Regional Variation in child immunization in Maharashtra, India

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Introduction: - Immunization is one of the greatest medical success stories in human history. Universal child immunization against vaccine-preventable diseases is recognized as one of the most cost-effective ways of reducing infant and child mortality in developing countries (Westly, 2003) The World Health Organization (WHO) launched the Expanded Programme on Immunization (EPI) in May 1974(Yadav et al., 2006) followed by UNICEF in partnership with other stake-holders launched Universal Childhood Immunization (UCI) in 1984(Keja et al., 1988), after that GOI launched the same in India in 1978 with a view to provide protection to the children against disease, focus of the program with the main objective of immunization for infants against the six basic infections namely measles, poliomyelitis, diphtheria, pertussis, tetanus, and tuberculosis. In India, the basic childhood immunization service has been part of essential health services and accorded top priority in its health delivery system. Following the Alma Ata Declaration in 1978, the country had adopted the Expanded Programme on Immunization (EPI) and introduced six childhood vaccines—Bacillus Calmette- Guerin (BCG), DPT, Polio and measles (Basu, 1985).

In case of India there is large regional variation in full immunization and a clear north–south differential was observed. The coverage of polio vaccine is higher than that of BCG and measles vaccine in India and the states and there is slow improvement over time of period (Kumar and Mohanty, 2011).

Second Largest state of India which called Maharashtra, it shows a completely dismal picture in full immunization coverage that made considerable progress between 64 percent in 1992–1993 to 78 percent in 1998–1999, while decline in during 59 percent in 2005–2006 (Chandran et al., 2011; Arokiasamy et al. 2011). Moreover, In spite of manifold increase in expenditure, there was a drastic decrease in full immunization was noticed in Maharashtra (Arokiasamy et al. 2011).

Need for study: - Keeping in view the above research work an attempt is made to evolve a suitable strategy for knowing the immunization status of the child in Maharashtra by geographical regions because Growing number of studies have examined child immunization coverage in India and states. However, there is a dearth of study about child immunisation in Maharashtra with reference to geographical division. Therefore, there is a need to study the factors, which are responsible for the different level of immunisation coverage across the geographical regions in the state of Maharashtra. DLHS or any other data provided only districts or states level data and information about the status of immunization, but both districts and states drown by the political perspective. However, geographical regions play a critical role in predicting demographic factors. Having this disparity, it is important to study the effect of socio-economic variation on child immunisation by geographical region.
Objective: - 1. To analyze the differentials & determinants in coverage of child immunization levels by geographical region of Maharashtra.

2. To assess the change of child immunization levels by vaccine and dropouts in BCG, to Measles by geographical region of Maharashtra.

3. To find out the socio-economic and gender inequality in child immunization by geographical region of Maharashtra.

Sources of Data: - The third round of the district level household survey, which was conducted during December 2007 to December 2008, has been used in this study. For this study the total sample of children in age groups 12-23 months is 3417, which enough to carry out any robust analyses. The sample size of children age groups 12-23 months by regions is Northern Maharashtra 513, vidharbha 994, Marathwada 889, konkan 371, Western Maharashtra380.

Methodology: - The differential and changes in immunization coverage has been analyzed through bivariate analysis using cross tabulation. The percentage coverage of vaccines was calculated to know the changes and dropouts between different doses of BCG to Measles.

**Binary Logistic Regression Model:** The Binary logistic regression analysis has been carried out to know the significance of different proxy-factors affecting the immunization. For the outcome variable logistic model take following general form,

$$\text{Logit } P = \ln \left( \frac{P}{1-P} \right) = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + \ldots \ldots b_i x_i + e_i$$

Where b1, b2, b3 and bi represent the coefficient of each of the predictor variables included in a model, while ei is an error term. Ln (P/1-P) represents the natural logarithm of the odds of outcome. **Dropout rate:** Simple formulae for calculating dropout rate between different doses of BCG to Measles vaccines. Those formulae are given below:

$$\text{Dropout from BCG to Measles} = \left( \frac{\text{BCG} - \text{Measles}}{\text{BCG}} \right) \times 100$$

Measuring the gender inequality in Full immunization used simple ratio of immunization rates for boys and girls multiplied by 100. The index is given below:

$$\text{Gender ratio for Full immunization} = \left( \frac{\text{percentage of boys fully immunised}}{\text{percentage of girls fully immunised}} \right) \times 100$$

The value of 100 implies no gender differential in full immunization. The value above 100 indicated that there is female disadvantage but below the 100 indicates that there is a female advantage.

**Measuring socio-economic inequality in child immunization by Concentration index:**

The concentration index is used for quantifying the degree of regional socio-economic inequality in immunization. Concentration index measures the extent to which a particular health status variable is distributed unequally across all five asset quintiles; it is similar to the Gini Coefficient frequently used in the study of income inequalities (Wagstaff et al., 1991). The value of the index can take to +1, the closer is the index to zero for any one health indicator, the less concentrated is the wealth inequality for that indicator; conversely, the
further away is the index from zero, the greater is the inequality. Thus, in the case of full immunization (where inequality is likely to take the form of higher rates in wealthier households than in poorer ones), a larger positive concentration index indicates greater inequality. The concentration index for \( t = 1 \ldots T \) groups is computed by following formulae

\[
CI = (p_1 L_2 - p_2 L_1) + (p_2 L_3 - p_3 L_2) + \ldots \ldots + (p_T L_T - p_T L_{T-1})
\]

Where \( P \) is the cumulative percentage of sample rank by wealth quintile, \( L(P) \) is the corresponding concentration curve ordinate, and \( T \) is the number of socioeconomic group.

**Background of the study area:** - Maharashtra is the second largest state in India in terms of population and area. In 2011 census of India, the population of the Maharashtra is recorded has 11, 23, 72, 972. On the basis of Geography, Revenue administration and Historically, Maharashtra has five main regions having 35 districts. These regions and the number of districts in each region are as follows: Vidharbha with 11 districts, Marathwada having 8 districts, Northern Maharashtra having 5 districts, western Maharashtra has 5 districts, and konkan having 6 districts. This state has succeeded in maintaining the first position in industrialization in India (Planning Commission Government of India: 2003, 2006; CIFE 2009; IITB 2009).

**Result:**

The study suggested Although the coverage of full immunization is reach above 68 percent of state level of Maharashtra but still entire region has big variation in context to coverage; where Northern Maharashtra region has far behind in coverage of full immunization only half of the children are fully immunized which is lower than the state level, also there is the big variation for vaccination by Socio- economic, Demographic and Education back ground of household of children ; on the other hand nearly three forth and fore fifth of children is fully immunized in Western Maharashtra and Konkan region. Whereas coverage in Vidharbha and Marathwada region is near about equivalent to the state level.

The results also demonstrate that the coverage of measles vaccine is lower than BCG. This situation is more prominent in Northern Maharashtra, the lower coverage of all vaccines therefore dropouts is higher by all demographic and socioeconomic characteristics in Northern Maharashtra, followed by Vidharbha and Marathwada. Western Maharashtra and Konkan region have higher coverage of both vaccines therefore dropouts are too lower, Gender and regional inequality in child immunization in Maharashtra by region has showing, Northern Maharashtra and Vidharbha region has higher inequality against girls in both rural and urban area, Hindu, Muslin Scheduled caste, scheduled tribe, higher age Mother, Higher Birth order, illiterate parents, poorest and poor wealth quintile, Whereas in Western Maharashtra region have favorable condition to girls to immunized than boys by all background condition followed by Konkan region.

The value of concentration index showing that in Maharashtra overall scenario show slightly lower inequality in case of full immunization with respect to wealth, where the value of concentration index have closer to the zero which is affected mainly due to the Northern Maharashtra region otherwise allover Maharashtra might have very lower inequality, because
inequality in case of full immunization is higher in Northern Maharashtra region and inequality is lower in Western Maharashtra region. Although the Konkan and Marathwada and Vidharbha region have lower inequality but it is slightly higher than Western Maharashtra region and lower than state level.

References


