Inequality of opportunity in Indian children: the case of immunization and nutrition

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Abstract: A child's access to health care and minimum nutrition should not depend on circumstances such as caste, religion, gender, place of birth, or other parental characteristics, which are beyond the control of a child. This paper uses two rounds of Indian National Family Health Surveys and concepts of Inequality of Opportunity and Human Opportunity Indices to measure inequality arising out of unequal access to full immunization and minimum nutrition for Indian children. The results suggest overall high level of inequality of opportunity with substantial geographical variations. Changes in inequality of opportunity in the two services during 1992-93 to 2005-06 were mixed with some geographical regions outperforming others. The findings also call for substantial policy revisions if the goal of universal access to full immunization and minimum nutrition has to be achieved.

Keywords: Inequality of Opportunity, Indian Children, Access to full immunization, Access to Minimum Nutrition, Inequality of Opportunity Index, Human Opportunity Index

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1. Introduction

Imagine the case of two children, first, child A, who is a girl child born in rural India to parents belonging to socially and historically disadvantaged caste, parents with no formal schooling, no formal occupation and therefore poor. Now consider the second, child B, who is a male child, born in urban India to parents belonging to socially advantaged caste, parents who are formally educated, have formal occupation and therefore affluent. If the two cases are considered, what are the chances that child A will have access to and receive health care (during infancy, early childhood and later), minimum level of nutrition and other services, comparable to the services available to child B. Since all these services and facilities are necessary for a child to blossom into a youth who is healthy and competent, every child should get an opportunity in terms of basic services and facilities equal to any other child of the society.

If there are unfair differences at starting points, it can be detrimental, in particular if opportunities are systematically denied to specific groups of the population. Opportunities here mean the set of goods and services that are critical for children, for example access to full immunization and minimum nutritional level. Equality of opportunity seeks to level the playing field so that circumstances such as gender, ethnicity, birthplace, or family background, which are beyond the control of a child, do not influence a child's life chances. Success in life should depend on individuals' choices, efforts and talents, and not on their circumstances at birth. For any child, access to health facilities is clearly an exogenous opportunity, which is controlled not by him/her but by his/her family or society.

If in a society, there is disparity in the extent and level of basic opportunities (such as access to full immunization and minimum nutrition) among children belonging to different socioeconomic groups, it is accounted as inequality of opportunity (Roemer 1998, 2006), deemed unacceptable and must be countered by policy interventions in terms of redistribution or other affirmative actions. But any policy intervention can happen only if, the extent of this inequality can be systematically measured.

A recent development in this field which addresses this issue is the Human Opportunity Index (Barros *et al*. 2009, p.2) which is a synthetic measure of inequality of opportunity and which can be used for measuring the inequality of opportunity in basic services for children. The index posits that a development process in which society attempts to equitably supply basic opportunities requires ensuring that as many children as possible have access to those basic opportunities, with a target of universalism; it requires distributing available basic opportunities increasingly towards the more disadvantaged groups. The Human Opportunity Index summarizes in a composite indicator two elements: (a) how many opportunities are available, that is, the coverage rate of a basic service; and (b) how equitably those opportunities are distributed (measured by dissimilarity index), that is, whether the distribution of that coverage is related to exogenous

circumstances. Hence, an increase in coverage of a basic service at the national level will always improve the index. Its distribution sensitivity, however, will ensure that the increase will be more, if the increased opportunities benefit the disadvantaged groups.

The first challenge to construct this kind of opportunity index lies in the identification of appropriate circumstances, which are exogenous to a child but affect his/her overall development. In the case of India, there is large diversity in terms of caste, religion and region of birth. Existing literature on the subject suggest that Indian society suffers from substantial inequalities, based on caste and ethnicity (Desai and Kulkarni 2008; Deshpande 2001). Historically, India has been predominantly a Hindu nation, though with a substantial degree of religious diversity, and the Hindu stratification system has tended to dominate Indian society. A significant percentage of Muslims, Christians, and Sikhs also identify with caste groups defined by Hindu traditions. The two groups that are lowest in the Indian social hierarchy are the Scheduled Caste and Scheduled Tribes followed by castes which are categorized in Other Backward Castes and the most advantaged castes which are referred as the Upper castes or General category. The lower castes have suffered severe exclusion from social activities and public resources, like water wells, public grounds etc. and have been deemed untouchables involving prohibition of interactions including any kind of direct physical contact (Bayly 1999; Beteille 1969; Mendelsohn and Vicziany 1998; Shah *et al*. 2006). Though the Indian Constitution makes untouchability illegal, it continues to be practiced. Social exclusion is common in both villages and cities and translate into active discrimination in access to government services (Desai, Adams and Dubey 2006).

In a manner similar to caste, religion also affects access to basic services. As per Government of India's report (Government of India 2006), Muslims have tended to fall behind Hindus and Christians in access to basic governmental services. There is little doubt that caste and religion form major axes of social stratification in contemporary India (Gupta 1991; Hasan 2001; Sharma 1999).

Castes and religion are not the only circumstances which affect the well being and attainment of children. Gender is another factor which influences the chances of a child to access basic health facilities and nutrition. There is ample evidence of female children being neglected by their family in comparison to the male children when it comes to provide for basic facilities (Basu 1989; Borooah 2004; Das Gupta 1987; Griffiths *et al*. 2002; Kishor 1993; Mishra *et al*. 2004; Pande 2003; Sen 1988; Singh, Hazra and Ram 2008).

Similarly, whether a child is born into rural or urban area affects his/her chances of access to good health facilities and other services in terms of access to electricity or safe drinking water. This happens because the provision

for these basic services is much lesser in rural India compared to urban India. For example, in 2005-06, as per NFHS-III (IIPS and ORC Macro 2007) only 42% of the households in rural areas had drinking water on premises compared to 71% in urban areas. Similarly, only 56% households in rural areas had access to electricity compared to 93% in urban areas.

In addition to the above social circumstances, there are some other family characteristics which affect the overall development of a child. Extant demographic literature suggests 'parental education' as one of the most important determinants of overall development of child (Davis 2005; Eccles 2005; Jejeebhoy 1993; Mukherjee and Das, 2008). Other than parental education, number of siblings is also an important circumstance which may affect the chances of a child's access to health facilities or minimum nutrition levels (Bhat 2002; Jejeebhoy 1993; Knoedel et al. 1991; Muhuri and Preston 1991). The evidence of parents preferring one child above other when it comes to sharing resources including food is not hard to find (Bairagi 1986; Basu 1989; Borooah 2004; DasGupta 1987; Griffiths et al. 2002; Miller 1981; Mishra et al. 2004; Oster 2006; Pande 2003; Singh, Hazra and Ram 2008).

Once the exogenous circumstances are identified then the inequality of opportunity in access to basic services can be measured. The measurement is important because other than reasons already discussed, universal equitable provision of basic opportunities such as access to full immunization or access to minimum nutritional level is a realistic and important social goal. In case of children, most societies agree on the importance of a set of basic opportunities, even if different societies might have different standards about the right set of basic opportunities.

For any opportunity, the coverage as well as the inequality associated with it would be taken into account by the Human Opportunity Index. The Human Opportunity Index focuses on coverage and inequality of opportunities among children for the following main reasons (Barros et al. 2009, p.3): First, from an empirical standpoint, it can be readily operationalized by measuring children's access to basic goods and services that are critical for the full development of the child, as, for children, access defines opportunity because children unlike adults cannot be expected to make the efforts needed to access these basic goods. Second, there is evidence that interventions to equalize opportunity early in the lifecycle are more cost effective and successful than interventions in later stage. Third, focusing on children helps in putting inequality of opportunity at the centre of the policy debate. As pointed out by the World Development Report 2006, on the day of their birth, children cannot be held responsible for their family circumstances, despite the fact that these circumstances, such as, caste, religion, gender, parent's education, and urban or rural location, will make major differences in the lives they lead.

The first component of the Human Opportunity index, the average coverage rate for a given basic opportunity can be readily determined using household survey data. The second component, the equity of opportunity distribution (measured by dissimilarity index) requires a suitable econometric specification. More detailed discussion on the Human Opportunity Index and its components has been carried out in the Data and Methods section.

Since, in India there is sufficient evidence that children belonging to different castes, religions, gender or region face different levels of opportunities as far as access to full immunization and minimum nutrition levels are concerned, this study attempts to estimate the extent of inequality in Indian children in access to the above mentioned necessities. The estimation has been done using inequality of opportunity and human opportunity indices. Human opportunity index has been computed in addition to the inequality of opportunity index because it gives a better depiction of both, the average availability of the services for the children in the country as well as how equitably the average availability of these services are distributed. The estimation has been done for six regions[1] of India (North, Central, East, North East, West and South) for the year 2005-06 and 1992-93. Estimations at two time points and six regions will bring out a clearer picture about how the inequality of opportunity varies across different parts of the country and how it has changed over a period of thirteen years or so. This is especially important to verify the concerns of academicians and policy makers that the benefits of the extraordinary growth achieved by India after 1990 have not been distributed equally across the different sections of the society.

In light of the above discussion the paper is organized into four sections; the next section is about the data and the methodology, section 3 discusses the results and finally section 4 concludes with further discussion along with policy implications.

2. Data and Methodology

Before proceeding to the description and details of the data and the individual services for which inequality of opportunity and human opportunity indices have been computed, it is important to describe the Human Opportunity Index, its components and their estimation for the two services (opportunities) considered in the paper.

The component of the Human Opportunity Index which is used to estimate the inequality of opportunity (dissimilarity or difference in access to basic services among children based on circumstances beyond the control of an individual) is a version of the dissimilarity index (D), widely used in sociology and applied to dichotomous outcomes (Barros et al. 2009, p.5). The D-index measures the dissimilarity in access rates for a given service for groups defined by

[1] Details of states in each region have been provided in section 2.2 on dataset and estimation.

circumstance characteristics (for example, caste, religion, gender, location, parental education, and so on so forth) compared with the average access rate for the same service for the population as a whole. If the equal opportunity principle is consistently applied, an exact correspondence between population and opportunity distribution should be observed. The D-index ranges from 0 to 1 (0 to 100 percentage terms), and in a situation of perfect equality of opportunity, D will be zero.

Access probability gaps are at the heart of the D-index (Barros et al., 2009, p.5). The D-index is a weighted average of the absolute differences of group specific access rates, p_i (the average probability in the subgroup i that a child will have access to a particular basic service say full immunization), from the overall access rate, $\bar{p}$ (the average probability in the entire population that a child will have access to full immunization). For example, if the two subgroups are rural and urban population (there can be any number of subgroups based on different circumstances or combination of circumstances) , p_{rural} (average probability in the rural population that a child will have access to full immunization) is less than $\bar{p}$ (average probability in the entire population that a child will have access to full immunization) then it captures that the children of rural areas have a much lower probability of having access to full immunization than the urban counterparts and the D-index will be higher than zero. There can be as many probability gaps as there are possible combinations of group defining circumstances. As discussed before, some important variables related to circumstances exogenous to a child in India are gender, caste, religion, urban-rural residence, educational attainment of parents, wealth status of the household and number of siblings. They all have been used to form subgroups for the purpose of estimation. The exact procedure to calculate the p_i*'s* (the average probability in the subgroup i that a child will have access to a particular basic service) is described in the subsection 2.1.

The D-index can be interpreted as showing the fraction of all available opportunities that needs to be reassigned from better-off groups (groups whose access rate is higher than the access rate for the population) to worse-off groups (groups whose access rate is lower than the access rate for the population) to achieve equal opportunity for all.

The human opportunity index (O) combines the average access to opportunities ($\bar{p}$) with how equitably those opportunities are distributed (D). The level of opportunity measured by this index can be interpreted as the number of existing opportunities in a given society that have been allocated based on an equal opportunity principle. It is measured as a proportion of the total opportunities necessary for universal access. Another interpretation of the human opportunity index is, as the equal opportunity equivalent coverage of basic goods and services (Barros et al. 2009).

The human opportunity index is given by $O = \bar{p}\ (1\text{-}D)$. On an intuitive level, the human opportunity index takes access to a basic opportunity, the coverage rate, and discounts it if those opportunities are allocated inequitably. Two factors drive the index: for a given level of D, an increase in the prevalence of opportunities (that is, a higher $\bar{p}$) increases the index, while an improvement in the way existing opportunities are allocated (a reduction in D) will also improve the index. The index is also Pareto-consistent, in the sense that it will improve if the overall average access to a given opportunity increases, no matter how access is distributed, at least someone is better off, and no one is worse off. On the other hand, the D-index gives much greater weight to those opportunities allocated to a disadvantaged sector of the population than to those allocated to an advantaged group, and is therefore a distribution-sensitive measure.

2.1 Computing Inequality of Opportunity Index (Dissimilarity Index) and Human Opportunity Index[2]

Assume that there is a random sample of population of children with information on whether a child *i* has or doesn't has access to a basic opportunity ($I_i = 1$ if that child has access to the opportunity and $I_i = 0$ otherwise) and a vector of variables indicating his/her characteristic/criteria (for example, caste, religion, gender, location, parental education, wealth status of family and number of siblings), the total criteria is *m*

$$x_i = (x_{1i}, \dots, x_{mi}).$$

Given this information, as is the case with the present study, the predicted probability (conditional on circumstance variables) of access to an opportunity of a child can be and have been obtained using the following separable logistic model which has been estimated as the first step for estimating *D*

$$Ln\left(\frac{P(I=1|x_1,\dots,x_m)}{1-P(I=1|x_1,\dots,x_m)}\right) = \sum_{k=1}^{m} h_k\,(x_k) \qquad (1)$$

where x_k denotes a vector of variables representing the k-dimension of characteristics (criteria, that is, caste, religion, gender, urban or rural, average parental education, wealth status and number of siblings). The complete specification has been described in subsection 2.2, but the important point to mention here is that the specification is chosen in such a way that in all cases, all functions end up being linear in parameters, so that, $h_k(x_k) = x_k\beta_k$. Estimates of the parameters,$\{\beta_k\}$ obtained from the above logistic regression are denoted by $\{\hat{\beta}_k\}$.

In second step, given the coefficient estimates for each child in the population, his/her predicted probability of access to an opportunity is obtained, that is, for each individual *i* following is computed

[2] The inequality of opportunity and human opportunity indices were developed by Barros et al. 2009 (also, see Barros et al. 2008) for Latin American and Caribbean countries. I don't take any credit for the conceptual development of these indices. The notations are retained in order to maintain coherence.

$$\hat{p}_i = \frac{Exp(\hat{\beta}_o + \sum_{k=1}^{m} x_{ki}\hat{\beta}_k)}{1 + Exp(\hat{\beta}_o + \sum_{k=1}^{m} x_{ki}\hat{\beta}_k)} \quad (2)$$

Next, as a third and final step, following is computed

$$\bar{p} = \sum_{1}^{n} w_i \hat{p}_i \quad (3)$$

and

$$\hat{D} = \frac{1}{2\bar{p}} \sum_{i=1}^{n} w_i |\hat{p}_i - \bar{p}| \quad (4)$$

where n is the total population and $w_i = \frac{1}{n}$ or some sampling weights.[3]

Once the average access rate ($\bar{p}$) and dissimilarity index (D) have been estimated, the human opportunity index (O) can be simply given by

$$O = \bar{p}.(1 - D) \quad (5)$$

It is nothing but the product of average access rate and how equitably the access to basic opportunity is distributed across subgroups.

It is important to note that both the dissimilarity index *(D)* and human opportunity index *(O)* vary between 0 and 1. If the dissimilarity index is zero for an opportunity, it means that there is perfect equality between children belonging to different subgroups, in terms of access to that opportunity. A dissimilarity index of 1 is the completely opposite case, therefore a low *D*-index is desired for any society. The *D*-index is insensitive to a balanced increase in access rate. Balanced increase means that the new opportunities are distributed among circumstance groups in the same way as the preexisting distributions are. Intuitively neither the proportion of population in each group, nor the proportion of population having access to a particular opportunity (out of total having access to the particular opportunity) in each group change as a result of balanced increase in access rate, therefore the inequality of distribution will be insensitive to this type of balanced increase in access rate.

On the contrary a high human opportunity index is desired for any society because it will be high only when the average rate of access is high ($\bar{p}$)and the inequality in access rates across subgroups (D) is low. The human opportunity index has other desirable properties like distribution sensitivity, additive decomposability in terms of decomposability of

[3] In a strict sense D is not defined when $\bar{p} = 0$. A close substitute D_s, can be used where $D_s = \frac{1}{2(1-\bar{p})} \sum_{i=1}^{n} p_i |p_i - \bar{p}|$. The interpretation will change a little where it signifies the proportion of all opportunities which need to be rearranged as a proportion of number of children who don't have access to an opportunity. However if $\bar{p}$ is zero, then the dissimilarity index doesn't make any sense, but the human opportunity index will become zero showing no availability of the opportunity at all.

changes into scale affect (change in average access to an opportunity) and distribution effect (change in the distribution of access to an opportunity across subgroups) and Pareto consistency in terms of increase in index if there is an increase in the number of opportunities available to any subgroup. Its distribution sensitivity, however, implies that the impact will be greater if the increase benefits groups with below average access to opportunities (see Barros *et al*. 2009 for greater details).

2.2 Dataset and Estimation

The research is based on India and uses data from two rounds (1992-93, and 2005-06) of National Family Health Survey (NFHS), which is nationally representative micro unit recorded household survey and is very reliable in terms of sample size, survey design, coverage etc. as well as very rich in terms of variables concerned (caste, religion, gender, urban-rural residence, wealth status, parental education, etc.). It also has detailed information on children (child's immunization status, child's anthropometric measures like height and weight etc.) collected through the Household and Woman's questionnaires. These surveys are nationally representative and cover more than 99 % of India's population. The two rounds of NFHS provide reliable estimates of fertility, mortality, family planning, utilization of maternal and child health care utilization and related issues.

The estimates obtained from the two rounds of NFHS are comparable because both the rounds followed comparable sampling design to select households and individuals for the interview (Mishra et al. 2004; Ram and Roy 2004). The NFHS followed Stratified Probability Proportional to Size (PPS) systematic sampling design. The villages were selected as first stage unit using PPS design and households were selected using systematic sampling in the selected villages in rural areas. In urban areas, NFHS followed a three stage design where blocks were selected at the first stage, census enumeration blocks (ceb) having 150-200 households in the second stage and households from the selected 'cebs' in the third stage. More than 85,000 households were covered in each of the rounds of NFHS. The household response rate in NFHS 2005-06 was 96 percent or higher in all the states. The individual response rate was 95 percent for the country as a whole. The response rate for eligible women varied from 90 percent in Maharashtra and Meghalaya to 99 percent in Madhya Pradesh and Chattisgarh. The household and eligible women responses rates in NFHS 1992-93 were 96 percent respectively. The eligible women response rates varied from 92 percent in Tripura to above 97 percent in Kerala (IIPS and ORCMacro 1995). So, the response rates in the two rounds of NFHS were very similar.

Since NFHS used a multistage sampling design and the design being self-weighting only at the domain level; the domains being urban and rural areas of each state and slum and non-slum areas of eight selected cities in NFHS 2005-06 and urban and rural areas in NFHS 1992-93, it is very important to use appropriate weights to make the

estimates representative and comparable over the two survey rounds. Appropriate weights (already given in the two rounds of NFHS) were used while generating all the estimates presented in the paper (IIPS ORCMacro 1995, 2007). The details of the sampling weights in the two rounds are given in the respective NFHS reports.

India is comprised of 29 states and seven Union Territories. The different states of India are at different levels of socio-economic development; most of the western and southern states of India are economically and demographically advanced than the northern and eastern states of India (Bhat and Zavier 1999; Bose 1991; Dyson and Moore 1983; Griffith *et al.* 2002; Pathak and Singh 2009). So, any meaningful analysis should take into account the vast regional diversity present in India. To take care of this regional diversity, present analysis was carried out for India as a whole and separately for the six major geographic regions of India namely North, Central, East, North-east, West, and South. Northern region comprises of states of Jammu & Kashmir, Himachal Pradesh, Delhi, Uttaranchal, Punjab, Haryana and Rajasthan. The states of Uttar Pradesh, Madhya Pradesh and Chattisgarh come under the central region. The Eastern region comprises of states of Bihar, Jharkhand, West Bengal and Orissa. The North-eastern region includes the seven north-eastern sister states namely Assam, Arunachal Pradesh, Meghalaya, Manipur, Tripura, Nagaland and Sikkim. The Western region includes states of Maharashtra, Goa and Gujarat. Finally, the Southern region comprises of states of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Pondicherry. The sample sizes for each region were large enough to carry out the bivariate and multivariate analysis presented in the paper.

The dependent variables used in the analysis are full immunization of children aged 12 months and above to capture the inequality in access to full immunization and percent of children falling above -2 sd of reference population in weight for age to capture the inequality in access to minimum nutrition. The analyses were limited to children aged greater than 12 months and less than 5 years because of the fact that the data on immunization and nutrition was only collected for children born in the 5 years preceeding the specific survey rounds. The sample was restricted to children above one year because a child requires at least nine months to receive immunizations for the six vaccine-preventable diseases (namely, tuberculosis, diphtheria, whooping cough, tetanus, polio, and measles). BCG should be given at birth or at first clinical contact, DPT and Polio require three vaccinations at approximately 4, 8 and 12 weeks of age, and measles should be given at or soon after reaching 9 months of age (IIPS and ORCMacro 2007). A child is said to have received full immunization if s/he receives this six sets of vaccines.

Though, the NFHS provides information about weight-for-age, weight-for-height (not available in few states in NFHS-1) and height-for-age (not available in few states in NFHS-1) for the two survey rounds, the height of children could not be measured in the states of Andhra Pradesh, West Bengal, Himachal Pradesh, Madhya Pradesh, and Tamil Nadu due to unavailability of measuring instruments during first phase of NFHS-1 (1992-93). Therefore, any estimate for

all India using height of children is likely to be biased. Consequently, to generate robust estimates for all India over time and space, we used the weight-for-age i.e. underweight as our preferred indicator for measurement of the nutritional status of children. Studies have also argued that 'weight-for age'-underweight deserves special attention as it is a comprehensive indicator of child nutritional status, incorporating both stunting and wasting (Deaton and Dreze 2008).

Underweight is a measure of protein-energy under nutrition (not being underweight has been considered as availability of minimum nutrition level, that is if a child is not underweight it is given the value 1 and 0 otherwise). It is used to describe children, who have a weight-for-age measurement less than two standard deviations below the median value of United States National Centre for Health Statistics (NCHS) international reference population as recommended by World Health Organization (WHO) (Dibley et al. 1987a, b). However, recently a new international reference population has been recommended by WHO based on the children around the world (Brazil, Ghana, India, Norway, and the United States) and accepted by government of India in 2006 (WHO Multicenter Growth Reference Study Group 2006). The underweight children have been estimated based on US NCHS reference population uniformly for all three rounds of NFHS due to unavailability of new WHO reference population in NFHS-1 (1992-93) and NFHS-2 (1998-99) datasets. Children (1 to 5 years of age) whose weight-for-age is below minus two standard deviations from the median reference population are classified as "underweight" or "malnourished". The children whose weight-for-age is above minus two standard deviations from the median reference population are classified as not being underweight. It is also noted that, on average, the US NCHS standards overestimate the prevalence of under nutrition in India by five percent point as compared to the new WHO standards of 2006. However, the overestimate in prevalence of under nutrition in US NCHS does not in any way affect the comparisons made in the paper. The sample sizes in case of the two dependent variables are presented in Table 1.

The independent variables used in the analysis are caste of the household head (categorized into scheduled castes, scheduled tribes, other backward castes, and general; scheduled castes as reference category), religion (categorized into Hindu, Muslims, Others; Hindu as reference category), sex of the child (male and female; female as reference category), place of residence (rural-urban; rural as reference category), wealth quintiles (categorized into poorest, poorer, middle, richer, richest; poorest as reference category), average parental education (categorized into 0 years, 1-4 years, and greater than 4 years of education) and number of siblings (continuous). All the variables except 'average parental education' and 'number of siblings' were converted into dummy variables for inclusion into the logistic regression models. The variables 'average parental education' and 'number of siblings' were treated as continuous variables in the logistic regression models. However for generating bivariate results, average parental education was treated as a categorical variable having three categories as mentioned above. The NFHS 1992-93 included 'other

backward castes' into 'general' category. Therefore, no estimates for 'other backward castes' were generated in NFHS 1992-93.

In the absence of direct data on income or expenditure in DHS, the wealth index based on the ownership of household assets is largely used as a proxy for assessing the economic status of the households (Filmer and Pritchett 2001; Howe et al. 2009; Johnson and Bradley 2008; Montgomery et al. 2000; Rutstein and Johnson 2004; Vyas and Kumaranayake 2006). This index was constructed using household asset data and housing characteristics. Each household asset is assigned a weight generated through principal components analysis (Filmer and Pritchett 2001). Each household is then assigned a score for each asset, and the scores are summed for each household; individuals are then ranked according to the total score of the household in which they reside. The sample is then divided into quintiles i.e., five groups with an equal number of individuals in each quintile (IIPS and ORCMacro 2007). The wealth quintile is already generated and is given in the NFHS 2005-06 dataset. Same methodology was adopted to create a comparable estimate of wealth quintile in NFHS 1992-93.

Using the predicted probabilities from the logistic regression analysis, inequality of opportunity (dissimilarity index) was estimated in access to full immunization and access to minimum nutrition for the years 1992-93 and 2005-06. Also, Human Opportunity Index was computed for the above services for the aforesaid years. This was done separately for each of the six regions of India. The next section presents the main findings of the analysis.

3. Results

Since the analysis is done separately for the two services, the results have been divided into two subsections. Each subsection discusses results of a particular service.

The percentage distribution of children by their socio-economic characteristics in NFHS I and NFHS III are presented in Table 1. A comparison of the two samples clearly suggests that, except for few exceptions, the distribution of children by their socio-economic characteristics remained same across the two NFHS rounds. The religious and gender distribution remained almost same during the two periods. An increase of eight percentage points was observed in the percentage of children belonging to the 'scheduled castes' in NFHS III. The percentage of 'scheduled tribes' in the sample remained almost same. However, the combined percentage of 'other backward castes' and 'general' declined by almost eight percent during the two survey rounds. The results suggest that India is still predominantly rural. Around three-fourths of Indian children were living in rural areas in the two rounds of NFHS. The percent of children belonging to urban areas increased marginally during the two NFHS rounds.

Parental education is considered as one of the important variable in explaining the performance of children whether it is health or minimum nutrition. Results presented in Table 1 suggest that the average parental education increased by only 'one' year during the last thirteen years (i.e. during 1992-93 to 2005-06). The average parental education was only four years in 1992-93 which increased to approximately five years in 2005-06. Results show very low levels of education among the parents of sampled children. However, there are some positive signs of improvement. The percentage of children with parents having four or more years of schooling increased from 39% in 1992-93 to 48% in 2005-06. On the other hand, the percentage of children whose parents had no formal education declined from 32% in 1992-93 to 25% in 2005-06.

3.1 Full Immunization

Access to full immunization is measured by whether a child has received the six vaccine-preventable diseases (namely, tuberculosis, diphtheria, whooping cough, tetanus, polio, and measles). The variation of average access to full immunization across socio-economic characteristics can be obtained from table 2. The average level of full immunization was very low in India (35.9% in 1992-93 and 44.0% in 2005-06). Though there has been an increase of 8 percentage points over a period of thirteen years but still more than 50% children don't have access to full immunization. West and south regions with average access to full immunization more than 50% (59.8% and 54.8% in 1992-93 and 55.2% and 58.5% in 2005-06) fared better than the other geographic regions. If these two regions are compared to each other then west region is in red because the average access to full immunization has decreased (which is a sign to worry) during the thirteen year period. Barring the west region, an increase in average access to full immunization was recorded in all other regions. The performance of central, east and northeast regions was especially not satisfactory as the average access in 1992-93 was only 23%, 21% and 21% respectively whereas the same figures for 2005-06 stood at 32%, 43% and 33% respectively. The picture in east region was more promising because it showed an increase of almost 23 percentage points over the aforesaid period. The scenario in the northern region did not alter much since the average access to full immunization increased only from 43% in 1992-93 to 46% in 2005-06.

If the average access to full immunization is seen in the light of caste categories then it was significantly higher for children belonging to 'general caste' category (38.4% in 1992-93 and 54.2% in 2005-06) compared to children belonging to 'scheduled castes' and 'scheduled tribes' categories (29.7% and 24.6%) in 1992-93 and children belonging to 'scheduled castes', 'scheduled tribes' as well as 'other backward castes' caste category (41.7%, 33.1% and 40.8%) in 2005-06. Though, the average access to full immunization has increased from 1992-93 to 2005-06 for all the caste categories, the increase recorded for the 'general caste' (16 percentage points) was much more than the increase recorded

for the 'scheduled caste' (12 percentage points) and 'scheduled tribes' (9 percentage points). This raises important questions related to the equitable sharing of the opportunities generated during this period.

Access to full immunization was also found to vary by 'religion'. Average access to full immunization was highest for the nonhindus and nonmuslims in 1992-93 (55%) as well as in 2005-06 (55.2%) followed by Hindus (36.3% and 45.1%) and then Muslims (27.5% and 36.2%). There was an improvement in this access for all the religious groups but the improvement was higher among the Hindus and Muslims (9 percentage points) compared to 'others' (almost 0). It is important to note that the average access rate was more among the Hindus than Muslims for both the years 1992-93 and 2005-06, the gap being 9 percentage points.

No significant differences in average access to full immunization were recorded between male and female children in 1992-93 or 2005-06. The average access has increased for both male and female children during this period with the increase being 8 percentage points for both of them (34.9% to 43% for females and 36.9% to 44.8% for males).

The children residing in urban areas were found to have much better opportunities compared to their rural counterparts as far as average access to full immunization is concerned. For instance 52% of children in 1992-93 and 57% in 2005-06 living in urban areas were fully immunized against six major diseases compared to only 31% and 39% of children living in rural areas during 1992-93 and 2005-06 respectively. The increase in full immunization in rural areas was more than the increase observed in urban areas during the two rounds (5% in urban areas and 8% in rural areas).

Another variable which was found to be positively associated with full immunization was the wealth status of the household; the children from the richest households being 2-3 times more likely to receive full immunization compared to children from the poorest households. For example, 64% and 71% of the children belonging to the richest wealth quintiles in NFHS I and NFHS III received full immunization compared to only 18% and 26% children belonging to poorest quintile in the two rounds. It is surprising to note that despite all government efforts only a quarter of children belonging to the poorest wealth quintile received full immunization in 2006-06.

Parental education has always been considered an important variable when wellbeing of a child is in question. This fact is reinforced by the present study, where the average access to full immunization for children belonging to parents with average education more than four years was more than twice that of children belonging to parents with no formal education. This observation was true for 1992-93 (52.5% and 20.7%) and 2005-06 (58.9% and 23.5%). The

results further suggest a greater increase in full immunization among children of parents with at least four years of schooling (7%) compared to children of parents with no formal schooling during the period 1992-93 to 2005-06.

Apart from average access to full immunization, it is also important to examine the inequality of opportunity and human opportunity index in access to full immunization. The data on inequality of opportunity and human opportunity index are presented in table 3 and table 4 respectively. The results suggest high inequality of opportunity in India during the two NFHS rounds. The inequality of opportunity in full immunization was 24% in 1992-93 and 20% in 2005-06. Even in 2005-06, approximately 20% opportunities needed to be transferred from better off groups (groups with average access to full immunization more than the average access rate for the population) to the worse off groups (groups with average access to full immunization less than the average access rate for the population) for achieving equality in access to health services. It is encouraging to note that the inequality of opportunity in access to full immunization has decreased by 4 percentage points (18%) over the period of thirteen years.

The inequality of opportunity in full immunization varied considerably across the six geographic regions of India during the two NFHS rounds. For instance, the inequality of opportunity ranged between 12% in southern region to 31% in the northeastern region of India during 1992-93. Similarly, it varied from 10% in southern region to 27% in central region in 2005-06. All the geographic regions except the central region observed decrease in inequality of opportunity. In the central region, the inequality of opportunity in access to full immunization showed a marginal increase of around one percentage point during the period 1992-93 to 2005-06. The west and south regions showed a much better picture (13.3% and 12.3% in 1992-93; 12.9% and 10.0% in 2005-06) compared to the rest of India. The regions of north (25.9% in 1992-93 and 22.4% in 2005-06), central (25.2% in 1992-93 and 26.5% in 2005-06) and east (26% in 1992-93 and 19.6% in 2005-06) had almost twice the inequality level than that of west and south.

The Human Opportunity Index in access to full immunization which combines both the average availability of full immunization and how equitably the access to full immunization is distributed gives an even better picture. The human opportunity index (full immunization) for India stood at 35% in 2005-06. It means that 35% of total opportunities needed to ensure universal access to full immunization were available and equitably distributed. The figure is low but it should be seen in the light of the fact that it was much lower in 1992-93 (27.1%). The increase of almost 8 percentage points (29.7%) during the period is ideal because it is a result of improvement on both the fronts, the average availability for the population increased from 36% to 44% and inequality of opportunity decreased from 24% to 20%. Still a lot needs to be done as approximately 65% of the opportunities required for universal access were not equitably distributed.

Region wise analysis shows that west (51.8% and 48.1%) and south (48.1% and 52.7%) regions have fared better than their other counterparts in both 1992-93 and 2005-06. Of the two, south is better because not only it had the highest index (52.7%) in 2005-06 but also it had recorded improvement in both the average availability (increase from 54.8% to 58.5%) and inequality of opportunity (decrease from 12.3% to 10.0%) during the period 1992-93 to 2005-06. West region, on the other hand, showed a decrease in the index from 1992-93 (51.8%) to 2005-06 (48.1%). The decrease in index was on account of decrease in average availability in opportunities (from 59.8% in 1992-93 to 55.2% in 2005-06) which has dominated the marginal improvement in inequality of opportunity during the period. The north region depicted a pattern which was quite similar to the national pattern. The inequality of opportunity index was 36% in 2005-06 which was an improvement over the 1992-93 (31.7%) level. The improvement in the index was on account of both the components, the average access rate (improved from 42.8% to 46.1%) and the inequality of opportunity (decreased from 25.9% to 22.4%). Of the remaining three regions (which were lagging behind the others), eastern region showed some promise where the index increased from 15% in 1992-92 to 35% in 2005-06, an increase of 20 percentage points (or 130%) over a period of thirteen years. It was even better when the fact that both, the average access rate (from 20.5% to 43.4%) and inequality of opportunity (from 26% to 19.6%) have improved is considered. Central region was at the bottom in 2005-06 with an index of 24%, though it registered an increase since 1992-93 (17.4%). The increase would have been much more if the increase in average availability (23.2% to 32.1%) would not have been weakened by increase in inequality of opportunity (25.2% to 26.5%). The condition of northeast in 2005-06 was not very different from the central region and an index of 24% was very close to the central region. But northeast region fared better in terms of overall increase in index (9.9 percentage points or 69.7%) as well as improvement in both the components; the average access rate increased by 12 percentage points (20.7% to 32.7%) and the inequality of opportunity decreased by 5 percentage points (31.2% to 26.1%) during this period.

3.2 Minimum Nutrition

Access to minimum nutrition was measured by whether a child was underweight or not. If a child is not underweight then it is taken as an indication that he/she has received minimum nutrition. The variation of average access to minimum nutrition across socio-economic characteristics is presented in table 2. The average access to minimum nutrition was considerably low in India (38% in 1992-93 and 46.9% in 2005-06). Though there has been an increase of 9 percentage points over a period of thirteen years but even then more than 50% children did not receive minimum nutrition. As in case of access to full immunization, the access to minimum nutrition also varied considerably across the different geographic regions of India. The northern region had the highest average access to minimum nutrition in 1992-93 (51.3%) and average access was also on the higher side in 2005-06 (53.2%). The regions of south and northeast overtook the northern region in terms of access to minimum nutrition in 2005-06. The southern and northeastern regions showed

incredible increase (43.6% to 57.8%, almost 14 percentage point increase for South and almost 11 percentage points for North East from 44.3% to 55.9%) in average access to minimum nutrition during this period. Central and western regions have shown an increase of 10 and 11 percentage points (32.4% to 42.3% and 38.2% to 48.8%) respectively during the same period but still more than 50% children in these regions did not have access to minimum nutrition. The eastern region fared worst in terms of access to minimum nutrition. The access to minimum nutrition in the eastern region increased only by eight percentage points during 1992-2006.

Of note is the important fact that average access to minimum nutrition was higher for children belonging to 'general caste' (39.3% in 1992-93 and 57.0% in 2005-06) compared to children belonging to 'scheduled castes' and 'scheduled tribes' (32.1% in 1992-93 and 34.4% in 2006-06) in 1992-93 and children belonging to 'scheduled castes', 'scheduled tribes' as well as 'other backward castes' (48.9%, 35.2% and 45.6%) in 2005-06. Though, the average access to minimum nutrition has increased during the period 1992-93 to 2005-06 for all the caste categories, the increase for the 'scheduled castes' (17 percentage points) was comparable to that of the 'general castes' (17.7 percentage points) but the increase was very low (0.8 percentage points) for the children of 'scheduled tribes' category. It is surprising that the average access to minimum nutrition among the 'scheduled tribe' children has shown near zero increase during the last 13-14 years.

Religion was also found significant in explaining the variations in access to minimum nutrition. The average access to minimum nutrition was highest for the nonhindus and nonmuslims in 1992-93 (49.9%) as well as in 2005-06 (57.4%). Compared to muslim children, average access to minimum nutrition was higher among the hindu children in 1992-93. However, in 2005-06 no significant difference was found between hindu and muslim children (47.4% for muslim children and 46.2% for hindu children). Although an increase was observed in the access to minimum nutrition for both the groups of children, the disturbing point was that more than 50% children belonging to these religions did not have access to minimum nutrition level.

Only marginal difference was found in access to minimum nutrition between a male child (38.4%) and a female child (37.7%) in 1992-93. But, the gap in average access to minimum nutrition increased by 4 percentage points during the period 1992-93 to 2005-06 (average access of 48.7% for male children and 45.0% for female children). The greater increase in average access for male children than female children shows that the fruits of the economic growth during this period have not been shared equally between male and female children.

The children belonging to urban areas fared better in terms of access to minimum nutrition compared to their rural counterparts during both the NFHS rounds. In 1992-93, the average access to minimum nutrition was 47% and 33% in urban and rural areas respectively. The average access to minimum nutrition increased by about 11% in both urban and rural areas during the period 1992-93 to 2005-06. It is surprising to note that the urban-rural gap in average access to minimum nutrition has persisted over the last 13-14 years.

As expected, a positive association was found between wealth status of a household and access to minimum nutrition to the children belonging to that household; the children belonging to the richest wealth quintile having much better access to minimum nutrition compared to children belonging to the poorest wealth quintile. For instance, 57% and 72% of the children belonging to richest wealth quintile during 1992-93 and 2005-06 had access to minimum nutrition compared to only 29% and 33% among children belonging to poorest quintiles. Such lower levels of average access among children belonging to poorest quintile raise numerous questions about India's ability to support the poor. The fact that the average access to minimum nutrition was not universal even among children belonging to the richest quintile shows that wealth necessarily may not translate into good nutrition. The results further suggest an increase in gap in average access to minimum nutrition between the rich and the poor. The gap between the children belonging to the poorest and richest quintiles has increased from 28 percentage points in 1992-93 to almost 39 percentage points in 2005-06.

Of great importance is the role of parental education in explaining the access to minimum nutrition among children. The average access to minimum nutrition for children belonging to parents with average education more than four years was much more than average access to children whose parents had no formal education in 2005-06 (56.3% for children with average parental education more than 4 years and 35.9% for children whose parents had no formal education). This observation was true for 1992-93 also, where the average access to minimum nutrition for children belonging to parents with average education more than four years (52.5%) was more than twice that of children whose parents had no formal education (20.7%).

The results on inequality of opportunity in nutrition were mixed. It is obvious from table 3 that the inequality of opportunity in access to minimum nutrition in India was low (14.5% in 1992-93 and 13.9% in 2005-06) which is encouraging but at the same time there was no decrease in inequality of opportunity (0.6 percentage points) over this period which is discouraging. A regional level analysis suggests that for three regions; north, central and east, inequality of opportunity in nutrition has increased (9.1 % to 11.3% for north, 9.8% to 11.9% for central and 11.5% to 16.1% for east) and for the other three regions of northeast, west and south it has actually decreased (16.1% to 11.3% for northeast,

21.5% to 13.8% for west and 16% to 9.5% for south). The region which was in stark contrast to other regions was the eastern region, where the inequality of opportunity was found to be considerably high compared to the other regions. As in the case of full immunization, southern region once again fared best with the inequality of opportunity in average access to minimum nutrition being the lowest.

The Human Opportunity Index in nutrition (table 4) which is a combination of both the average availability of opportunities in access to minimum nutrition and how equitably they are distributed depicts a much clearer picture. The human opportunity index (nutrition) for India stood at 40% in 2005-06. It implies that 40% of the total opportunities needed to ensure universal access to minimum nutrition were available and equitably distributed. The human opportunity index in average access to minimum nutrition was higher than the corresponding figure for full immunization (35.2%) at the all India level. In absolute terms, the index was not very high but compared to the case of 1992-93 (32.5%) there was an increase of almost 8 percentage points (24.6%). The increase is encouraging because it is due to improvement in both the components, the average access to the population increased from 38% to 47% and inequality of opportunity decreased marginally (14.5% to 13.9%).

Regional pattern in human opportunity index in average access to minimum nutrition is similar to the pattern observed in average access to full immunization. The only exceptions in case of average access to minimum nutrition were north, central and northeast regions which have also done better. The similarity however comes from the fact that the southern region once again had the highest index (52.3%) in 2005-06 as in the case of full immunization. The south region has shown high improvements in the human opportunity index during 1992-2006 (index increased from 37% in 1992-93 to 52% in 2005-06. The improvement in human opportunity index in the south region (15.7 percentage points or 43%), which was highest among the regions, was driven by both the factors, an improvement of 14 percentage points in average availability (highest among regions) and a decrease of 6 percentage points (second only to western region) in inequality of opportunity. Northeastern region with an index of 50% ranked second in human opportunity index in nutrition among the six geographic regions of India in 2005-06. This region experienced good improvement in human opportunity index during 1992-2006 (in 1992-93 the index was 37.2%). This improvement was the result of 12 percentage point increase in average availability and a decrease of 5 percentage points in inequality of opportunity. Although the northern region stood at third position with a human opportunity index of 47% in 2005-06, it was surprising to note a very low improvement in available opportunities (access to minimum nutrition was 51% and 53% in 1992-93 and 2005-06 respectively) during the 1992-2006 period. In addition, the inequality of opportunity deteriorated during the 13-14 years period, i.e., the inequality of opportunity increased from 9% (1992-93) to 11% (2005-06) during this period. On the contrary, the western region (human opportunity index of 42.1% in 2005-06) which followed the north region in

the ranking not only showed a very high (12.1 percentage points or 40.4%) increase in the human opportunity index (second only to south and almost equal to northeast in percentage point terms but more than northeast in percentage terms) but also registered improvement in average access (increase of 10.6 percentage points) and in inequality of opportunity (decrease of 7.7 percentage points). At the bottom of the ladder were the central (Human Opportunity Index of 37.3% in 2005-06) and eastern (Human Opportunity Index of 33.9% in 2005-06) regions of the country. Fortunately these two regions also experienced improvement in human opportunity index during the last 13-14 years; the improvement mainly due to an increase in average availability (access to minimum nutrition).

4. Discussion and Conclusion

The present study uses two unique and new indices, namely inequality of opportunity index and human opportunity index, to measure inequality of opportunity among Indian children in terms of access to full immunization and access to minimum nutrition (measured in terms of percentage of children falling above -2sd of the reference population in weight-for-age). The earlier socio-demographic and economic studies have used measures like rich-poor ratio, concentration curves and concentration indices to measure inequality in access to various maternal and child health services. This study for the first time (for India) has used the above mentioned new indices to actually examine the inequality in opportunities. The advantage of using these new measures over the earlier measures is that these measures directly inform the policy makers about the magnitude of the opportunities that need to be transferred from the favorable to the less favorable groups to achieve equality. Similarly, the human opportunity index suggests what proportions of the opportunities that are required to achieve equality were available and equitably distributed between the various population subgroups. The use of these new measures gains more significance while evaluating the various welfare programmes launched from time to time by the government of India since the early nineties. In addition, the use of data from the two NFHS rounds which were 13-14 years apart gives a unique opportunity to examine changes in the access to basic services during the economic reform period. The NFHS 1992-93 round provides evidence for the pre-reform period. The estimates for the post-reform period can be obtained from 2005-06 round of NFHS. Again the findings based on these new indices can throw useful insights for improving the policies and programmes related to societal welfare in general and child welfare in particular.

Studies have shown that India has achieved noteworthy advancement in the field of science, agriculture, medicine, information technology, and unprecedented economic growth over the past decade (CSNSI 2008). The implementation of the new economic policy in 1991 by the Government of India led to such remarkable improvements in the Indian economy during the last two decades. The Indian economy has grown steadily at healthy rate and the per capita income has doubled during the post reform period. Recent studies (Ahluwalia 2002; Ghosh and Chandrasekhar

2003; Pal and Gosh 2007; Sen and Himanshu 2005) have shown that, despite such an impressive economic growth, the economic inequalities and regional disparities have enlarged in India during the post reform period. The findings of the present study also show that despite India's economy growing at such a faster rate the inequality of opportunity measured in terms of two opportunity variables remained high and did not change dramatically during the last 13-14 years. In addition, the findings suggest large inter-regional disparities in access to opportunity of basic services to Indian children. The inequality of opportunity ranged between 9-10% in the southern region to 12-27% in the central region. The central region fared worst in inequality of opportunity in access to healthcare whereas the eastern region fared worst in access to minimum nutrition.

The human opportunity index values also present some very important and significant findings related to access to the two basic services among Indian children. The human opportunity index values remained at low levels and did not register substantial improvement over the post reform period. Considerable and significant regional variations were also observed in the human opportunity index values in both the access variables considered in the paper. The southern region not only had the highest human opportunity index values but also registered highest improvements in the human opportunity index during the post reform period. The regions like central and eastern regions that were lagging behind in socio-economic and demographic development were also found to have low human opportunity index values. These were the regions that experienced least improvements in the human opportunity index during the post reform period. It is clear from the results that the developed states and developed regions not only had more opportunities but were also more likely to have those opportunities equitably distributed.

Some of these regional disparities in inequality of opportunity and in the human opportunity index may be attributed to uneven declines in poverty and uneven spending on the government sponsored programmes in the different regions of the country over the last two decades. Poverty declined only marginally from 36 percent in 1992-93 to 27.5 percent in 2004-05 (Planning Commission, 1992-93, 2004-05). Moreover, the decline in poverty has been uneven; poverty being largely concentrated in underdeveloped regions and among the deprived socioeconomic groups. The Public distribution system (PDS)-one of the world's largest food security program for poor households, and Integrated Child Development Services (ICDS) scheme-world's largest early child development programme, was instituted by the Government of India for last three decades in the country. Studies have documented that the large inter-state differences in child malnutrition were due to monotonous focus on ICDS programmes which were limited, infrequent and often varied considerably across the different states and geographic regions of India; access to ICDS appears to be poorest in states with worst nutritional indicators (Deolalikar 2004; Gragnolati *et al.* 2006). For example, on an average, only one quarter of children between 6-72 months benefitted from the supplementary nutrition program (SNP) under ICDS and

this statistics varied considerably from 10% to 90% across the different states of the country. Less than 15% of children in Bihar, Jharkhand and Uttar Pradesh were benefitted from SNP component of ICDS as compared to more than 50% children from Manipur, Mizoram and Nagaland. Earlier studies also bring out mismatch between the demand and supply of ICDS services in economically backward states like Bihar and Uttar Pradesh (part of the eastern and central region respectively), with low programme coverage and lowest budgetary allocations to tackle the nutritional problem (Dasgupta *et al.* 2005). There also exits significant variation in public expenditure on nutritional programme across different states which account for disparity in the nutritional status. For instance, states like Bihar, Uttar Pradesh, Madhya Pradesh and Rajasthan, spend only Rs. 30 to 50 on nutrition programs per child, whereas, states like Gujarat, Punjab and Haryana, spend Rs. 90-100 on nutrition per child. The expenditure on nutrition program per child in Tamil Nadu was almost Rs. 170 while the same in northeastern states was more than Rs. 500 per child (Deolalikar 2004). This clearly suggests that the progressive states like Tamil Nadu (which have lower levels of child malnutrition) spend 3-5 times more than the less progressive states like Madhya Pradesh, Bihar, Uttar Pradesh and Rajasthan on nutritional programmes. The study also suggests high human opportunity index values for access to minimum nutrition for the northeastern region of the country. This could be because of the highest utilization of the ICDS services in the northeastern states during the last two decades. It is worthwhile to note that the Government of India has accorded special status to this region and additional resources were invested for the implementation of ICDS programme in the region (MOWCD, 2003-04).

The economic reforms during the last two decades were also accompanied by huge investments in improving the existing public health infrastructure. There was also a thrust on developing new public health infrastructure which will be comparable to international standards. The main aim of these initiatives on the part of the Government of India was to provide low cost and affordable services to the rural, poor, downtrodden, and deprived classes of the population. The Reproductive and Child Health (RCH) programme launched in 1995 and the ambitious National Rural Health Mission (NRHM), the flagship programme of the federal government, launched in 2005 are some of the important programmes in this list. The findings from the present study, however, do not suggest significant contribution of these programmes in reducing the inequality of opportunity in access to public health services. Though some improvements have been observed in the human opportunity index over the two survey rounds, but the increase is not significant enough in the light of implementation of such programmes. The results suggest that either the programmes were not implemented properly or they were not accessible to deprived and poor sections of the population.

The findings of the current study are very relevant and have significance for the various policies and programmes implemented in the country since independence. The findings provide clear clues for the improvement of

existing policies and implementing region specific policies. The implementation of NRHM and National Rural Employment Guarantee Scheme (NREGA) are welcome steps in this direction. Results clearly suggest considerable regional variations in access to basic opportunities and in human opportunity index. So, policies and programmes made at the national level are less likely to be effective in reducing the inequality of opportunity and improving the human opportunity index. Policies and programmes catering to the need of specific regions are the need of the hour. It is important and useful to review the policies and programmes successfully implemented in the southern states and the strategies adopted to make these programmes successful. Such review may help the central and eastern states to better formulate and implement their policies and programmes to reduce the inequality in opportunity. Further, special thrust is required for the central and the eastern regions which comprise more than 50% of the India's population. India's average values are less likely to change unless significant improvements are registered in these two regions of the country.

Findings also suggest the importance of providing basic education to the general masses of the country. Education of the parents came out to be one of the decisive factors in access to the opportunities. So, increasing the educational level of the population is likely to reduce a substantial proportion of the inequalities in opportunities and also likely to increase the access to basic opportunities. The programmes like 'Sarva Siksha Abhiyaan', 'Night Schools', and other 'Literacy' related campaigns are likely to pay dividends in educating the masses in general and parents of younger children in particular thereby increasing the access to basic opportunities and reducing inequality of opportunity among the Indian children.

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Table1: Percentage Distribution of Socio-economic characteristics of Children (NFHS 1992-93 and NFHS 2005-06)

	NFHS 1992-93		NFHS 2005-06	
Characteristics	Full Immunization)	Nutrition	Full Immunization	Nutrition
Caste				
SC	12.95	12.95	21.12	21.12
ST	9.56	9.56	9.48	9.48
OBC	NA	NA	41.92	41.92
General	77.49	77.49	27.08	27.08
Religion				
Hindu	79.31	79.31	77.94	77.94
Muslim	15.51	15.51	17.36	17.36
Others	5.19	5.19	4.71	4.71
Gender				
Female	48.86	48.86	47.33	47.33
Male	51.14	51.14	52.67	52.67
Place of Residence				
Rural	76.53	76.53	73.86	73.86
Urban	23.47	23.47	26.14	26.14
Wealth Quintiles				
Poorest	19.63	19.63	25.00	25.00
Poorer	19.47	19.47	22.05	22.05
Middle	19.66	19.66	19.87	19.87
Richer	20.28	20.28	18.17	18.17
Richest	20.96	20.96	14.91	14.91
Mean Parental Education				
Mean Value	***4.08***	***4.08***	***5.23***	***5.23***
0	32.43	32.43	24.87	24.87
1-4	28.46	28.46	26.66	26.66
>4	39.11	39.11	48.47	48.47

NA: Not Applicable, General in NFHS 1992-93 also includes OBC

Table 2: Crosstab of different outcome variables with the socio-economic variable of children, India, NFHS 1992-93 and NFHS 2005-06

	NFHS 1992-93		NFHS 2005-06	
Characteristic	Full Immunization	Nutrition	Full Immunization	Nutrition
Caste				
SC	29.67	32.08	41.69	48.98
ST	24.60	34.40	33.14	35.23
OBC	NA	NA	40.79	45.60
General	38.37	39.31	54.15	57.03
Religion				
Hindu	36.32	37.73	45.05	46.23
Muslim	27.54	35.71	36.24	47.35
Other	55.03	49.87	55.21	57.36
Sex				
Female	34.89	37.66	43.05	44.99
Male	36.92	38.41	44.86	48.68
Place of Residence				
Rural	31.02	33.17	39.33	43.38
Urban	51.93	47.34	57.20	57.58
Quintile				
Poorest	18.09	29.03	26.05	32.83
Poor	22.80	30.86	33.97	39.96
Middle	29.29	32.56	46.40	47.35
Rich	43.27	40.66	55.90	55.04
Richest	63.76	56.59	71.23	71.48
Mean Parental Education				
0	20.72	30.07	23.49	35.86
1-4	30.51	32.70	36.59	40.52
>4	52.48	48.22	58.91	56.26
Region				
North	42.79	51.25	46.07	53.23
Central	23.23	32.37	32.05	42.30
East	20.52	32.60	43.36	40.33
North East	20.70	44.34	32.72	55.87
West	59.78	38.18	55.21	48.82
South	54.82	43.56	58.47	57.83
India	35.90	38.00	44.00	46.90

NA: Not Applicable

Table 3: Index of Inequality of Opportunity (D, in percentage) in India and its six regions (1992-93 and 2005-06)

Region	Full Immunization			Minimum Nutrition		
	NFHS 1992-93	NFHS 2005-06	Increase	NFHS 1992-93	NFHS 2005-06	Increase
North	25.9	22.4	-3.5 (-13.5)	9.1	11.3	2.2 (24.2)
Central	25.2	26.5	1.3 (5.2)	9.8	11.9	2.1 (21.4)
East	26	19.6	-6.4 (-24.6)	11.5	16.1	4.6 (40)
North East	31.2	26.1	-5.1 (-16.3)	16.1	11.3	-4.8 (-29.8)
West	13.3	12.9	-0.4 (-3.0)	21.5	13.8	-7.7 (-35.8)
South	12.3	10	-2.3 (-18.7)	16	9.5	-6.5 (-40.6)
India	24.5	20.1	-4.4 (-18)	14.5	13.9	-4.1 (-0.6)

Note: The figure in parenthesis is the percentage increase.

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Table 4: Human Opportunity Index (O, in percentage) for India and its six regions (1992-93 and 2005-06)

Region	Full Immunization			Minimum Nutrition		
	NFHS 1992-93	NFHS 2005-06	Increase	NFHS 1992-93	NFHS 2005-06	Increase
North	31.7 (42.8)	35.8 (46.1)	4.1 [12.8]	46.6 (51.3)	47.2 (53.2)	0.6 [1.3]
Central	17.4 (23.2)	23.6 (33)	6.2 [36]	29.2 (32.4)	37.3 (42.3)	8.1 [27.6]
East	15.2 (20.5)	34.9 (43.4)	19.7 [130]	28.9 (32.6)	33.9 (40.3)	4.9 [17.3]
North East	14.2 (20.7)	24.2 (32.7)	9.9 [69.7]	37.2 (44.3)	49.6 (55.9)	12.4 [33.2]
West	51.8 (59.8)	48.1 (55.2)	-3.7 [-7.3]	29.9 (38.2)	42.1 (48.8)	12.1 [40.4]
South	48.1 (54.8)	52.7 (58.5)	4.6 [9.6]	36.6 (43.6)	52.3 (57.8)	15.7 [43]
India	27.1 (35.9)	35.2 (44)	8.1 [29.7]	32.5 (38.0)	40.4 (46.9)	7.9 [24.3]

Note: 1. Figures in parenthesis () represent the average access rate.

2. Figures in parenthesis [] represent the percentage increase.