Re-examining Socio-economic & Demographic determinants of High Infant Mortality in Pakistan

An analysis of PIHS 1998-99

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... From Author

Due to the deadline of European Population Conference 2010 as of December 31, 2009; I have to re-analyze my paper findings later on, on the basis of the latest data set of Pakistan Social & Living Standard Measurement Survey – 2007-08 yet to be released in January, 2010. In this regard a fresh research paper will be submitted later on and as per EPC guidelines.

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ACRONYMS

FBS	FEDERAL BUREAU OF STATISTICS
GOP	GOVERNMENT OF PAKISTAN
HDR	HUMAN DEVELOPMENT REPORT
IMR	INFANT MORTALITY RATE
MDGs	MILLENNIUM DEVELOPMENT GOALS
PDS	PAKSITAN DEMOGRAPHIC AND HEALTH SURVEY
PIHS	PAKISTAN INTERGRATED HOUSEHOLD SURVEY
UN	UNITED NATIONS
UNDP	UNITED NATIONS DEVELOPMENT PROGRAMME
UNICEF	UNITED NATIONS CHILDREN'S FUND
WB	WORLD BANK

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ABSTRACT

This paper is an attempt to examine the relationships between selected individual, household & community level DEMOGRAPHIC & SOCIO-ECONOMIC factors AND the SURVIVAL OF INFANTS under one year age with special reference to a traditional developing society. The research is based on secondary data analysis of Pakistan Integrated Household Survey 1998-99. Analysis found a remarkable influence of MOTEHR LITERACY upon child survival in both urban and rural areas. A significant finding was observed that MATERNAL AGE between 24 and 39 years enhances child survival and that FEMALE babies are safer as compare to MALE infants, as the later have 1.4 times spare chances to be victims of death at their very early age. Furthermore, household SANITATION FACILITY has significant influence while SOURCE OF DRINKING WATER do not appear to significantly influence the survival probability of children under one year age in both URBAN and RURAL areas. The only interaction found significant in this study was infant gender and the residence of family. This indicates that Urban-Females have 0.87 times chances of survival than Rural-Males do have.

Keywords: *child survival, maternal education, theory, statistical model, developing countries*

SECTION - 1

INTRODUCTION

1.1 Statement of the problem

This paper is woven around two major gear of social science analysis: the exploration of the relationship between maternal education and infant mortality in Pakistan with special emphasize on the health seeking behaviour of mother to her children; and the analytical review of various other socio-economic and demographic factors which either may have significant role or may have no say to the higher levels of infant mortality in Pakistan. En passant, this paper makes an earnest effort to determine the multi-channel mechanisms that are likely to skew the inverse relationship between infant mortality and its causal determinants. By delving into the interactive effect between maternal education (here, literacy) & the destiny of rural-urban residence and by questioning the provincial disparities over sighted by the state in provision of the basic needs to the masses.

1.2 Justification of the problem under study

The study of Infant Mortality is considered important for enormous and quite different reasons; its contribution to the total loss of years of human life is ample because it occurs early in life and at relatively high level; its determinant causes tend to be largely distinct from those which operate at the older ages of childhood; its measurement provides a widely useful index of the status of health and also the standard of living of a society; and, its prevention has been a major preoccupation of the health authorities and the degree of success of health programs could be ascertained on the basis of significance decrease in infant mortality.

According to the illustrious study by Flegg (1982), the understanding of the determinants of infant mortality differentials is of critical importance to underdeveloped countries. In addition to reducing the huge human suffering from infant mortality, such an understanding might facilitate initiatives from governments and international organizations to take needful initiatives in resolving the issue of infant mortality. Armed with the knowledge of factors that are significant determinants of infant mortality, governments and organizations can take effective steps in fighting this problem (Bajracharya, 2003).

The proposition that rising levels of female education are associated with lower infant mortality particularly in developing settings congregates with unusually widespread scholarly consensus. To quote one study, “In fact, so many proximate determinants may be directly influenced by a mother’s education to drastically vary chances for child survival, that recent literature was impelled to label the process ‘social synergy’ (Mosley & Chen, 1984 in Stroobant 2001). This harmony vests with an almost fetishistic celebration as a policy baton for countervailing high infant mortality in developing countries. This consensus was mainly initiated by the exemplified study on the determinants of mortality in Nigeria by Caldwell (1979). In his study, Caldwell, put forward *three* hypotheses to explain the relationship between maternal schooling and

child mortality. *Firstly*, more educated females are considered to be less despondent about sickness, making them more likely to confront cultural traditions in order to take advantage of biomedical health technologies and new health-related skills and practices. *Secondly*, education may enable women to communicate with health care professionals and demand their attention in order to obtain the required assistance. Here, the argument behind the first two hypotheses is that education makes women more proficient caregivers and users of health care system due to increased awareness, better cognitive expertise, and increased social status. Similarly, the *third* hypothesis postulates that education transforms the intra-household balance of power, ensures women more autonomy in terms of household decision-making process (Vog, 2004). Likewise, it can also be argued that not only the mother's individual educational level but the overall level of awareness in society is of utmost importance in shaping up the child survival trends in a developing country.

In Pakistani context, the expected inverse relationship between maternal education and infant mortality has been well-established in urban region and particularly in rural areas. Similarly, significant impact of other control socio-economic and demographic factors active to determine the outcome for an infant and which are responsible for high infant mortality in the country; maternal age at child birth, child gender, birth order, household as well as community level variables such as access to safe drinking water, toilet & sanitation facilities available were also examined. The pragmatic dimensions have been explored but not established and the underlying factors have not been adequately canvassed. Evidently, there is a main scarcity of research and investigation conducted for taking the inter-province and inter-regional variations into account while emphasizing on the socio-economic and demographic interventions and special consideration for the role of mother's literacy into the process of children survival. Therefore, the study in hand is an attempt towards this end.

1.3 Structure of the study

This research paper cascades into five parts. Chapter 1 contains the core introductory substance. Chapter 2 portrays the theoretical framework for this study and this Chapter is aimed for a review of previous studies and pertinent literature for molding the scaffold and background rationalization. Chapter 3 is intended to model the data by applying the Binary Logistic Regression and potential correlations to examine various dynamic factors of infant mortality in Pakistan; maternal education (literacy), as major concern for this study. Chapter 4 is showing the significant results and analysis following by a discussion which attempts to capture the major sources of variation for infant mortality regarding province and regions-wise disparities in Pakistan. Key bottom-line of this research is presented in Chapter 5.

1.4 Clarification of certain concepts

It is critical to set forth at the outset that the concept of 'literacy' refers to, as a whole, the ability of reading, writing and to be able to deal with simple arithmetic (addition and multiplication). Hence, a person who can read but can't write and thus can't numerate is considered as '*illiterate'.* Moreover*, literacy* can be attained through the education which transmits specific skills in terms of functional numeracy and verbal

& oral aptitude of human being regardless of specific educational levels and contrasts do exist among religious/missionary schools and the Western stylized school system.

SECTION - 2

THEORITICAL FRAMEWORK OF THE STUDY & ANALYTICAL LITERATURE REVIEW

The conceptualization for this research is mainly based on the pioneer framework of relationship among various proximate determinants as established by Mosley and Chen (1984). They articulated a link between socio-economic and biomedical factors on childhood health and mortality. According to the framework of proximate determinants, mortality is an outcome originated by both bio-medical and socio-economic factors at community, household and individual levels. These factors include maternal fertility, lack of nutrition, environmental pollution, also personal injury & sickness; is the course through which socio-economic factors shape the process of infant health and thus the level of infant mortality in a society (Preston 1975, 1980; Agha 2000; Bawah 2001).

2.1 Infant Mortality - Socio-Economic Explanations

The earlier research in this development area suggests that the underline socio-economic variables can suitably surrogate the conditions of well-being of a population. As, these variables are believed to measure the status in which children are conceived, born or live, I hypothesize that socioeconomic status information collected in the surveys at community, household and individual levels serves as proxies for living standards. In this regard, selected multi-level variables included in this analysis are highlighted in the following:

2.1.1 The Community level variables

This study, principally, to capture the effects of the variables active at the community or regional levels, on infant mortality, employ the provincial differences as well as the urban – rural division in Pakistan. The objective is to clutch the effect of opportunities of public (or household) access to medical and health care and other social services for their children and themselves. Prior research studies about the South Asian region, documented, that cultural variation, gender bias and regional diversity have considerable impact on children survival (Gupta 1987). Nevertheless, such disparities can justifiably be depicted by the inclusion of community level variables and a great deal of variation is shared by the behavioural impressions of people in that community is portrayed.

2.1.2 The household level variables

The access to safe and clean drinking water and proper sanitation facility available to the household are two of the main determinants dictating the environmental eminence and leads to improved living standards of the household in a community. Thus, in fact, these two variables are aggregate of individual and household capabilities and suggest the ways and means – that how they interact with other socio-economic and health variables – which are potentially important while we are looking for better performance on social services delivery by the government. Manifestly, lack of access to piped water and proper system of sanitation manipulate unhygienic way of living, causes infectious diseases which negatively strain the already limited income resources of households.

2.1.3 The individual level variables

Individual variables particularly, parental personal manners have important repercussions on child survival: for instance, a mother education has a leading role in mounting her efficiency in child care especially in adopting health seeking behaviour (O'Hara, 1980; Mosley & Chen, 1984; Streatfiled et al., 1990). Maternal education, may also play role in shaping the contraceptive choice by female, thus helping them to lead longer birth intervals and to opt for fewer children. Since Caldwell's (1979) study of Nigerian data much of research have demonstrated a sound negative relationship between mother's education and infant mortality (Jatrana, 1999). Likewise, maternal fertility associated factors such as birth order, sibling spacing and mother's age have an important influence on undr-five mortality (Alam & Cleland 1984; Hobcraft et al 1985).

2.2 Maternal Education – more about Caldwell's Theory

The inverse relationship between the explanatory variable of interest for this study, maternal education, and infant mortality particularly in the countries at early stages of demographic transition has gained a prolific ground in population studies. During the past few decades, voluminous research has flourished and increasingly multifaceted narrative frameworks have been constructed in order to symbolize the observed empirical models. Following the revolutionary theory by Caldwell (1979), it has been argued that, other things being equal, children of educated mothers experience lower mortality than the children of uneducated mothers. But more importantly, maternal behaviour may be more important to child mortality than to infant mortality. Hence, the effect of maternal education may increase with the age of the child (Caldwell and Caldwell, 1993). Education may affect, in under-five mortality, access to health facilities at the community level. Caldwell's (1979) analysis demonstrated that the mother's education is a more decisive determinant of child survival than other family characteristics such as husband's occupation and his education. In his study, Tulasidhar, (1993), is making point that studies using World Fertility Survey data clearly indicate that education has a strong favourable effect on child mortality independent of the influence of different fertility behaviour and better socioeconomic status (Hobcraft, McDonald and Rutstein 1984; Cleland and van Ginneken 1988). Mother's education affects child survival in two main ways: through better child-care practices and higher standards of hygiene at home, and more rational and greater use of preventive and curative medical services (Mosley and Chen 1984; Cleland and van Ginneken 1988).

Have the socio-economic factors significantly affect on the mortality under five in the developing countries? Keeping aside the substantial role of health and medical variables, various socio-economic and demographic factors have their effective contribution towards the shaping of infant mortality trends in a developing society. With notable exceptions, the fact has largely been studied from the socio-economic and demographic perspectives. In a traditional and predominantly peasant society, like Pakistan; where 60% of country's population is rural and hence demographic transition and urbanization is in intermediary stages, literacy rate is drastically low around 53% especially in females (33%), enormous factors are responsible in determining the survival probability of infants. However, interestingly, the major factor as described by prominent researchers in their studies is mother health seeking behaviour, both in pre-

natal and post-natal periods. Hence, it is justified to make an argument here, that mother's literacy is the most proactive variable leading mother to more clear and vindicated behaviour towards her own and her children comfort.

In continuation, the major routes of causation identified by the earlier studies indicate that the way in which maternal education influences child mortality are literally multifaceted and has three different facets, as mentioned by Tulasidhar, 1993 in his paper, '*maternal education, female labour force participation and child mortality: evidence from the Indian Census'. He revealed that f*irst; the observed relationship between maternal education and child mortality could partly be due to certain independent factors associated with education, such as different fertility behaviour and higher economic and social status, which reduce mortality risk. Secondly, education itself can have an independent influence on child mortality by promoting better child-care practices at home and more intensive use of preventive and curative health care. Finally, certain extraneous factors may either enhance or suppress the overall strength of the relationship between child health and maternal education. What is observed is an amalgam of these three routes of causation.

Moving ahead on the same route, Tulasidhar (1993), in his study with an Indian perspective, described that the socio-economic part of the observed association between maternal education and child mortality, may be due to certain independent factors connected with educated mothers. He explains that different fertility behaviour and better socioeconomic status are often cited as important associated factors. Further clarifying the phenomenon, he cited that the fertility behaviour of educated mothers minimizes the child mortality risk associated with birth as they tend to have children when they are neither too young nor too old; they also may be better at spacing their births. All these factors are known to reduce the child mortality risk. Similarly, with higher education, women are likely to have higher incomes and better social status either through their direct participation in the labour market or through the higher probability of being married to wealthier men.

In a classic study of examining the factors involved in the process of infant mortality was conducted by STROOBANT (2001), *the determinants of infant mortality: how far are conceptual frameworks really modelled?* In this particular research, the author, described and furnish a good ground for the maternal education or literacy to be a good reason for infant mortality.

The theory presented and justified by Caldwell in 1979, that maternal education has an ultimate impact on infant and stronger on child mortality is verified by Stroobant (2001). He illustrates that the wealth of results showing the positive association between mother's education and survival chances of her children: Caldwell (1989, p. 102) states that the "… most important finding at the individual level was the extraordinary stability of the relationship between maternal education and child survival across the different continents and across enormous differences in societal levels of education and mortality, those findings hold true even after controlling for other socio-economic variables (Hobcraft et al., 1984 on 39 WFS; Rutstein, 1984, quoted by Cleland and Van Ginneken,

1988, p. 1358 on 41 WFS; Hobcraft, 1993 on 25 DHS, etc.)". When discussing these findings, Cleland (1990, p. 402) observes that: there is no threshold; the association is found in all major developing regions; the linkage is stronger in childhood than in infancy; only about half the gross association can be accounted for by material advantages associated.

2.3 A fresh perspective about the Caldwell's Theory

In his study, *Tom Vogl*, (2005) attempts to assess how the relative roles of education and income as determinants of mortality have changed over time. He testifies the Caldwell's (1986) cross-national evidence for the importance of female primary education and then contrasts it with more recent data. As Caldwell demonstrated the relative importance of maternal education vis-à-vis per capita income by examining how 1982 mortality measures [infant mortality rate (IMR) and life expectancy at birth) correlated with the two determinants of interest in 99 less-developed countries (LDCs). Vogl follow these correlations over time and then presents multivariate analyses using data from 1982 and 2002. According to the findings of his research, he suggests that education and income have exchanged roles as determinants of infant mortality and life expectancy. Moreover, per capita income has become a more robust determinant of mortality over the past twenty years, while the role of female primary schooling has reduced considerably. The inception of the HIV/AIDS epidemic in the past two decades accounts for some, but not all, of the observed change. Although the results reported by *Vogl* are not indicative of specific methods, rather he argues that they highlight a broader shift towards economic determinism in mortality.

SECTION - 3

RESEARCH DESIGN - DATA AND METHODOLOGY

3.1 About the Sample

This research study is based on the core data analysis of Pakistan Integrated Household Survey (PIHS) 1998-99, a country-wide representative two-stage cluster sample of 16,305 households, containing around 33% of urban areas. The sample design and the data collection for the survey were conducted by Federal Bureau of Statistics, the National Statistical Office of Pakistan with the technical assistance from the World Bank. The questionnaire of the PIHS was based on the conventional Integrated Living Standards Measurement Survey of the World Bank. It is pertinent to note that data on various socio-economic factors and income & expenditure were collected for all 16,305 households. While, Information regarding reproductive histories was congregated from all married women aged 15-49 years, the child-bearing span of females. Keeping in view the scope & time available for this study and the retrospective nature of the PIHS, also for the purpose of having reliable and unbiased estimates and to evade the effects of seasonal variation on the variables of interest, only births and deaths in the last three years (1993-1995) were used (FBS, 2000; Agha 2000).

3.2 Data quality

Extensive data quality checks were carried out at various levels; in the field at data collection stage and at the administrative centres at the time of data cleaning. Extensive reliability and validity checks were implemented at data entry level, by means of sophisticated and especially developed software programmes. Similarly, data were cleaned from errors and inconsistencies found subsequently. By and large, estimates from PIHS and other sources at national level; like Population Census 1998 and Pakistan Demographic and Household Survey (PDS) were found consistent and trustworthy (FBS, 2000). However, the PIHS questionnaire emphasised on Primary education responses, during the analysis some discrepancies were found in estimating various levels of female education. Accordingly, this paper uses the more reliable and consistent data on female literacy from the PIHS 1998-99.

3.3 Retrospective data on mortality determinants

The data available from PIHS series of surveys are of retrospective nature and is a valuable source for analytical purposes of the death measures. According to Vanzo, 1984, 'such information permits analysis of influences on mortality and of determinants of mortality trends, since explanatory variables can be defined to be specific to each child, and not merely to refer to the time of the survey... moreover, a life history matrix, in which retrospective information is collected at one time on a diversified notions of life, definitely provides more valid and reliable information on each life event as compare to if it were the only area being covered. He further argues that the sequencing of different types of events can help prompt recall of the timing of their occurrence.

3.4 MODEL BUILDING STRATEGY

3.4.1 Significance Testing

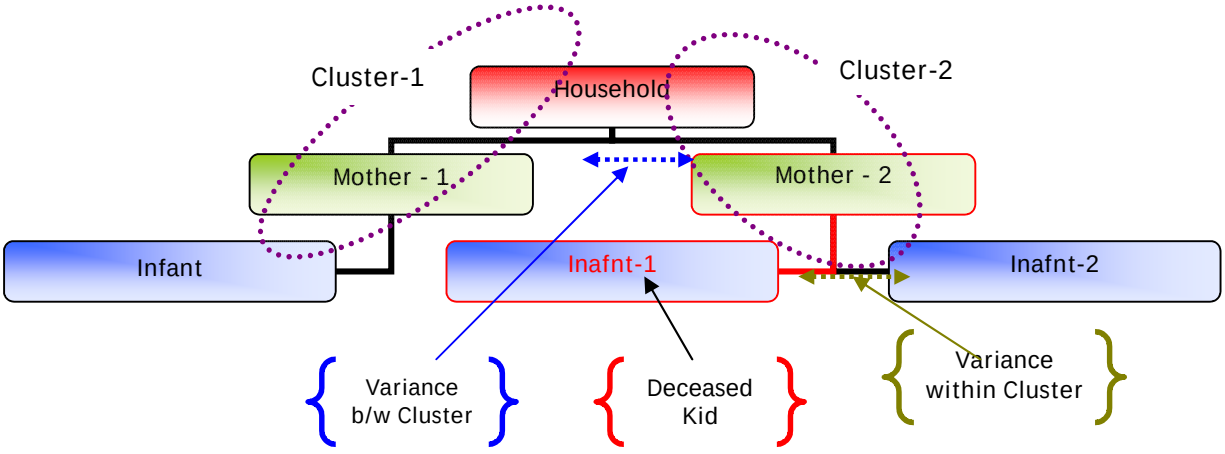
The variable of interest in this particular research is infant death. This outcome was extracted from a dichotomous variable named as; IMR. A binary logistic regression model is used for the analysis of the phenomenon. Hence, binary Logistic Regression is most useful when we have to model the event probability for a categorical response variable with two outcomes (Agresty & Finlay, 1997). Hence, two kinds of test are performed in the model building progression. *Firstly*, the most commonly used procedure of nested testing of Forward Selection with Likelihood Ratio as method to assess the goodness of fit of the model and the significant contribution of each predictor included in the model. Here, variables are added in three different blocks, based on the order suggested by the theoretical model along with two possible interaction effects between Drinking Water (DW) & Sanitation (SAN) and between infant's gender (GEN) and region of residence (RES) of family. The significant change in (-2 log Likelihood) at 5% level from model-1 to model-3 has suggested that each following model developed (model-3, last in the series) of the model building strategy, emerged a better fit of the data. *Secondly*, a considerable change in x^2 also illustrated the goodness of fit of model to the target population. As a further check, we compared the values of Wald statistic for each predictor which agreed with the results of -2 log Likelihood a good fit to the data. However, the change in -2 log-likelihood is generally more reliable than the Wald statistic (Kuha, 2006).

3.5 LIMITATIONS OF THE STUDY

Keeping in view the multilayer nature of PIHS survey data a multilevel or nested model approach would be a reasonably good pathway instead of binary logistic regression in order to accommodate the variation attributed to each of the three levels of data. These three levels are:

- Household
- Mother
- Infant

Figure – 3.1 Multilevel Variation in Survey Data - Theoretical layout



Based on Author's perspective of PIHS dataset

In case of Pakistan Integrated Household Survey; it is pertinent to look at the multilevel nature of the survey data. Figure 3.1 outlines that the covariates may vary at various levels i.e. between clusters, say, mother education or mother's age at child's birth; within clusters, e.g. infant's birth order and both between and within clusters like mother's age at child's birth and infant's birth weight. It is pertinent to mentions that, although, a multilevel approach of modelling to this particular set of data would be more feasible to explain the source of maximum of the variation at all levels i.e. between, within and both between & within clusters. However, to keep in view the scope of this research, I have only make the use of Binary Logistic Regression in *SPSS* which do not have the option of multilevel modelling in contrast to *STATA*.

SECTION - 4

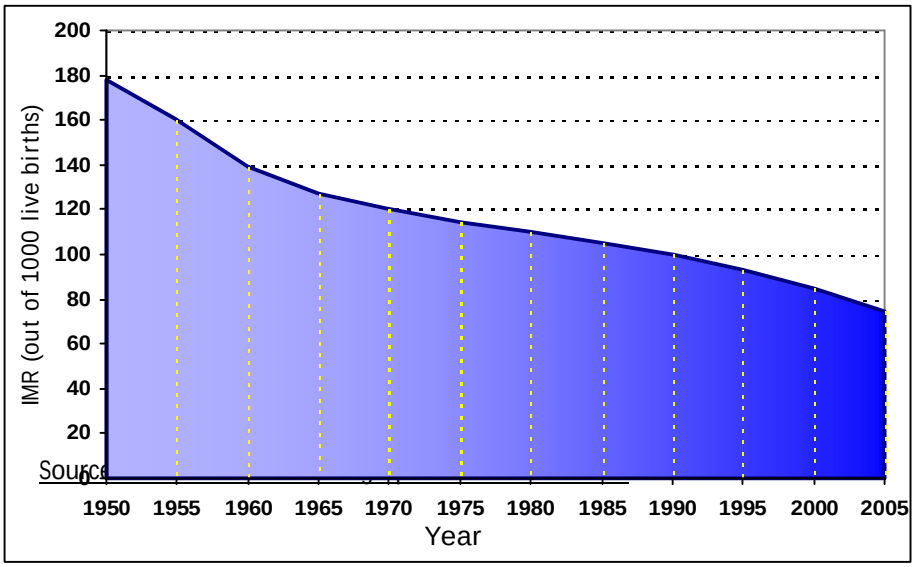
ANALYSIS AND DISCUSSION

4.1 INFANT MORTALITY IN PAKISTAN – LEVELS & TRENDS

4.1.1 Historical Background

The infant mortality level in Pakistan – as shown below in the figure has experienced a steep decline in 1950's from about 180 deaths per 1000 live births in the early 1950 to around 140 in the beginning of the next decade (UNDY, 2006). This pre-dominant and tremendous decreasing trend could not be maintained in the preceding years and was followed by a gradual decline from 135 in the late 1960s to 105 in early 1980s. Likewise, a manifest stagnant IMR, at around 103 deaths per 1000 live births, has been evident in the mid 1980s and early 1990s (Agha S, 2000). However, in the following years, in 1990s and at the eve of new millennium, by the inception of Social Action Programme (SAP) and through modest improvement in basic education, reproductive health, population welfare and rural water supply & sanitation, the IMR was brought down from 100 in early 1990s to 79 deaths in 1000 live births in 2005. Although, the latest figure of IMR is 75, which is still at a very high level as compare to the contemporary developing world. Although, the target set for the Millennium Development Goal (MDG) is to bring down the IMR to 40 deaths per 1000 live births in 2015 (PMDGR, 2004).

Figure 4.1 Infant Mortality Rate – Trends in Pakistan



Source

4.2 SOCIAL SECTOR DEVELOPMENT – REGIONAL STANDINGS

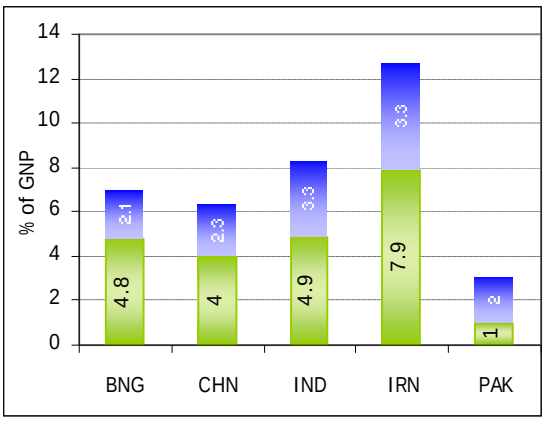
WITH the infant mortality rate at around 77-80 per 1,000 live births (2005 figures), rampant nutritional disorders and infectious diseases, Pakistan has a dismal score card to show when it comes to mother and child health indicators even in South Asia. Going in-depth to the core of the matters, let us think about the social sector development at broad level. The best representative snaps appear when we have glance at the regional comparison on the public expenditure as %age of GNP. However, in the

case of Pakistan, the government's expenditure on health has still to exceed one per cent of the GNP. This compares unfavorably with India (.2 per cent), China (4.7 per cent), Sri Lanka (4.8 per cent), Bangladesh (4.8 per cent), Thailand (7.4 per cent) and Iran (7.9 per cent) (*Zofeen, 2006).* Similarly, in case of education sector expenditure, we see that the same dismal scenario emerges keeping in view the fate of people of Pakistan, as only 2% of its GNP is allocated for education at all level *(UNESCO, 2005*).

Similarly, Figure 4.2 (b) articulates that intra-regional variation of IMR is enormously vivid and evidently, in 2001, Pakistan is leading this particular group of countries with 84 infant's death out of 1000 live births. Although, a downturn is witnessed in each country including Pakistan, but the high IMR of 84 tells the story by itself of the vivid exception in the region. This drastically invites the attention of policy makers to address the overall state of affairs.

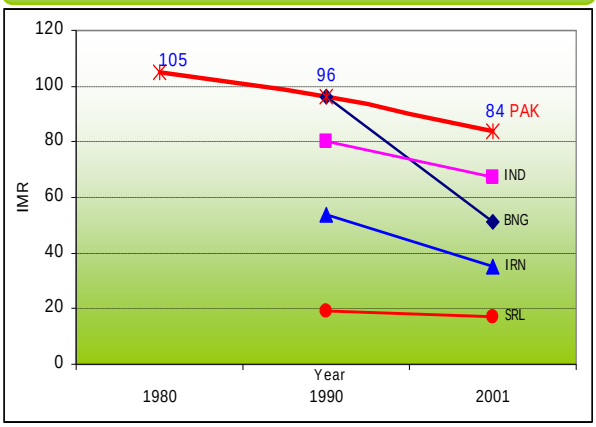
Figure – 4.2

Health & Education – Expenditure of %



Source: UNESCO, 2007

INFANT MORTALITY – Regional Trends



Source: HDR, 2001, UNDP

4.3 FREQUENCY DISTRIBUTIONS OF PREDICTORS

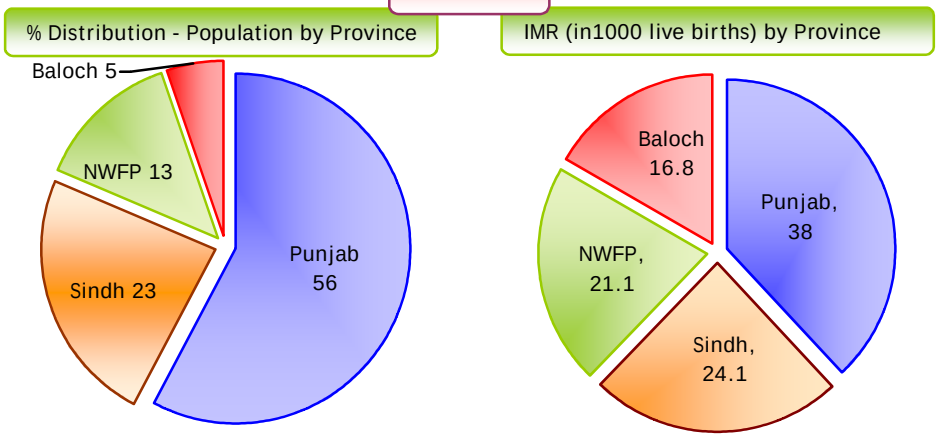
4.3.1 IMR - Province and Urban/Rural differentials

Frequency distribution of deaths by province and residence are shown in Table-4.1. The province differentials of infant deaths show a hierarchal pattern among the four provinces. Out of the total sample (n=8463), 38% of deaths occurred in Punjab, 24% in Sindh, 21% in NWFP and 17% in Balochistan. In contrast, 32% of deaths occurred to the families residing in urban areas in comparison to 68% in rural areas. Interestingly, these intra-provincial and intra-region distribution of death for the infants who died before their first birthday is not much consistent with the country's overall population distribution among the four provinces.

Table 4.1 Frequency Distribution of Infant Deaths by PROVINCE and

Characteristic	% distribution (n=8463)
PROVINCE	100.0
Punjab	*38.0*
Sindh	*24.1*
NWFP	*21.1*
Balochistan	*16.8*
RESIDENCE	100.0
Urban	*31.7*
Rural	*68.3*

Figure 4.3



Source: Based on PIHS, 1998-99, FBS, GOP

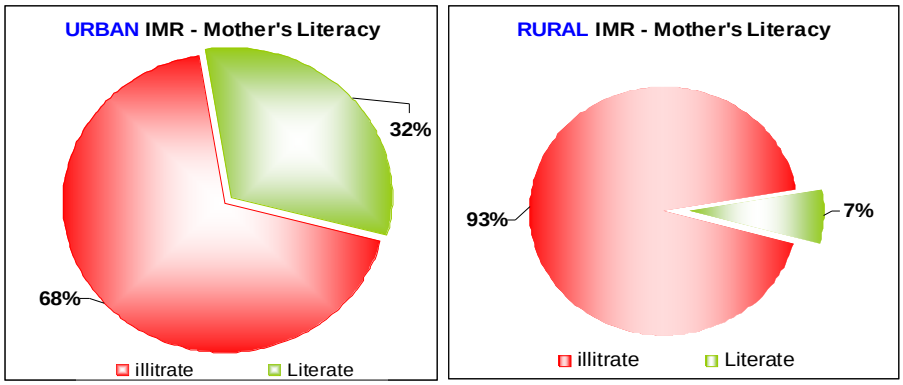
Why and how these provincial differences are significant? Are there could be any significant explanations for such variations among various areas of the country? Are disparities like indicated in case of IMR, indicative of the overall living standards of their origins? The ultimate response to such type of questions is yes! As IMR is one of the societal indicators, reflecting the living standards of a society. Likewise, the infant mortality rate often serves as a key development indicator, reflecting the combined effects of economic development, technological change, including health interventions, and the socio-cultural environment (Zachariah et al, 1982; Philip, 1985). Here, for the sake of argument, it is noteworthy, that Infants and children are indeed the future of today's population. Also, Infant deaths cut short a population's life expectancy. Several studies have attempted to evaluate the impact of morbid conditions during infancy which can have a detrimental effect on the development of a child.

4.3.2 Socio-economic vulnerability – urban / rural contrast

Table-2 below depicts distribution of deaths mainly in urban and rural domains by socio-economic features. These data provide significant evidence for the differences between urban and rural areas within Pakistan in socio-economic indicators like mother's literacy and water supply and sanitation facilities at household level. Figure 4.4 below, reveals that about 68% of urban infant deaths have occurred to the mothers who were illiterate compared to 93% of rural mothers with no education. *Per se*, this evidence, in principle depicts not only the intra-regional disparities but also strongly

underline one of the theoretical arguments of this study that mother's education (or literacy) has a significant impact on child's survival. In other words, it is evident from the figure that there is high correlation between infant health and low status of mother irrespective of the regional difference. The negative association between lack of maternal literacy and infant health is stronger than for any other variable in the study.

Figure 4.4 Infant Mortality – Region & Mother's Literacy



Source: Based on PIHS, 1998-99, FBS, GOP

Moreover, nearly 55% infant deaths in urban areas and 14% in rural areas occurred in household with piped water. However, less than 56% of rural deaths, compared to 36% in urban areas, occurred in households with hand/motorized pumping or tube well as source of drinking water. It is relevant to mention that about 30% of deaths occurred in rural households having traditional and conventionally unsafe source of drinking water such as river, canal, stream and pond etc. Almost 74% of urban infant deaths occurred to households having flush connected to underground sewer, compared to less than 15% in rural areas. In contrast, a huge bulk of around 57% infant deaths in rural areas occurred to households with no proper toilet/sanitation system. This evidence may be attributed to the weak penetration of public sanitation facilities in rural areas.

Has poor sanitation in community and particularly in household, a significant impact on the infant survival? As poor sanitation leading to high infection rates and a rapid spread of infectious disease; it is hence, relevant; to argued that lack of hygiene and sanitation in a community, if considered as a proxy for the degraded environment, deteriorating quality of life coupled with inaccessibility to healthcare are the conditions can strongly be attributed for high and sustained under-five and infant mortality in both type of inhabitants; rural and urban (Awasthi & Agarwal, 2003; Bhatti et al, 2001).

Table 4.2 Distribution of Infant Deaths by Mother's Literacy and Housing Characteristics

Characteristic	% distribution (n=8463)	
	URBAN (2683)	RURAL (5780)
MOTHER'S LITERACY	100.0	
Literate	*20.1*	*4.6*
Illiterate	*79.9*	*95.4*
SOURCE OF DRINKING WATER	100.0	100.0
Piped Water	*54.7*	*14.0*
Hand/Motorized Pumping & Tube Well	*35.7*	*55.7*
Others	*9.6*	*30.3*
SANITATION	100.0	100.0
Flush	*74.1*	*16.4*
Open	*16.9*	*26.8*
No Toilet	*9.0*	*56.8*

Source: Based on PIHS, 1998-99

4.3.3 Socio-demographic inequalities

Urban-rural variants by mother's age, order of birth and infant's gender are revealed in Table-3. According to the comparative analysis, there depicts a shallow regional difference in infant deaths regarding mutable mother's age groups. For example, the largest bulk of infant deaths occurred to the age-group of 25-35 year's mothers in both the regions: urban and rural, with a ratio of 52% to 57% respectively. Critically, such a high rate of infant mortality to mothers of a specific age group can largely be attributed to the high fertile age-group in child bearing life-span of women. Likewise, the survey data signifies almost consistent infant death ratios according to various birth orders. The first or the eldest child (in order of birth among siblings) born to either mother from urban or rural region has the most chances of around 23% of being the deceased kid in infancy. Sex ratio for infant mortality in both of urban and rural regions is consistent with the universal norms of sex ratios at birth having considerably skewed (to male) distribution. Consequently, about 55% of urban & less than 53% of rural male infants couldn't accomplish their first birthday.

Table 4.3 Distribution of Infant Deaths by Maternal Factors and Infant's Gender

Characteristic	% distribution (n=8463)	
	URBAN	RURAL
MOTHER' AGE *(YEARS)*	100.0	100.0
15 - 24	*5.4*	*6.6*
25 - 39	*52.0*	*57.2*
40 - 49	*42.6*	*36.1*
ORDER OF BIRTH	100.0	100.0
1	*22.2*	*23.6*
2	*17.3*	*16.4*
3	*13.2*	*13.7*
4 & higher (up to 16th)	*47.3*	*46.3*
INFANT'S GENDER	100.0	100.0
Male	*55.4*	*52.8*
Female	*44.6*	*47.2*

Source: Based on PIHS, 1998-99

4.4 DISCUSSION

4.4.1 Bivariate Logistic Regression Analysis

Keeping in view the dichotomous nature of response variable: infant mortality; the mortality phenomenon was recoded with probability of death equal to 0 and probability of survival equal to 1, and to reveal the net effect of predictors on infant survival, the data was modelled through bivriate logistic regression. Three separate models were generated based on combined urban-rural main effects. Table-4 shows the odds of death of infants (before the age of 12 months) associated with selected socio-demographic and maternal variables. Hence, in order to get specific variables into the model which could significantly contribute to the variations in infant survival, in Model-1 we included province, family residence and mother's literacy[1]. While in Model-2 we incorporated all variables in model-1 *plus* three other variables i.e. mother's age, order of birth of the deceased kid among siblings and gender of the dead child. Here, it is essential to note that inclusion of new variables into succeeding models did not trim down the effect of variables in earlier models. This evidence substantiated the individual significant effect of variables (in the analysis) on infant mortality. *Consequently*, Model-3 included all variables as per theoretical framework of the study; we discuss outcomes from Model-3.

The results from Model-3 imply that infants in Punjab are more likely to survive in their first year of life than the infants born to families from other three provinces i.e. Sindh, NWFP and Balochistan. More specifically, infants from Sindh and Balochistan are on the average 1.11 times as likely to die as infants in Punjab, while kids from NWFP are luckier than the infants from these two provinces as they have about 7% fewer chances of distress by under-one (infant) mortality; although they are 1.05 times less likely to survive than those of infants from Punjab, provided other things being equal. Evidently, as the analysis indicates, infants from rural Pakistan are higher sufferer of death in childhood than their urban equivalents. These estimates indicate that higher rural-urban disparity in IMR as described in earlier studies has an active role in deciding about mortality in infancy at national level. Supposedly, the inequalities sustained in socio-medical and socio-demographic determinants might have been playing main roles in high IMR in rural areas.

In accordance with the main research question of this study and indeed, the evidence from data, mother's education (literacy) has a highly significant effect on infant mortality even in the traditional society like Pakistan where women have yet to initiate and uphold their active role in decision making about their children's health and other relevant factors prevailing at individual and household levels. These results are well justified and aligned with the exemplified hypothesis initiated and testified with the Nigerian data by Caldwell, 1979. He argued, taking the net effects, children of educated mothers experience lower mortality than the children of uneducated mothers. More precisely, infants of illiterate mothers are 1.6 times as likely to die as to those whose mothers are literate. In other words, literate women are in higher advantage and are more dynamic as compare to their illiterate or less educated counterparts in adopting

[1] *A proxy for mother's education*

the realm of health seeking behaviour ensuring that their children will survive the hard first year of life. (Flegg 1982)

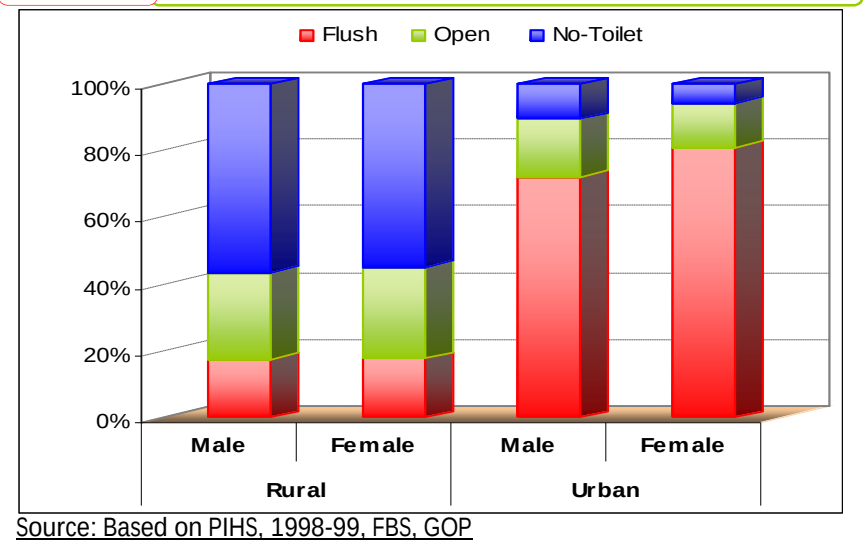
Young maternal age at birth, theoretically should increases the odds of infant mortality (Agha 2000); however, the evidence here is not supportive, mainly because, in this study instead of taking the mother's age at child birth, mother's current age at interview time was taken for analysis in order to investigate whether it has any statistically significant relationship with the probability of child survival. Accordingly, analysis shows; young maternal age has smaller impact on infant survival as compare to mothers in mature age groups 25-39 year and 40-49 years at the time of interview, once other factors are controlled. For the sake of an argument, this is because a large number of mothers, who might have experience infant mortality in younger age, would definitely be in upper age groups at the time of interview. While, logically, very young under 20 year's and very old over 40 year's mothers are presume to exhibit different and high in nature mortality risks as compare to mothers in their prime childbearing age – (between 20 and 40 years of age). Analysis for this study reflects 1.13 times higher mortality hazards for the infants born to mothers of age more than 40 years. Hence, conventionally estimated by several research studies that young age reflects maternal immaturity and old age is associated with increased likelihood of birth defects. Moving forward, it can be argued that maternal age at birth is also an indicator of mother's experience with childcare and may be leading to likelihood that the child is wanted (Julie, 1984).

Although the birth order of siblings is generally treated as reflecting as biological mechanism, at the same time it may also be taken as the likelihood of the thought that the child born was wanted (Vanzo, 1984). Similarly, it is an indicator for the degree of competition for family resources particularly for meagre resources of a poor family (Shami 1980). The current analysis indicates that the elder babies have 20% lower chances of survival as compare to the babies born at the 2^{nd} order, if other effects are controlled. In the same way, siblings at birth orders 3^{rd} and 4^{th} have 1.02 and 1.10 times higher chances of being victims of death before their first birthday respectively. The reasonable explanations for these variations in infant mortality partially affected by the sibling birth order might be the equilibrium between parental preference to have a child at specific time of their marriage and their corresponding socio-economic or status of family or the health status of mother. Sometimes if parents are not looking for a child due to certain circumstances like financial position or else thing, and otherwise they might not be able to substantially take care of their unwanted born baby.

Looking at the gender differentials in infant mortality, it is observed that male infants have 1.40 time higher chances of death than the female infants. Surprisingly, these findings are contrary to the earlier studies documenting unfavourable attitude towards female infants in the developing world especially in South Asian region (Ahmed, 1992). The only significant interaction effect included in the model was between infant's sex and family residence in rural/urban areas. The analysis divulge that male infants from rural Pakistan are the worst victims of mortality as compare to female rural infants having 13% higher chances of death, if other conditions stay the same. Moving ahead, it

can be substantiated from the findings of this research and one of the major correlates involved in this interaction effect, considered active; is the poor sanitation facilities and thus degraded living environment available in the rural areas (Agha, 2000). Evidently, in rural areas, around 60% of babies, both male and female, died in the households where there was no toilet facility available at all. This findings is consistent with the PIHS 1998-99 (2000) brief report, indicating over 60% of rural households are existing without any toilet facility, even at the eve of 21st century. In contrast, A quite different story emerges if we look at the urban areas, comparatively in better conditions, where infant deaths in households with no-toilet are only 7% to 10%, but the higher %age, i.e. 80% of infant deaths associated with households having flush toilet facility showing the high penetration of sanitation system but with little public utility. These analytical findings suggest that, such humiliated circumstances, particularly, in rural areas, may not necessarily representing the real economic well-being of the society, but net of other factors, this may be showing the overall interest shown by the governments and policy makers over decades to provide the basic needs to the masses in the far long areas of the country. Also, this may be at best, regarded as a chronic mass entitlement failure, frequently taking place in the most deprived societies around the globe.

Figure 4.5 Infant Survival – By Urban / Rural & Sanitation



Source: Based on PIHS, 1998-99, FBS, GOP

Here, in the model-3 on the following page, the variable about source of drinking water in the household where the infant mortality occurred do not touch the significance level, although, considerable improvement to the fitness.

Table 4.4 ODDS of death associated with Mother's Literacy & other socio-demographic Factors

Variables	Model-1	Model-2	Model3
PROVINCE			
Punjab	1.00	1.00	1.00
Sindh	1.05	1.06	1.11[d]
NWFP	1.03	1.03	1.10[a]
Balochistan	1.14	1.14	1.14[d]
RESIDENCE (U)			
Urban	1.00	1.00	1.00
Rural	0.93	0.92	1.35[d]
MOTHER'S LITERACY			
Literate	1.00	1.00	1.00
Illiterate	1.76	1.77	1.62[d]
MOTHER' AGE (YEARS)			
15 – 24	-	1.00	1.00
25 – 39	-	1.12	1.15[c]
40 – 49	-	1.12	1.13[d]
ORDER OF BIRTH			
1	-	1.00	1.00
2	-	0.81	0.80[d]
3	-	1.03	1.02
4 & higher (up to 16th)	-	1.10	1.10[b]
INFANT'S GENDER (M)			
Female	-	1.00	1.00
Male	-	1.10	1.40[d]
DRINKING WATER (DW)			
Piped	-	-	1.00
Hand/Motorized Pumping & Tube Well			1.04
Others	-	-	0.90
SANITATION (SAN)	-	-	
Flush	-	-	1.00
Open	-	-	1.13
No Toilet	-	-	1.15[c]
DW x SAN (Interaction)	-		
DW1 X SAN1	-	-	1.16
DW1 X SAN2	-	-	0.80[b]
DW2 X SAN1	-	-	1.17[a]
DW2 X SAN2	-	-	0.88[a]
Gen X Res	-	-	1.00[a]
Female x Urban			0.87[c]
STATISTICAL SIGNIFICANCE			
- 2 Log Likelihood	51654.14	51545.44	51426.22
x^2 Improvement	292.00	109.20	119.22

[a] *P <0.10* [b] *P<0.05* [c] *P<0.01* [d] *P<0.001; n = 8463*

of model was observed with the inclusion of this household level explanatory variable in the third model. In contrast, poor sanitation in household and at community levels has

markedly signifies its impact on infant mortality. The upshot of having a flush toilet is supposed to improve infant survival because of its usefulness for hygienic environment through household members. Comparing to the reference category of flush connected to public sewerage or flush connected to pit, all other types of sanitation facilities and not surprisingly, no proper sanitation to the household; are likely to increase the occurrence of infant mortality available. It is striking that having flush connected to open drain or to septic container has equally likely chances of causing infant mortality as compared to the worst conditions of having no sanitation at all.

In fact, such gloomy conditions highlight the role of local environmental effect on infant mortality. Although, the worsen state of affairs regarding likelihood of infant mortality belongs to the households having no sanitation are at 1.20 times higher risk of being responsible for infant mortality as compare to the households having flush connected to public sewerage system. Therefore, firstly to provide the sanitation system and secondly, proper public access to it, is essential to provide hygienic living conditions to the masses not only in urban and suburbs but also in rural areas of Pakistan where, the current and other studies suggest, the sanitation is almost inexistent, to bring the infant mortality substantially down.

SECTION - 5

CONCLUSION

This paper has mainly examined the endogenous as well as exogenous socio-economic and demographic factors responsible for shaping the high infant mortality trends in developing countries with particular analytical perspective of Pakistan. My special research interest was to investigate the association between infant mortality and maternal education regarding aforementioned factors.

Findings of this research indicate that prevailing high levels of infant mortality, although has a downward trend but in contrast to other contemporary developing countries in the South Asian region, Pakistan still has a very high infant death rate, 75 - 80 infant deaths per 1000 live births, just below the deteriorated scenario of Sub-Saharan Africa's average IMR of around 105 infants deaths. The principal finding of this study demonstrated that literate mothers have more than double advantage as compare to their illiterate or un-educated counterparts of not being sufferer of their babies' early deaths. Same pattern was observed for both rural and urban regions. Subsequently, it can be concluded that, other factors being constant, maternal education is one of the leading determinants of infant death and is the principal source of ascertaining, broadly a health seeking behaviour by mothers towards their children. It is also pointed out that, maternal education is one of the leading motives in declining infant mortality specifically in developing settings where other factors such as access to medical and health care facilities, lack of breast feeding practices, might be due to active participation of mothers in economic activities, clean drinking water and sanitation etc are not well-established in the community.

In the present study it has been identified that regional differences; rural – urban parity, is one of the most predominant factors defining this horrific phenomenon in the country. The study signifies that babies in rural areas are the main victims as compare to urban Pakistan. This upshot may be justified by the fact and it can be argued that only 35% of the total population is urbanized and almost 65% of the country population are rural inhabitants along with the absence of predominant basic drinking water and sanitation capacities. In fact, a tiny proportion of people in Pakistan whether they are educated or not have access to impediment, health & medical care and to a hygiene way of living, in contrast to a gigantic majority of people do not. The pressure on the already squat basket of resources available to the rural population is shattering the inequalities between rural and urban areas and comparatively higher IMR is one of the symbols representing the overall picture of ongoing state of affairs.

A quite similar story emerges if we look at the regional and provincial inequalities, as manifested by the current research study are apparently driven by the hypothetical trickle down policy of economic growth and structural transformations pursued in Pakistan and posed by the World Bank mainly since early 1990s'. Because, by implementation of such regulations has led to un-employment among labour force and results in scarcity of resources available to households. These disparities among various socio-economic groups have substantially increased more strain on family income and its

access to basic needs. The argument here is that such phenomenal change has affected the Pakistani society in multifaceted ways, and a stagnant or very slow socio-economic development process was one of the repercussions. Consequently, the achievement of wishful target to bring Infant mortality at 50 infant deaths per 1000 live births, as set by United Nations through Millennium Development Goals (MDGs) is really far from reality.

The findings of this research also highlight the relationship between low status of women and health of Pakistani children. Evidently, 93% of rural deaths and 68% of urban deaths occurred during 1993 to 1995 to women without literacy. The negative association between the lacks of maternal literacy was stronger in rural areas than in urban areas. Due to this finding, it may be argued, that high fertility or high population density and high infant mortality are significantly associated in the case of Pakistan, and fertility decline is likely to put downward trend in the IMR. Therefore, it can be concluded that interventions which focus on improvement of reproductive health are essential for lowering the IMR. Similarly, the empowerment of women in terms of their legal and economic status is almost indispensable for substantial and sustained long-term declines in the IMR.

5.1 Scope for future research

In Pakistan, further and enhanced research is required to improve the directions towards better health interventions focusing infants and mothers. Due to lack of research, little is known about parental practices. A fresh and improved knowledge about parental behaviour can guide the government and policy makers for bringing up with better interventions that reinforce and improve infant-centric practices prevailing in the society. Historically, child and maternal health intervention are not evaluated in Pakistan with frequent quality research. In absence of plausible research mirror, signifying the efficacy and optimization of various interventions, how it is possible to make best possible decisions regarding resource allocation? But the bottom-line of this research is that although, vigilant evaluations regarding policy interventions may apparently be costly, but avoiding them at the development stage is, in fact, likely to be more expensive in the long run.

BIBLIOGRAPHY

A.T.Flegg (1982) "Inequality of income, illiteracy and medical care as determinants of infant mortality in Underdeveloped countries" Population Studies 36.441-458.

Agha, S. (1995). The determinants of infant mortality in Pakistan: Social Science & Medicine 51, 199-208

Agresti, A. and B. Finlay. (1997). Statistical Methods for the Social Sciences. 3rd ed. Prentice Hall

Ahmed, T. (1992) Factors associated with child mortality in Pakistan and implications for the National Health Programs. Asia and Pacific Population Forum 6: 29-34, 53.

Alam, I., Cleland.J. (1984). Infant and Child mortality: trends and determinants: In: Agha, S. 1995. The determinants of infant mortality in Pakistan: Social Science & Medicine 51, 199-208

Awasthi S, Agarwal S. (2003). Determinants of childhood mortality and morbidity in urban slums in India. 40(12):1145-61. Review. PMID: 14722365 [PubMed - indexed for MEDLINE], http://www.ncbi.nlm.nih.gov/sites/entrez accessed on 16-08-2007

Bajracharya. Ashish (2003). Socio-Economic Factors that Influence the Infant Mortality Rates in Developing Nations: A Cross-Country Regression Analysis. Senior Independent Study, Ohio Wesleyan University Press.

Bawah. A. (2001). Living standards, Household size and Childhood Survival in Africa: Evidence from Census Data. University of Pennsylvania, Population Studies Centre.

Bhatti, Mansoor ul Hassan, Abdul Hakim, and Faateh ud Din. 2001. Correlates of Infant Mortality in Pakistan. In Pakistan's Population Issues in the 21st Century, Conference Proceedings of the Population Association of Pakistan. Karachi: Population Association of Pakistan.

Caldwell, C. J. (1979). Education as a Factor in Mortality Decline An Examination of Nigerian Data. Population Studies, Vol. 33, No. 3. (Nov., 1979), pp. 395-413.

Cleland, J.G. and J.K. van Ginneken. (1988). Maternal education and child survival in developing countries: the search for pathways of influence. Social Science and Medicine 27,12:1357-1368.

Federal Bureau of Statistics (2000). PIHS Found 3: 1998-99. Government of Pakistan, Islamabad.

Hobcraft, J.W., J.W. McDonald and S.O. Rutstein. (1984). Socio-economic factors in infant and child mortality: a cross national comparison. Population Studies 38:193-223.

Jatrana, Santosh (1999). Determinants of Infant Mortality in a Backward Region of North India: Are Socio-economic or Demographic Factors Dominant. Working Paper in Demography 82; The Australian National University.

Kuha. Jouni (2006). Quantitative Analysis II: The Generalized Linear Model. Course Pack. The Methodology Institute, London School of Economics.

Philip E. 1985). Why infant mortality is low in Kerala. Indian Journal of Pediatrics, 1985, 52 (418): 439–443.

Planning Commission. (2004). Pakistan Millennium Development Goals Report. 20. Government of Pakistan

Preston, S. 1975. The changing relation between mortality and level of economic development. Population Studies 29:231-248.

Preston, S. 1980. Causes and consequences of mortality declines in less developed countries during the twentieth century. Pp.289-341 in Population and Economic Change in Developing Countries, ed.R. Easterlin. Chicago: University of Chicago Press.

Sathar Z. A. (1987) "Seeking explanations for high levels of infant mortality in Pakistan" Pak Dev Rev. 1987 Spring;26(1):55-70

Shami, S.A. (1980) Parental age, birth order and tertiary sex ratio in the human population of Punjab, Pakistan. Pakistan Journal of Zool 12: 115-122.

Stroobant G.M. (2001). The determinants of infant Mortality: how far are Conceptual frameworks Really modelled? Institut de démographie, UCL.

Tom Vogl (2005). New Routes to Low Mortality in Poor Countries? Crossover in the Roles of Income and Female Education. Undergraduate Economic Review. Illinois Wesleyan University

Tulasidhar V.B. (1993). Maternal education, female labour force participation and child mortality: evidence from the Indian census. Health Transition Review Vol. 3, NO. 2

United Nations (2006). United Nations Demographic Yearbook – New York

UNESCO (2007). 'Education for all: Global Monitoring Report', UNESCO

Vanzo J. D. (1984). A Household Survey of Child Mortality Determinants in Malaysia. Population & Development Review: 10, Supplement. Child Survival: Strategies for Research. Pp. 307-322

Zachariah KC, Patel S. (1982). Trends and determinants of infant and child mortality in Kerala. Washington, DC, The World Bank, (Population and Human Resources Division, Discussion Paper No. 82-2).

Zahid GM. (1996) "Mother's health-seeking behaviour and childhood mortality in Pakistan" Pak Dev Rev. 1996 Winter; 35(4 Pt. 2):719-31. PMID: 12146446 [PubMed - indexed for MEDLINE]

Zofeen T. Ebrahim (2006). Of mother and child. Daily Dawn, 30-04-2006. accessed on 21-8-2007at www.dawn.com