Achievements of Healthcare Services Vis-À-Vis the Millennium Development Goals Targets: Evidence from Pakistan

Saeeda Batool, Ather Maqsood Ahmed

Abstract—This study investigates the impact of public healthcare facilities and socio-economic circumstances on the status of child health in Pakistan. The complete analysis is carried out in correspondence with fourth and sixth millennium development goals. Further, the health variables chosen are also inherited from targeted indicators of the mentioned goals (MDGs). Trends in the Human Opportunity Index (HOI) for both health inequalities and coverage are analyzed using the Pakistan Social and Living Standards Measurement (PLSM) data set for 2001-02 to 2012-13 at the national and provincial level. To reveal the relative importance of each circumstance in achieving the targeted values for child health, Shorrocks decomposition is applied on HOI. The annual point average growth rate of HOI is used to simulate the time period for the achievement of target set by MDGs and universal access also. The results indicate an improvement in HOI for a reduction in child mortality rates from 52.1% in 2001-02 to 67.3% in 2012-13, which confirms the availability of healthcare opportunities to a larger segment of society. Similarly, immunization against measles and other diseases such as Diphtheria, Polio, Bacillus Calmette-Guerin (BCG), and Hepatitis has also registered an improvement from 51.6% to 69.9% during the period of study at the national level. On a positive note, no gender disparity has been found for child health indicators and that health outcome is mostly affected by the parental and geographical features and availability of health infrastructure. However, the study finds that this achievement has been uneven across provinces. Pakistan is not only lagging behind in achieving its health goals, disappointingly with the current rate of health care provision, but it will take many additional years to achieve its targets.

Keywords—Socio-economic circumstances, unmet MDGs, public healthcare services, child and infant mortality.

I. INTRODUCTION

THE state of child health is an important dimension of households' well-being and human development. Despite the improvements in the coverage of health services, Pakistan has so far been incapable of achieving the health targets set under the umbrella of MDGs. According to the some careful estimates, the infant mortality has reduced from 102 in 1991 to 74 deaths per 1,000 live births in 2013. Similarly, even though the mortality rate of under-5 year old children has reduced from 117 in 1991 to 89 per 1,000 live births, but the progress has been quite slow [1]. In fact, even with this improvement, Pakistan lies amongst the countries which have the highest

infant and under–5 year child mortality rates, globally as well as in the South Asian region [2].

Children with the poorest socio-economic backgrounds are most likely to be malnourished and vulnerable to diseases. The childhood immunization campaigns are regularly launched in the country with the support of the World Health Organization (WHO); however, a large proportion of population remains prone to malaria, measles, polio and dengue viruses and other communicable and non-communicable diseases. The prevalence of these diseases is highly correlated with low levels of education and hygienic practices, on the one hand, and poverty, on the other. The inability to reduce the child mortality by two-thirds and attainment of universal opportunities for full immunization can also be attributed to regional and provincial disparities and unequal access to public health services for the marginalized groups in society.

The present study uses historical cross sectional PSLM dataset from 2001-02 to 2012-13 of 17,000 households at the national and provincial levels to empirically analyze the patterns of health inequalities and coverage of health opportunities over time[1].The objective is to highlight the contribution of the socio-economic circumstances which encompass regional features, parental characteristics, family attributes, and the public provision of infrastructure availability.

The estimates are used to simulate the time for achieving the health related MDGs and the universal access to health opportunities, envisaged as per Pakistan's *Vision 2025* of the Planning Commission.

II. SUBJECTS AND METHODS

To achieve the objectives, the HOI is calculated for different "types" of individuals to analyze the inequality of opportunity in access to basic health services necessary for reducing child morality and full immunization against infectious diseases. The 'type' here, refers to different groups of population that are homogeneous in terms of socio-economic circumstances variables [3]. These variables are sex of child, parental education and father's occupation, per capita income of the household, geographical location of the

Ather Maqsood Ahmed is Professor in Economics, Department of Economics, School of Social Sciences and Humanities, Pakistan.
Saeeda Batool is Assistant Professor, Department of Economics, School of Social Sciences and Humanities, Pakistan (e-mail: Saeeda@s3h.nust.edu.pk).

[1] The PSLM survey terminology was initially used in 2004-05 and continues till today with regular intervals. Prior to that similar information was available in the Pakistan Household Integrated Survey (PIHS). The current study uses the relevant information of PIHS that is consistent with the available PSLM dataset of different years to derive the cross-sectional time series.

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household, and the satisfaction level from the government-provided infrastructure to avail quality health services in terms of time and cost to reach the nearby health center.

The HOI methodology used in the present study is standard in nature. It was developed by the World Bank in 2008 and measures the influence of personal circumstances on the likelihood of accessing the basic services for children [4]. The value for HOI is calculated as $HOI = \bar{P}(1-D)$, where $\bar{P}$ as the average coverage of opportunity across all individuals and D is the dissimilarity index. D measures weighted dispersion in the distribution of access to health services available to a type (k) in the society. D is calculated as: $D = \frac{1}{2\bar{P}} \sum_{k=1}^{K} w_k |P_k - \bar{P}|$, where w_k is the population weight of any type (k) and P_k measures the probability of having access to the selected health opportunity for individual belonging to that group. The probabilities are estimated from binary data on access for selected indicators of the health service using logistic regression. The value of HOI lies between zero and 100%. Increase in average coverage rate increases the HOI and vice versa, whereas increase in the dispersion D decreases the value [5].

For this study, indicators for the fourth and sixth MDGs are taken as variables of child health. The first health opportunity variable (child mortality) takes the value of 1, if the responding mother has not experienced any case of still birth, infant and child mortality, and zero otherwise. The opportunity to a child to be immunized against measles is also represented by a dichotomous variable, where the variable takes a value of one when there is immunization (evidence generated on the basis of availability of immunization card or recall basis), and zero otherwise. The health variable for opportunity to combat diseases (such as Diphtheria, Polio, BCG, and Hepatitis), is constructed in two steps. As a first step, a polychotomous variable ranging from one to four is constructed where "1" shows the minimum vaccination, while "4" shows complete vaccination against all diseases. In second step, a dichotomous variable is constructed which takes value 1 if the above mentioned variable is 4, and zero otherwise. The MDG six refers to combating diseases such as Diphtheria, Polio, BCG, and Hepatitis. After the construction of variables, the role of preexisting circumstances faced by mothers to access child healthcare opportunity has been investigated. The relative importance of each circumstance is examined by decomposing HOI using Shapley inequality decomposition technique [6], [7]. The variables encompassing circumstances include family background, parental features, region, gender of the child, and the provision of health related infrastructure. The family background refers to family income and size, while the parental features include education of parents and father's occupation. Region refers to area of residence of the household which is rural or urban. Health infrastructure is index of multiple indicators of health facilities provided by government. Components of health infrastructure includes availability of Basic Health Units (BHUs) and family planning centers, provision of safe drinking water and availability of public transport in terms of road and bus which is expected to

reduce the cost and time to access the available healthcare services. The index is constructed using the principal component analysis. The overtime data on all the mentioned variables for year 2001-13 have been drawn from PSLM cross sectional dataset. This dataset covers 17,000 households belonging to 1,252 villages/ enumeration blocks chosen on the basis of the stratified random sampling technique. The health section on immunization and mortality is used to generate the target sample that consists of females belonging to the 14-49 year old age group who also have children of less than five years of age.

Finally, based on the last estimated value of the HOI and annual point average growth of HOI, the years required to achieve the desired target are simulated. Assuming a linear expansion, we estimate the years required to achieve selected denoted by TR and calculated as:

$$TR = \frac{Target\ value - HOI_{2012-13}}{Point\ Average\ Growth\ of\ HOI}$$

The point average growth (PAG) is given by:

$$PAG = \frac{HOI_f - HOI_0}{Total\ number\ of\ Years}$$

where HOI_f and HOI_0 correspond to data of the year 2001-02 and 2012-13, respectively, in this study. The target value is revealed through the set of indicators and objectives of each health goal under the MDG umbrella. These targets have been translated through the calculation of HOI. The target value is calculated by adding the initial value of HOI and the product of current deprivation (DV) with the proportion of DV to be reduced. The proportion of deprivation to be reduced in a given indicator refers to the improvement that was desired by 2015 i.e., reducing child mortality and immunization against measles by two thirds (2/3 of the initial value of 2001-02) and achieving the immunization target against other diseases by 50%.

$$TV = HOI_0 + (DV)(\%\ of\ DV\ targetted)$$
$$DV = (100 - HOI_{initial})$$

As the development agenda has extended from MDGs to SDGs[2], universal access to all opportunities have become the new target for the previous goals. After simulating the time of achieving the MDGs, the study calculates the time to achieve the universal access of opportunities. Such analysis is essential to guide public policy makers to reconsider the fundamental tools for enhancing the coverage of all basic health opportunities. HOI approaches the universal level when its value touches its upper boundary. Thus, the time required for universal access (denoted by TU) to health opportunities is simulated as:

$$TU = \frac{100 - HOI_0}{PAG\ of\ HOI}$$

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[2] Sustainable Development Goals (SDGs)

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The required growth rate (RG) to achieve the goal by 2025 is calculated by using the HOI methodology as:

$$RG = \frac{100 - HOI_f}{12}$$

As the current value of HOI is for the year 2012-13, it takes 12 years to reach 2025. If the simulated time required for achieving the universal access is less than 12 years, the existing progress is 'on track' and goal will be achieved by 2025.

III. RESULTS

The information presented in Tables I and II lists the HOI for two of the targets related to child mortality and immunization. The results show that the HOI for both indicators of goal four has improved quite slowly. For the national level, the HOI for reducing child mortality has increased from 50.4% to 64.1% between 2001-02 and 2011-12, and that of immunization against measles from 52.1% to 67.3% over the period of 13 years. It is also evident that there is slow but consistent improvement in reducing mortality in urban and rural areas; however, inter-provincial disparities are persistently prevailing. Punjab has registered remarkable progress in reducing infant and child mortality rates, followed by KPK and Sindh, while the situation in Balochistan remains worrisome as it continues to lag behind, even though the HOI has improved from 48.3% in 2001-02 to 59.1% in 2011-12.

TABLE I
HOI FOR OPPORTUNITY TO REDUCE CHILD MORTALITY[3]

HOI	2001-02	2005-06	2007-8	2011-12
Pakistan	50.4	57.2	61.6	64.1
Urban	52.0	59.7	64.2	67.2
Rural	49.6	56.0	60.2	62.3
Punjab	49.9	55.7	62.9	70.8
Sindh	47.5	53.5	58.5	60.3
KPK	59.1	74.7	81.6	74.3
Balochistan	48.3	52.6	51.7	59.1

The results in Tables II.A and II.B show an erratic pattern of immunization success against measles and other diseases for children under-5 years of age. The HOI value has increased by 15 points in the case of former and by 32.4 points for later during 2001-2013. It is also evident that the immunization effort has been more intensive in urban areas as compared to rural areas. Moreover, there are startling provincial variations in achievement of health services. The results show that the momentum gained in the attainment of these objectives during 2007-11 has not been maintained in the subsequent years.

The decomposition of health achievements in terms of HOI for the selected health indictors has allowed us to estimate the contribution of each of the socio-economic circumstances in

[3] The data for 2004-05, 2006-07, 2008-09 and 2012-13 are not available as PSLM was not conducted in these years. Even though the information for these years is available in PIHS, it has not been used in the present study as it was not extensive enough.

health outcomes. It is interesting to find that the most effective way of reducing infant and child mortality rates is through provision of infrastructure for health services as its contribution in total has been 38.1%. It is followed by regional identity, i.e. whether you live in urban or rural areas, with a contribution of 34.4%; parental education contributes 22% to health outcome, and family background 5.2%.

A similar decomposition for attainment of full immunization target reveals the importance of regional identity that contributes the highest, i.e., 40.1%, followed by the provision of health infrastructure which contributes 36.7% to the target. The role of parental education cannot be ignored as its contribution is calculated as 17.4%. The contribution of family background and gender has been the lowest at 5.3% and 0.6%, respectively.

The extension of health services recorded by the increase in the percentage points of HOI is presented in Table III. The values indicate the status of the MDG targets and the time required to achieve the target based on the point average growth of the previous 13 years. It can be seen that even though the HOI related to reduction in child mortality in Pakistan has increased from 50.4% in 2001-02 to 64.1% in 2012-13, the target value for this indicator was 83.6%, which has been missed. According to the estimates, with an annual point growth rate, the time required to achieve the MDG target would be 17.2 years. The universal achievement of this target would take place in 31.5 years if the HOI grows by 3%.

IV. DISCUSSION

The results presented above do confirm steady progress in Pakistan in reducing infant and child mortality and protecting children against measles and other diseases through an elaborate program of immunization. However, the progress remains slow and uneven across rural and urban regions, on the one hand, and across provinces, on the other. There are two fundamental aspects to this outcome. The first one pertains to the demand for basic healthcare services and the other relates to the supply side. It has been observed with extreme wretchedness that health-providers are not welcomed in certain areas and localities, their sincerity of purpose and conduct notwithstanding. Apprehensions are widespread about the entire process of immunization, and at times the lives of healthcare providers, are also put on risk. However, despite these unfortunate incidents, the demand for healthcare services, in general, remains strong. The basic issue therefore reduces to the supply side of the phenomenon. Whereas the role of the private sector in healthcare provision remains abysmally low due to various reasons, including the high cost of service delivery, the public sector becomes the ultimate choice for majority of the population to fill-in the vacuum thus created [8]. As indicated, the government intervention plays a critical role in the improvement of nationwide health indicators [9]. The three dimensions of the intervention are: Establishment of fully functional BHUs, provision of basic healthcare and awareness through a network of Lady Health Workers (LHWs), and the country-wide program of immunization. We now discuss the results of the current study

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in the light of these three public sector health interventions.

TABLE II
IMMUNIZATION AGAINST DISEASES FOR CHILDREN UNDER 5 YEARS OF AGE

A. Goal 4: Immunization Against Measles								
HOI	2001-02	2004-05	2005-06	2006-7	2007-8	2008-9	2010-11	2011-12	2012-13
Pakistan	52.10	64.8	51.58	63.03	60.76	65.90	69.94	61.45	67.25
Urban	64.59	75.35	65.67	73.78	71.64	77.24	79.83	71.91	78.02
Rural	46.90	59.99	45.88	59.30	56.32	62.00	66.30	57.04	63.56
Punjab	63.03	76.45	58.94	72.96	64.57	76.27	80.31	74.76	79.60
Sindh	38.77	57.61	47.02	56.07	53.09	63.22	67.91	54.66	63.39
KPK	55.51	65.12	49.99	66.36	58.65	66.90	65.74	60.32	65.32
Balochistan	44.65	49.03	42.38	48.46	63.29	46.81	54.28	35.78	48.98
B. Goal 6: Immunization Against all Major Diseases								
HOI	2001-02	2004-05	2005-06	2006-7	2007-8	2008-9	2010-11	2011-12	2012-13
Pakistan	34.84	67.66	55.93	69.15	62.36	77.07	75.59	62.69	67.20
Urban	45.58	79.30	71.07	80.02	74.52	86.80	86.74	76.13	82.54
Rural	30.88	62.61	50.40	65.51	57.61	73.87	71.87	57.27	62.27
Punjab	41.22	80.24	63.23	79.37	67.06	87.74	87.66	76.38	67.79
Sindh	33.63	60.40	51.76	64.89	56.61	72.42	73.03	59.85	84.06
KPK	45.40	67.12	56.72	70.39	64.17	77.69	71.46	61.71	62.36
Balochistan	10.45	50.24	40.92	52.20	54.55	59.69	57.85	30.37	42.00

TABLE III
SIMULATED TIME TO ACHIEVE MDGS AND UNIVERSAL ACCESS OF HEALTH GOALS

GOALs	Levels	HOI 2001-02	HOI 2012-13	Target Valve	Annual Point Growth Rate	Time to Achieve MDGs	Time to Universal Achievement	Required Growth Rate in HOI
Reduce Child Mortality	Pakistan	50.4	64.1	83.6	1.1	17.2	31.5	3.0
	Urban	52.0	67.2	84.2	1.3	13.4	25.8	2.7
	Rural	49.6	62.3	83.4	1.1	19.9	35.5	3.1
	Punjab	48.3	59.1	82.9	0.9	26.5	45.5	3.4
	Sindh	47.5	60.3	82.7	1.1	20.9	37.1	3.3
	KPK	49.9	70.8	83.5	1.7	7.3	16.8	2.4
	Balochistan	59.1	74.3	86.5	1.3	9.6	20.2	2.1
Immunization against Measles	Pakistan	52.1	67.3	84.2	1.3	13.5	26.0	2.7
	Urban	64.6	78.0	88.3	1.1	9.2	19.6	1.8
	Rural	46.9	63.6	82.5	1.4	13.6	26.2	3.0
	Punjab	63.0	79.6	87.8	1.4	5.9	14.8	1.7
	Sindh	38.8	63.4	79.8	2.1	8.0	17.9	3.1
	KPK	55.5	65.3	85.3	0.8	24.4	42.3	2.9
	Balochistan	44.7	54.0	81.7	0.8	35.6	59.0	3.8
Immunization against other diseases	Pakistan	34.8	67.2	67.4	2.7	0.1	12.1	2.7
	Urban	45.6	82.5	72.8	3.1	Achieved	5.7	-
	Rural	30.9	62.3	65.4	2.6	1.2	14.4	3.1
	Punjab	41.2	84.1	70.6	3.6	Achieved	4.5	-
	Sindh	33.6	62.4	66.8	2.4	1.9	15.7	3.1
	KPK	45.4	67.8	72.7	1.9	2.6	17.2	2.7
	Balochistan	10.5	42.0	55.2	2.6	5.0	22.1	4.8

The National Health Policy and other official proclamations continuously emphasize the instrumental role of BHU in the provision of primary healthcare services as they are perceived as the foundational tiers of the healthcare infrastructure [10]. The primary responsibility of more than 5,300 BHUs in Pakistan is to provide healthcare to the poor through promotion, preventive, and curative services. However, less than satisfactory progress and under-achievement of health related indicators at regional and provincial levels clearly indicate that the BHUs have not been fully utilized, especially in rural areas of Pakistan across all provinces [11]. Be it the absence of medical doctors and other nursing staff or lack of diagnostic tools and non-availability of medicines, there are many reasons for the under-performance of BHUs in rural areas. These inefficiencies of BHUs are somewhat compensated in urban areas by the availability of private medical practitioners and secondary hospitals where patients queue up for basic primary health facilities. Going forward, maintaining the status quo is expected to further aggravate this divergence and it will be difficult for the rural areas to catch up the urban areas [12]-[14].

One of the positive contributions of BHUs is that they serve

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as a training hub for LHWs. It is argued that improvement in the health outcome is noticeable in the provinces where the LHW network is strong. The evidence cited in the above tables confirms that the situation has been better in Punjab, KPK, and most of the urban areas of other provinces than rest of the country. This achievement can be attributed to the efficacy of the LHWs network, which is relatively stronger in these better performing areas. The health workers here are allocated to facilitate population in neo- and antenatal care, counseling, and provision of essential healthcare tips related to common infectious diseases and family planning issues [15]-[18]. The earlier research also supports this outcome, where it has been shown that in Punjab regular services of LHWs for family planning, skilled birth attendance, and neonatal care plays an important role in reducing infant and child mortality rates and the occurrence of still births [19]. Compared to this, the performance of LHWs is hindered by the *biradari* and caste based hierarchies in Balochistan and Sindh provinces [20], [21]. Apart from that, the efficiency of LHWs is adversely affected by inadequate lucrative incentives and ad hoc policies of recruitment. Resultantly, their attitude with the patients is not satisfactory. The evidence further shows that the overall health service delivery at BHUs by the LHWs is also affected by the immunization campaigns [22].

Finally, even though the Extended Immunization Program (EPI), initiated by the WHO, has acted as a strong intervention for eradicating diseases, the results across regions and provinces are not similar and Pakistan continues to lag behind its regional neighbors. While the coverage rate for BCG, DPT1 and HBV is the highest, it is lowest for polio. The trend analysis shows that the value of HOI is high at a time period when the vaccination campaigns, mainly for polio eradication, are at their peak level. This momentum is often lost in the off-campaign period [23]. The provincial analysis reveals that the campaign effect is fairly dominant in Punjab, as shown by the value of HOI that is highest in 2008-10 when the 'Mother and Child Healthcare Week' was in vogue. Besides campaigns, the immunization program is also influenced by logistical issues for vaccinators to move and maintain the cold chain. Regional disparities are more evident when the vaccinators faced difficulties to reach the outskirts of the provinces, particularly in Balochistan [24].

The socio-economic and cultural milieu is also important in the utilization of healthcare services. The results of present study are in conformity with earlier research that has also shown a strong correlation between the parental education and child health outcomes [25]. We believe that education inculcates awareness and knowledge, and as a result, the health seeking behavior in parents improves. In particular, education of the mother and her participation in the labor market not only strengthens her decision-making power, it also affects positively the well-being and health outcomes of her children [26]. The present study also finds that despite the presence of gender inequalities in Pakistan, child healthcare services are equally available for all children, especially those who are under the age of five. This result yet again confirms the positive impact of public sector intervention that has reduced gender differences as far as immunization is concerned [27].

V. CONCLUSION

Notwithstanding the progress in healthcare services and marginal achievement in the MDGs, the healthcare for infants and children continues to be a seriously deficient area in Pakistan. As a consequence, not only are the infant and child mortality rates are high compared to the regional countries, the vaccination campaign against polio and measles also has limited success. Based on the estimates, it has been calculated that the authorities would require another 26 years to achieve health related targets set out under SDGs if they persist with the current pace of the work. The healthcare-infrastructure-inequality across the country, especially in rural areas, has been a major stumbling block and to address regional and provincial disparities, more direct and specific public sector intervention would be required. The provision of a low-cost well-functioning healthcare system equipped with appropriate human and physical resources is expected to outweigh the negative impact of children circumstances on their health.

VI. LIMITATION

Even though the study results are not expected to change much, updated information to more recent years from the currently used data until 2013 may have a notional value.

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