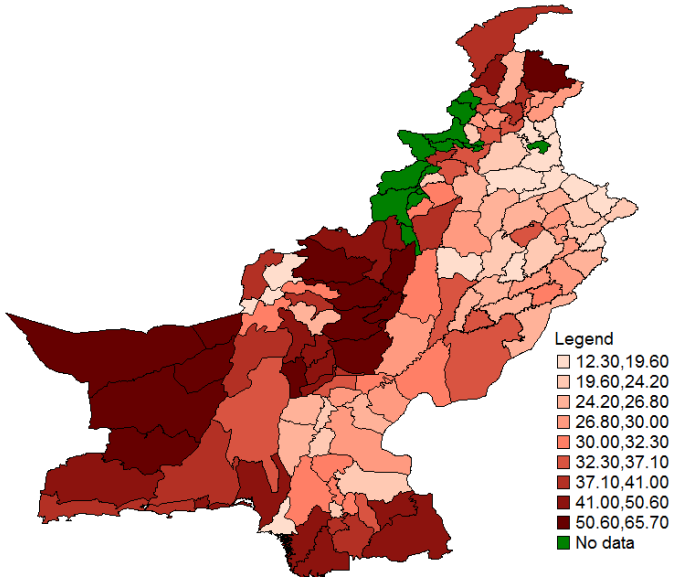
Source: Author's Calculation Using PSLM, 2010-11

Figure A.5a: Spatial Poverty Incidence - Pakistan Unidimensional Poverty



Source: Author's Calculation Using PSLM, 2010-11

Figure A.5b: Spatial Poverty Incidence- Pakistan Multidimensional Poverty



Source: Author's Calculation Using PSLM, 2010-11

APPENDIX B

B.1: STATA do-file for Merging Covariates

Variable generation. do

```
cd "C:\pslm 10-11 hies\pslm 10-11 hies\hies data\data in stata\"

//demographics
use plist.dta, clear                    //the file includes information on household roster
gen age15=1 if age<15
replace age15=0 if age15==.
gen age65=1 if age>65
replace age65=0 if age65==.
gen hhsize=1
gen wrkng=1 if age>15 & age<65
replace wrkng =0 if wrkng ==.
gen nospouse=1 if idc==1 & sbq06==1
replace nospouse=0 if nospouse==.
gen child=1 if age<=12
replace child=0 if child==.
gen female=1 if sbq03==2
replace female=0 if female==.
gen agehh=age if idc==1
gen femalehh=1 if idc==1 &  sbq03==2
replace femalehh=0 if femalehh==.
collapse (sum) femalehh agehh  age15 age65 hhsize wrkng nospouse child female, by(hhcode)
gen dep=(age15+age65)/wrkng
gen female_prop=female/hhsize
gen child_prop=child/hhsize
gen prop_adults=age65/hhsize
save "C:\Users\shazia\Desktop\demographics.dta"

//education of head
use sec_c.dta, clear                    // the file contains data about education of household roster
drop if idc!=1        //since household head's education is used, the rest of the roster is dropped
gen educ=scq04
replace educ=7 if educ==17  //diploma label of 17 is changed to 7 so as to relabel it as secondary
recode educ (1/6=1) (7/12=2) (12/max=3)
label define e 0 "illiterate" 1 "primary" 2 "secondary" 3 "degree
```

```
label values educ e                    //new labels defined are attached
drop  psu- scq92                       // variable not relevant to the study are drop to save a clean file
replace educ=0 if educ==.
save "C:\Users\shazia\Desktop\educationhh.dta"
```

//employment of head

```
use sec_e.dta, clear                   //this dataset covers employment profile of household roster
drop if idc!=1      //since household head's employment is used, the rest of the roster is dropped
replace seq06=0 if seq01==2
label define seq06 0 "unemployed", add
drop  seq07- seq26
drop seq01- seq05
drop  psu sec idc                      // variable not relevant to the study are drop to save a clean file
save "C:\Users\shazia\Desktop\employmenthh.dta"
```

//ownership of agri land and livestock

```
use sec_f1.dta, clear                  //the file provides information on household's agriculture assets
drop if  q1to10!=1 &  q1to10!=4 & q1to10!=5 &  q1to10!=6 &  q1to10!=7
gen livestock=1 if q1to10 ==5 &  sf1col1==1
replace livestock=1 if q1to10 ==4 &  sf1col1==1
replace livestock=1 if q1to10 ==6 & sf1col1==1
replace livestock=1 if q1to10 ==7 &  sf1col1==1
gen agriland=1 if q1to10 ==1 &  sf1col1==1
replace agriland =0 if agriland ==.
replace livestock=0 if livestock  ==.
collapse (sum)  livestock agriland, by(hhcode )
tabulate livestock
replace livestock =1 if livestock >1
save "C:\Users\shazia\Desktop\agriland_livestock.dta"
```

//assets

```
use sec_f2, clear                      //the file provides information on household's durable assets
foreach var of varlist sf2q11a sf2q11b sf2q11d sf2q11e sf2q11f  sf2q11h  sf2q11j
sf2q11lsf2q11m sf2q11n sf2q11p sf2q11q sf2q11r sf2q11s  {
replace `var'=0 if `var'==2
}
foreach var of varlist sf2q11a sf2q11b sf2q11d sf2q11e sf2q11f  sf2q11h  sf2q11j sf2q11l
sf2q11m sf2q11n sf2q11p sf2q11q sf2q11r sf2q11s {
label define `var' 1 "yes" 0 "no"
}
```

```
gen assets=0
foreach var of varlist  sf2q11a sf2q11b sf2q11d sf2q11e sf2q11f  sf2q11h  sf2q11j sf2q11lsf2q11m sf2q11n sf2q11p sf2q11q sf2q11r sf2q11s {
replace assets = assets+`var'
}
gen tv=1 if  sf2q11g==1
replace tv=0 if tv==.
gen ac=1 if   sf2q11k==1
replace ac=0 if ac==.
gen washing_mach=1 if  sf2q11t==1
replace washing_mach =0 if washing_mach ==.
gen motorcycle=1 if  sf2q11n==1
replace motorcycle =0 if motorcycle ==.
gen sewing_mach=1 if  sf2q11c==1
replace sewing_mach =0 if sewing_mach ==.
gen refrigerator=1 if  sf2q11i==1
replace refrigerator =0 if refrigerator ==.
drop psu section sf2q11a sf2q11b sf2q11c sf2q11d sf2q11e sf2q11f sf2q11g sf2q11h sf2q11i sf2q11j sf2q11k sf2q11l sf2q11m sf2q11n sf2q11o sf2q11p sf2q11q sf2q11r sf2q11s sf2q11t sf2q12 sf2q13
save "C:\Users\shazia\Desktop\number of assets.dta"
```

//household characteristics

```
use sec_g, clear       //file gives information on household's non-income welfare characteristics
recode  sgq01 (1=1) (2=1) (5=1) (3=0) (4=0)
label define sgq01 1 "ownership" 0 "no ownship", modify
recode  sgq03 (1=1) (3=1) (4=1) (2=0)
label define  sgq03 1 "improved" 0 "not improved", modify
recode  sgq05 (1/5=1) (8/9=1) (6/7=0) (10=0)
label define sgq05 1 "safe" 0 "notsafe", modify
recode  sgq06 (2/3=1) (6=1) (1=0) (4/5=0) (7=0)
label define sgq06 1 "improved" 0 "not improved", modify
recode  sgq08 (1/3=1) (4/6=0)
label define sgq08 1 "improved" 0 "not improved", modify
recode  sgq07 (2/5=1) (1=0) (6/8=0)
label define sgq07 1 "improved" 0 "not improved", modify
drop sgq09 sgq10a1 sgq10a2 sgq10b1 sgq10b2 sgq10c1 sgq10c2 sgq10d1 sgq10d2 sgq10e1 sgq10e2 sgq10f1 sgq10f2 sgq10g1 sgq10g2 sgq10h1 sgq10h2
rename  sgq01 ownrship
rename  sgq02 no_rooms
```

```
rename  sgq03 roof
drop sgq04
rename  sgq05 water
rename  sgq06 toilet
rename  sgq07 cooking
rename  sgq08 lighting
drop psu section
save "C:\Users\shazia\Desktop\non_income indicators.dta"
```

//merge

```
cd "c:\users\shazia\desktop\"
use demographics.dta, clear
merge 1:1 hhcode using "C:\Users\Shazia\Desktop\educationhh.dta"
drop if _merge!=3
drop _merge
merge 1:1 hhcode using "C:\Users\Shazia\Desktop\employmenthh.dta"
drop if _merge!=3
drop _merge
merge 1:1 hhcode using "C:\Users\Shazia\Desktop\agriland_livestock.dta"
drop if _merge!=3
drop _merge
merge 1:1 hhcode using "C:\Users\Shazia\Desktop\number of assets.dta"
drop if _merge!=3
drop _merge
merge 1:1 hhcode using "C:\Users\Shazia\Desktop\non_income indicators.dta"
drop if _merge!=3
drop _merge
tabulate educ, gen(educ)              //to generate dummy variables for each type of education
xi i.seq06                            //to generate dummy variables of each employment type
save "C:\Users\shazia\Desktop\sheet.dta"
```

B.2: STATA do-file for Consumption calculation

Consumption calculation.do

```
use sec6abcde.dta, clear //detailed consumption expenditures are provided in this file
foreach var of varlist v1 v2 v3 v4 {
replace `var'=`var'/12 if itc>=5101 & itc<=5406 //expenditure are adjusted to monthly scale from annually
replace `var'=`var'/12 if itc>=5408 & itc<=5701
replace `var'=`var'/12 if itc>=5705 & itc<=5804
```

```
replace `var'=`var'/12 if itc>=5902 & itc<=5904
replace `var'=`var'/12 if itc>=6501 & itc<=6504
replace `var'=`var'*2.17 if itc>=1101 & itc<=1901 //expenditure are adjusted to monthly scale from fortnightly
replace `var'=`var'/12 if itc==6101
}
keep if itc>=1101 & itc<=1901 | itc>=2101 & itc<=3003 | itc>=4101 & itc<=4406 | itc>=5101 & itc<=5406 | itc>=5408 & itc<=5701 | itc>=5705 & itc<=5804 | itc>=5902 & itc<=5904 | itc>=6501 & itc<=6504 | itc==6101      //the relevant codes of consumption components are kept while dropping others.
collapse (sum) v1 v2 v3 v4, by(hhcode )
gen cons=v1+v2+v3+v4 //consumption
save "C:\Users\shazia\Desktop\consumption.dta"
```

B.3: STATA do-file for adult equivalent household size and consumption expenditure per adult equivalent

Adult equivalent hhsize & consumption per adulteq.do

```
use plist.dta, clear // data on household roster
gen child=1 if age<=12 //assigns a value of 1 to members less than or equal to 12 years of age
replace child =0 if child==. //inserts zero where household member is greater than 12
gen hhsize=1
collapse (sum) child hhsize , by(hhcode )
gen adult=hhsize-child //number of adults are found by subtracting number of children from hhsize
replace child=child*0.8 //children are given weight of 0.8
gen hhsize_adultequiv=adult+child //redefined number of children are added to number of adults for hhsize
keep hhsize hhcode hhsize_adultequiv
save "C:\Users\shazia\Desktop\hhsize_adult.dta"
//adult equivalent hhsize merged with monthly consumption expenditure
//merge
cd "c:\users\shazia\desktop\"
use consumption.dta, clear //calculated monthly consumption expenditure
merge 1:1 hhcode using "C:\Users\Shazia\Desktop\hhsize_adult.dta"
drop if _merge!=3
drop _merge
gen per_adeqcons=cons/hhsize_adultequiv          //consumption expenditure divided by adult equivalent hhsize
merge 1:1 hhcode using "C:\Users\Shazia\Desktop\sheet.dta"
```

```
drop if _merge!=3
drop _merge
gen lpc=ln(per_adeqcons)                // log of consumption expenditure per adult equivalent
save "C:\Users\shazia\Desktop\sheet.dta, replace"
```

B.4 STATA do-file for poverty estimation at district level using SAE

SAE.do

```
cd "C:\Users\shazia\Desktop\shazia\files\"
use sheet.dta //file including all covariates and log of adult equivalent consumption expenditure
svyset psu [pweight = weight], strata(province) // declaring survey data
forval i=1/4 {
svy: reg lpc  hhsize nospouse prop_adults female_prop child_prop livestock agriland assets
ownrship no_rooms roof water toilet cooking lighting  car washing_mach tv ac refrigerator
motorcycle sewing_mach hhsizesq age femalehh agesq _Iseq06_1 _Iseq06_2 _Iseq06_3
_Iseq06_4 _Iseq06_5 _Iseq06_6 _Iseq06_7 _Iseq06_8 _Iseq06_9 educ2 educ3 educ4 if province
==`i'
mat beta`i' = e(b)
predict e`i', residual // predicting residuals for each province to standard error calculation
replace e`i' = (e`i')^2
}
replace e1=. if province!=1 //inserting a missing value operator "." So as to estimate sum of
squared residuals using only province specific values.
replace e2=. if province!=2
replace e3=. if province!=3
replace e4=. if province!=4
forval i=1/4 {
summarize e`i'
gen se`i'=r(sum)
}
replace se1=. if province!=1
replace se2=. if province!=2
replace se3=. if province!=3
replace se4=. if province!=4
replace se1=se1/6915 //the number of observation for punjab is adjusted for degree of freedoms.
replace se2=se2/4059 //the number of observation for sind is adjusted for degree of freedoms.
replace se3=se3/2915//the number of observation for kpk is adjusted for degree of freedoms.
replace se4=se4/2295//the number of observation for balochistan is adjusted for degree of
freedoms.
forval i=1/4 {
```

```
replace se`i'=(se`i')^0.5
}
summarize se1
gen se11=r(mean)
summarize se2
gen se12=r(mean)
summarize se3
gen se13=r(mean)
summarize se4
gen se14=r(mean)
forval i=1/4 {
svmat double beta`i'
}
keep se11 - beta439
drop if beta11==.
expand 76527
save "C:\Users\shazia\Desktop\betas.dta"
use district_sheet.dta, clear
merge 1:1 _n using "C:\Users\shazia\Desktop\betas.dta"
gen lpreg=0
forval i=1/4 {
gen lpren`i' = beta`i'27*_Iseq06_1 + beta`i'28*_Iseq06_2 + beta`i'29*_Iseq06_3 +
beta`i'30*_Iseq06_4 + beta`i'31*_Iseq06_5 + beta`i'32*_Iseq06_6 + beta`i'33*_Iseq06_7 +
beta`i'34*_Iseq06_8 + beta`i'35*_Iseq06_9 + beta`i'36*educ2 + beta`i'37*educ3 +
beta`i'38*educ4 + beta`i'1*hhsize + beta`i'2*nospouse + beta`i'3*prop_adults+
beta`i'4*female_prop + beta`i'5* child_prop + beta`i'6*livestock + beta`i'7*agriland +
beta`i'8*assets + beta`i'9*ownership + beta`i'10*no_rooms+ beta`i'11*roof + beta`i'12*water+
beta`i'13*toilet + beta`i'14*cooking + beta`i'15*lighting + beta`i'16*car +
beta`i'17*washing_mach+ beta`i'18*tv + beta`i'19* ac + beta`i'20*refrigerator +
beta`i'21*motorcycle + beta`i'22*sewing_mach + beta`i'23*hhsizesq + beta`i'24*age +
beta`i'25*femalehh + beta`i'26*agesq + beta`i'39 if province==`i'
replace lpren`i' = 0 if lpren`i'==.
replace lpreg = lpreg + lpren`i'
}
forval i=11/14 {
gen z`i' = (7.4645-lpreg)/se`i'  //z-score measurement
}
replace z11=0 if province!=1
replace z12=0 if province!=2
replace z13=0 if province!=3
```

```
replace z14=0 if province!=4
gen z=0
forval i =11/14 {
replace z`i'=0 if z`i'==.
replace z=z+z`i'
}
gen probabilities=normal(z) //estimating of probabilities using cumulative normal distribution
mean probabilities, over(district) //calculation of poverty as average of probabilities over each district.
```

B.5 STATA do-file for preparing variables and measuring multidimensional poverty

MDP.do

```
cd “c:\users\shazia\desktop\plsm2010-11\data in stata\”
use sec G.dta, clear //PLSM file for non-income welfare indicators of households.
recode  sgq01 (1=1) (2=1) (5=1) (3=0) (4=0)
label define sgq01 1 "ownership" 0 "no ownship", modify
recode  sgq03 (1=1) (3=1) (4=1) (2=0)
label define  sgq03 1 "improved" 0 "not improved", modify
recode  sgq05 (1/5=1) (8/9=1) (6/7=0) (10=0)
label define sgq05 1 "safe" 0 "notsafe", modify
recode  sgq06 (2/3=1) (6=1) (1=0) (6=0) (4=0) (7=0)
label define sgq06 1 "improved" 0 "not improved", modify
recode  sgq08 (1/3=1) (4/6=0)
label define sgq08 1 "improved" 0 "not improved", modify
recode  sgq07 (2/3=1) (5=1) (4=0) (1=0) (6/8=0)
label define sgq07 1 "improved" 0 "not improved", modify
drop sgq09 sgq10a1 sgq10a2 sgq10b1 sgq10b2 sgq10c1 sgq10c2 sgq10d1 sgq10d2 sgq10e1 sgq10e2 sgq10f1 sgq10f2 sgq10g1 sgq10g2 sgq10h1 sgq10h2
rename  sgq01 ownrship
rename  sgq03 roof
drop sgq04
rename  sgq05 water
rename  sgq06 toilet
rename  sgq07 cooking
rename  sgq08 lighting
drop psu section
save "C:\Users\shazia\Desktop\non_income indicators.dta"
cd “c:\users\shazia\desktop\plsm2010-11\data in stata\”
```

```
use sec J.dta, clear // file on visits to basic health units
recode  sjq01a (3/4=1) (1/2=0)
label define  sjq01a 0 " does not go" 1 " does go", modify
label values  sjq01a sjq01a
drop  sjq01b- sjq12d
rename sjq01a bhu
save "C:\Users\shazia\Desktop\bhu.dta"
cd “c:\users\shazia\desktop\plsm2010-11\data in stata\”
use sec c.dta, clear //file on education profile of household roster
drop if idc!=1
gen litt=1 if  scq01==1 &  scq02==1
replace litt=0 if litt==.
rename litt lill
label define l 0 "illiterate" 1 "literate"
label values lill l
drop   psu- scq92
save "C:\Users\shazia\Desktop\literacyhh.dta"
use sec_f2, clear              //the file provides information on household’s durable assets
gen  asset=1 if   sf2q11g==1 & sf2q11k==1 & sf2q11t==1 & sf2q11n==1 & sf2q11c==1 & sf2q11i==1
replace asset=0 if asset==.
save "C:\Users\shazia\Desktop\asset.dta"
merge 1:1 hhcode using "C:\Users\Shazia\Desktop\non_income indicators.dta"
drop if _merge!=3
drop _merge
merge 1:1 hhcode using "C:\Users\Shazia\Desktop\bhu.dta"
drop if _merge!=3
drop _merge
merge 1:1 hhcode using "C:\Users\Shazia\Desktop\asset.dta"
drop if _merge!=3
drop _merge
// following command estimates alkire and foster method
imdp_afi ownership roof water toilet cooking lighting education health_units lill asset, hgroup(district) dcut(3.33) w1(.55) pl1(1) w2(.55) pl2(1) w3(1.67) pl3(1) w4(.55) pl4(1) w5(.55) pl5(1) w6(.55) pl6(1) w7(1.67) pl7(6) w8(1.67) pl8(1) w9(1.67) pl9(1) w10(.55) pl10(1)
```

APPENDIX C

Sustainable Development Goals	
Goal 1	End poverty in all its forms everywhere
Goal 2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3	Ensure healthy lives and promote well-being for all at all ages
Goal 4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5	Achieve gender equality and empower all women and girls
Goal 6	Ensure availability and sustainable management of water and sanitation for all
Goal 7	Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10	Reduce inequality within and among countries
Goal 11	Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12	Ensure sustainable consumption and production patterns
Goal 13	Take urgent action to combat climate change and its impacts*
Goal 14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17	Strengthen the means of implementation and revitalize the global partnership for sustainable development

Millennium Development Goals (MDGs)	
Goals and Targets **(from the Millennium Declaration)**	**Indicators for monitoring progress**
Goal 1: Eradicate extreme poverty and hunger	
Target 1.A: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	1.1 Proportion of population below $1.25 (PPP) per day[i] 1.2 Poverty gap ratio 1.3 Share of poorest quintile in national consumption
Target 1.B: Achieve full and productive employment and decent work for all, including women and young people	1.4 Growth rate of GDP per person employed 1.5 Employment-to-population ratio 1.6 Proportion of employed people living below $1.25 (PPP) per day 1.7 Proportion of own-account and contributing family workers in total employment
Target 1.C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	1.8 Prevalence of underweight children under-five years of age 1.9 Proportion of population below minimum level of dietary energy consumption
Goal 2: Achieve universal primary education	
Target 2.A: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	2.1 Net enrolment ratio in primary education 2.2 Proportion of pupils starting grade 1 who reach last grade of primary 2.3 Literacy rate of 15-24 year-olds, women and men
Goal 3: Promote gender equality and empower women	
Target 3.A: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015	3.1 Ratios of girls to boys in primary, secondary and tertiary education 3.2 Share of women in wage employment in the non-agricultural sector 3.3 Proportion of seats held by women in national parliament
Goal 4: Reduce child mortality	
Target 4.A: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	4.1 Under-five mortality rate 4.2 Infant mortality rate 4.3 Proportion of 1 year-old children immunised against measles
Goal 5: Improve maternal health	
Target 5.A: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio	5.1 Maternal mortality ratio 5.2 Proportion of births attended by skilled health personnel
Target 5.B: Achieve, by 2015, universal access to reproductive health	5.3 Contraceptive prevalence rate 5.4 Adolescent birth rate 5.5 Antenatal care coverage (at least one visit and at least four visits) 5.6 Unmet need for family planning
Goal 6: Combat HIV/AIDS, malaria and other diseases	
Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	6.1 HIV prevalence among population aged 15-24 years 6.2 Condom use at last high-risk sex 6.3 Proportion of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS 6.4 Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years

Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it	6.5 Proportion of population with advanced HIV infection with access to antiretroviral drugs
Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	6.6 Incidence and death rates associated with malaria 6.7 Proportion of children under 5 sleeping under insecticide-treated bednets 6.8 Proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs 6.9 Incidence, prevalence and death rates associated with tuberculosis 6.10 Proportion of tuberculosis cases detected and cured under directly observed treatment short course
Goal 7: Ensure environmental sustainability	
Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	7.1 Proportion of land area covered by forest 7.2 CO2 emissions, total, per capita and per $1 GDP (PPP) 7.3 Consumption of ozone-depleting substances 7.4 Proportion of fish stocks within safe biological limits 7.5 Proportion of total water resources used 7.6 Proportion of terrestrial and marine areas protected 7.7 Proportion of species threatened with extinction
Target 7.C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	7.8 Proportion of population using an improved drinking water source 7.9 Proportion of population using an improved sanitation facility
Target 7.D: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	7.10 Proportion of urban population living in slums[ii]
Goal 8: Develop a global partnership for development	
Target 8.A: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system Includes a commitment to good governance, development and poverty reduction – both nationally and internationally Target 8.B: Address the special needs of the least developed countries Includes: tariff and quota free access for the least developed countries' exports; enhanced programme of debt relief for heavily indebted poor countries (HIPC) and cancellation of official bilateral debt; and more generous ODA for countries committed to poverty reduction	*Some of the indicators listed below are monitored separately for the least developed countries (LDCs), Africa, landlocked developing countries and small island developing States.* <u>Official development assistance (ODA)</u> 8.1 Net ODA, total and to the least developed countries, as percentage of OECD/DAC donors' gross national income 8.2 Proportion of total bilateral, sector-allocable ODA of OECD/DAC donors to basic social services (basic education, primary health care, nutrition, safe water and sanitation) 8.3 Proportion of bilateral official development assistance of OECD/DAC donors that is untied 8.4 ODA received in landlocked developing countries as a proportion of their gross national incomes 8.5 ODA received in small island developing States as a proportion of their gross national incomes <u>Market access</u> 8.6 Proportion of total developed country imports (by value and excluding arms) from developing countries and least developed countries, admitted free of duty

Target 8.C: Address the special needs of landlocked developing countries and small island developing States (through the Programme of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly) Target 8.D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term	8.7 Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries 8.8 Agricultural support estimate for OECD countries as a percentage of their gross domestic product 8.9 Proportion of ODA provided to help build trade capacity <u>Debt sustainability</u> 8.10 Total number of countries that have reached their HIPC decision points and number that have reached their HIPC completion points (cumulative) 8.11 Debt relief committed under HIPC and MDRI Initiatives 8.12 Debt service as a percentage of exports of goods and services
Target 8.E: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries	8.13 Proportion of population with access to affordable essential drugs on a sustainable basis
Target 8.F: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications	8.14 Fixed-telephone subscriptions per 100 inhabitants 8.15 Mobile-cellular subscriptions per 100 inhabitants 8.16 Internet users per 100 inhabitants

The Millennium Development Goals and targets come from the Millennium Declaration, signed by 189 countries, including 147 heads of State and Government, in September 2000 (http://www.un.org/millennium/declaration/ares552e.htm) and from further agreement by member states at the 2005 World Summit (Resolution adopted by the General Assembly - A/RES/60/1, http://www.un.org/Docs/journal/asp/ws.asp?m=A/RES/60/1). The goals and targets are interrelated and should be seen as a whole. They represent a partnership between the developed countries and the developing countries "to create an environment – at the national and global levels alike – which is conducive to development and the elimination of poverty".

[i] For monitoring country poverty trends, indicators based on national poverty lines should be used, where available.

[ii] The actual proportion of people living in slums is measured by a proxy, represented by the urban population living in households with at least one of the four characteristics: (a) lack of access to improved water supply; (b) lack of access to improved sanitation; (c) overcrowding (3 or more persons per room); and (d) dwellings made of non-durable material.