

Examining Disparity in Child Immunization within Marginalized Caste Groups in India
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1. Introduction

Inequality arises when resources, opportunities, and privileges are not shared equally among people or groups in society. It shows up in different forms, such as economic, social, and political inequalities, often disadvantaging some groups (Thorat, 2008). In India, a country known for its diverse cultures, religions, and economic disparities, inequality is linked to the caste system. This system divides people into hierarchical groups, determining their social status and access to resources, jobs, and quality of life (Pande & Yazbeck, 2003).

Social exclusion perpetuates poverty among marginalized communities in India, including Scheduled Castes (SCs), Scheduled Tribes (STs), Other Backward Classes (OBCs), and some religious minorities. Dalits, historically outside the caste system, and STs, indigenous communities with distinct cultural practices, face deep-seated discrimination (Mutatkar, 2005)(Singh et al., 2015).

Poor socioeconomic conditions and discrimination impact the health of members of SC and ST communities (Singh et al., 2015). Research indicates that Dalits and Adivasis suffer much higher rates of malnutrition, maternal and infant mortality, and chronic illnesses compared to other groups. The socioeconomic disadvantage further hinders their access to quality healthcare, leading to health inequalities among individuals and groups. Singh et al. (2015) explain that inequality in India can be categorized into two types: vertical inequality, based on income, and horizontal inequality, based on caste. Arcaya et al. (2015) discuss approaches to studying inequalities within and between populations. In health inequality research, most studies focus on the pattern and causes of inequality in health access and outcomes between the different caste groups. However, very little research exists on the differences within each caste group. Vishwakarma et al., 2020, identified clear evidence of unequal access to child immunization between SC, ST, and other caste groups, with STs being especially vulnerable in many states. It highlights the need to focus on caste-based differences in healthcare access. Similarly, Thapa et al., 2021 and George, 2022 highlighted how caste and socioeconomic status together worsen health inequality, especially for Dalits. Singh, 2013, observed a general decline in urban-rural and gender gaps in immunization rates, but at regional this gap persists.

Rekha et al. (2024) similarly examined the ST population in Jharkhand and Odisha, revealing that within ST communities, the poor and uneducated suffer from a lack of access to essential newborn and child health services. Singh, 2011 highlighted similar inequalities in child immunization coverage across India driven by socioeconomic factors like geographic locations and parental education. (Saikia et al., 2023) argued that socioeconomic factors such as residence, household size, and wealth status influence immunization

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1 <https://indianexpress.com/article/explained/explained-law/explained-sub-classification-of-sc-st-9489996/>

coverage more than gender or caste. The recent ruling by the Indian Supreme Court on the sub-classification of SCs and STs marks a significant step towards recognizing internal diversity and aims to address the varying degrees of discrimination within these groups¹. Sub-classification allows states to acknowledge these differences and develop a more targeted approach to address the needs of these most marginalized communities in states like Punjab, Bihar, and Mizoram (Singh et al., 2015). Yet, there is limited knowledge and understanding of variations in health outcomes within the disadvantaged groups such as scheduled castes, scheduled tribes, and Other backward classes.

Children in marginalized communities are especially vulnerable to health inequities. Lack of access to proper nutrition, sanitation, and medical care puts them at a higher risk for preventable diseases. Immunization, a critical health care in ensuring child health, often remains inadequate in these communities due to poverty, geographical isolation, and social exclusion. Ensuring that children receive proper immunization is essential to breaking the cycle of poor health and poverty in these marginalized groups. As per National Family Health Survey reports, full immunization among children aged 12-23 months has increased from 35% in 1992-93 to 77% in 2019-20(Shukla et al., 2019).

2. Data and Methods

This study will investigate health inequalities within caste groups SCs and STs. We focus on full immunization for children aged 12 to 35 months and use the relevant data from the National Family Health Surveys I to V, conducted from 1992 to 2020. As per WHO standards, a child is said to be fully immunized if he/she has received eight vaccinations. The analysis will include critical socioeconomic and demographic factors, including gender and birth order of the child, mother's education, place of residence, income, and geographical locations such as district, state, and region. We have used cross-tabulations, Poor-rich ratio (ratio of prevalence of full immunization in richest by poorest, where the value greater than 1 indicates the prevalence of immunization in rich children)(Hashmi & Singh, 2023), Concentration indices (degree of socioeconomic inequality in health, positive indicates that full immunization is more prevalent in high-income group) (Pathak & Singh, 2011) and Maps where we have plotted the prevalence of total immunization of each caste groups over the time state wise. We have used STATA 17 and QGIS for our analysis.

3. Results

The Poor-rich ratio in table 1, the overall PR ratio among SC children has increased from 0.223 in NFHS1 to 0.849 in NFHS 5, indicating that significant disparities existed in early rounds but have narrowed considerably by 2021. While the disparity is more noticeable in 2016 among females with a PR ratio of 0.699, this has significantly reduced among females with a ratio of 0.867 in 2021. Children with higher birth order, typically at a disadvantage, show a remarkable improvement in PR Ratio over time, from 0.217 to

0.924 in 2021. Similarly, children's birth order 1 and 2 disparities have consistently reduced, with PR ratios reaching 0.822 and 0.904, respectively, by NFHS 5. Hindus have a consistent improvement in the PR ratios than Muslim children, but then in 2021, Muslims have a PR ratio of 1.157, indicating that more of the poorest Muslim children are now fully immunized than their richer counterparts. Urban areas have lower disparity in earlier rounds compared to rural areas, which increased in 2021, with 0.788 in urban areas and 0.824 in rural areas. Economic disparities have reduced across all education levels, but the PR ratio for children of mothers with no education remained lower at 0.800 NFHS 5), reflecting continued challenges for the poorest children in less educated households. Children of secondary and higher education mothers displayed relatively higher parity with ratios of 0.907 and 0.868, respectively, by NFHS 5. The North and Central regions, historically showing the highest disparities, have improved but still lag with PR ratios of 0.897 and 0.876, respectively, in NFHS 5. This indicates that the poorest children, especially in regions like the North and Central, still face lower immunization rates than the richest. The Northeast region, which had the lowest PR ratio (0.100 in NFHS 3), saw significant improvement, reaching 0.924 in NFHS 5, indicating a major reduction in economic disparities. The concentration index will help us identify the concentration of full immunization, and a negative value presents that the concentration of full immunization is higher among poor children. However, in Table 2, all the values are positive, implying that full immunization is the higher income group. Overall, the index values have improved from 0.286 in NFHS1 to 0.036 in NFHS5, narrowing the gap. Similarly, male and female children show a significant reduction in economic disparities in immunization, with male children showing a slight edge in recent rounds (0.039 for males and 0.033 for females in NFHS5). Religiously, Hindus show a steady reduction in disparities (0.283 in NFHS1 to 0.038 in NFHS5), while Muslims present erratic trends, including a negative index in NFHS2 (-0.151), indicating immunization was more concentrated among poorer families in that round. Urban areas exhibit lower economic disparities compared to rural areas. By NFHS5, urban areas had a concentration index of 0.035, while rural areas showed slightly higher inequality at 0.042. Regionally, the central and Northern regions have consistently shown higher economic disparities, particularly in earlier rounds, with Central India showing a concentration index of 0.320 in NFHS1, which dropped to 0.036 by NFHS5. In contrast, southern India presents the least disparity throughout all rounds, with a concentration index of 0.081 in NFHS5.

Table 1 - Trends in economic disparities based on Poor-Rich ratios within SC Children

	NFHS1	NFHS2	NFHS 3	NFHS4	NFHS 5
All India	0.223	0.398	0.355	0.711	0.849
Characteristics					
Gender					
Male	0.220	0.371	0.351	0.985	0.835
Female	0.226	0.437	0.359	0.699	0.867
Birth order					
1	0.247	0.469	0.453	0.711	0.822
2-3	0.271	0.511	0.418	0.768	0.904
3+	0.217	0.328	0.465	0.811	0.924
Religion					
Hindu	0.221	2.447	0.355	0.726	0.848
Muslim	0.989	0.687	0.185	0.509	1.157
Others	0.672	1.869	0.466	0.594	0.806
Place of residence					
Urban	0.130	0.512	0.390	0.734	0.788
Rural	0.211	0.417	0.332	0.664	0.824
Mother's Education					
No education	0.310	0.492	0.529	0.856	0.800
Primary	0.400	0.678	0.472	0.801	0.954
Secondary	0.427	0.824	0.691	0.780	0.907
Higher	1.195	no observation in poorest		0.838	0.868
Region					
North	0.095	0.163	0.365	0.541	0.897
Central	0.114	0.349	0.340	0.678	0.876
East	0.417	0.409	0.411	0.827	0.844
Northeast	0.648	0.505	0.100	0.705	0.924
West	0.926	0.867	0.497	0.745	0.730
South	0.593	0.671	0.442	0.732	0.850

Source: Authors' computations based on NFHS data (1992-2021)

Table 2 - Trends in economic disparities based on Concentration indices among SC Children

	NFHS 1	NFHS 2	NFHS 3	NFHS4	NFHS 5
All India	0.286 (0.000)	0.178 (0.000)	0.195 (0.000)	0.066 (0.000)	0.036 (0.000)
Characteristics					
Gender					
Male	0.285 (0.000)	0.186 (0.000)	0.190 (0.000)	0.066 (0.000)	0.039 (0.000)
Female	0.288 (0.000)	0.169 (0.000)	0.201 (0.000)	0.066 (0.000)	0.033 (0.000)
Birth order					
1	0.277 (0.000)	0.146 (0.000)	0.155 (0.000)	0.060 (0.000)	0.039 (0.000)
2-3	0.260 (0.000)	0.136 (0.000)	0.142 (0.000)	0.052 (0.000)	0.026 (0.000)
3+	0.300 (0.000)	0.224 (0.000)	0.207 (0.000)	0.058 (0.000)	0.022 (0.005)
Religion					
Hindu	0.283 (0.000)	0.175 (0.000)	0.193 (0.000)	0.063 (0.000)	0.038 (0.000)
Muslim	0.151 (0.130)	-0.151 (0.3931)	0.310 (0.029)	0.141 (0.000)	0.027 (0.169)
Others	0.225 (0.000)	0.102 (0.001)	0.147 (0.01)	0.039 (0.000)	0.033 (0.000)
Place of residence					
Urban	0.195 (0.000)	0.089 (0.000)	0.137 (0.000)	0.059 (0.000)	0.035 (0.000)
Rural	0.269 (0.000)	0.173 (0.000)	0.186 (0.000)	0.069 (0.000)	0.042 (0.000)
Mother's Education					
No education	0.238 (0.000)	0.153 (0.000)	0.140 (0.000)	0.047 (0.000)	0.036 (0.000)
Primary	0.110 (0.002)	0.045 (0.054)	0.090 (0.001)	0.038 (0.000)	0.023 (0.001)
Secondary	0.147 (0.000)	0.037 (0.048)	0.066 (0.000)	0.042 (0.000)	0.020 (0.000)
Higher	-0.004 (0.804)	0.028 (0.423)	0.068 (0.017)	0.035 (0.001)	0.008 (0.245)
Region					
North	0.306 (0.000)	0.280 (0.000)	0.176 (0.000)	0.088 (0.000)	0.022 (0.000)
Central	0.320 (0.000)	0.154 (0.000)	0.205 (0.000)	0.081 (0.000)	0.036 (0.000)
East	0.127 (0.067)	0.161 (0.000)	0.143 (0.000)	0.061 (0.000)	0.038 (0.000)
Northeast	0.122 (0.425)	0.140 (0.015)	0.262 (0.000)	0.072 (0.000)	-0.006 (0.640)
West	0.068 (0.114)	0.028 (0.310)	0.127 (0.000)	0.073 (0.000)	0.072 (0.000)
South	0.081 (0.003)	0.065 (0.000)	0.085 (0.000)	0.035 (0.000)	0.014 (0.008)

Source: Authors' computations based on NFHS data (1992-2021)

Table 3 shows an overall improvement in PR ratio from 1992 to 2021 among ST children, indicating that the disparity has reduced over time. Both male and female ST children show similar trends, with the PR ratio improving significantly by 2021. However, there is a disparity for religious groups. Hindus and Muslims show distinct disparities. For Muslims, the PR ratio was meagre in 1998, with a ratio of 0.00, indicating that no poor child was immunized, improved to 0.749 in 2021, whereas Hindus and other religions show much higher ratios, indicating a reduction in disparity over time. The disparity among urban and rural areas has narrowed over time. Regionally, disparities are evident in NFHS 5, the eastern region, and the northern region, with a PR ratio above 1, indicating that poorer children are more likely to get immunized than richer children. In contrast, the northeastern region exhibits persistent disparities in comparison to other regions over time. As per Table 8, the economic disparity within ST children decreased steadily from 0.217 in NFHS 1 to 0.012 in NFHS 5, indicating a significant reduction in inequality and greater access to immunization across different economic groups. Both in birth order and gender, the levels of disparity have decreased. As of 2021, among children with higher education, their mothers have a disparity of -0.041, indicating that full immunization became more accessible to children regardless of their mother's educational background. On the other hand, the northeastern region saw the highest concentration of full immunization among wealthier families, with disparities peaking at 0.318 in NFHS 1 and gradually reducing to 0.026 in NFHS 5. Additionally, to examine within-group disparity, we have used the disparity ratio to indicate that if the value is greater than 1, the prevalence of fully immunized is higher in one group than another

Table 3 - Trends in economic disparities based on Poor-Rich ratios within ST Children

	NFHS1	NFHS2	NFHS 3	NFHS4	NFHS 5
All India	0.313	0.281	0.348	0.741	0.963
Characteristics					
Gender					
Male	0.328	0.321	0.344	0.749	0.941
Female	0.297	0.243	0.345	0.730	0.986
Birth order					
1	0.255	0.364	0.390	0.809	0.987
2-3	0.342	0.261	0.446	0.763	1.012
3+	0.482	0.347	0.262	0.619	0.748
Religion					
Hindu	0.286	0.274	0.355	0.726	0.975
Muslim	NA	0.000	0.109	0.715	0.749
Others	0.284	0.456	0.299	0.751	0.927
Place of residence					
Urban	0.000	0.181	0.410	0.664	0.896
Rural	0.335	0.362	0.292	0.813	0.876
Mother's Education					
No education	3.268	0.394	0.326	1.081	0.798
Primary	0.725	0.918	0.962	0.882	0.748
Secondary	0.265	0.483	0.689	0.794	0.936
Higher	no observation in poorest			0.928	1.207
Region					
North	0.332	0.237	0.038	0.683	1.065
Central	0.283	0.062	0.235	0.635	0.837
East	0.182	0.375	0.548	0.766	1.134
Northeast	0.171	0.279	0.273	0.590	0.871
West	0.533	0.461	0.496	0.478	0.997
South	0.525	0.317	0.414	0.761	0.800

Source: Authors' computations based on NFHS data (1992-2021)

Table 4. - Trends in economic disparities based on Concentration indices among ST Children

	NFHS 1	NFHS 2	NFHS 3	NFHS4	NFHS 5
All India	0.217 (0.000)	0.202 (0.000)	0.178 (0.000)	0.065 (0.000)	0.012 (0.000)
Characteristics					
Gender					
Male	0.222 (0.000)	0.235 (0.000)	0.220 (0.000)	0.074 (0.000)	0.011 (0.001)
Female	0.217 (0.000)	0.174 (0.000)	0.135 (0.000)	0.055 (0.000)	0.013 (0.000)
Birth order					
1	0.245 (0.000)	0.175 (0.000)	0.157 (0.000)	0.053 (0.000)	0.010 (0.009)
2-3	0.203 (0.000)	0.208 (0.000)	0.135 (0.000)	0.057 (0.000)	0.003 (0.447)
3+	0.189 (0.000)	0.156 (0.000)	0.168 (0.000)	0.052 (0.000)	0.021 (0.000)
Religion					
Hindu	0.228 (0.000)	0.202 (0.000)	0.176 (0.000)	0.067 (0.000)	0.012 (0.000)
Muslim	-0.177 (0.582)	0.645 (0.001)	0.232 (0.013)	0.086 (0.000)	0.032 (0.051)
Others	0.219 (0.000)	0.128 (0.000)	0.217 (0.000)	0.045 (0.000)	0.001 (0.842)
Place of residence					
Urban	0.181 (0.000)	0.187 (0.000)	0.155 (0.000)	0.036 (0.000)	0.007 (0.412)
Rural	0.199 (0.000)	0.159 (0.000)	0.162 (0.000)	0.055 (0.000)	0.016 (0.000)
Mother's Education					
No education	0.175 (0.000)	0.107 (0.000)	0.093 (0.000)	0.015 (0.017)	0.009 (0.039)
Primary	0.077 (0.030)	0.040 (0.277)	0.106 (0.001)	0.037 (0.000)	0.011 (0.047)
Secondary	0.190 (0.000)	0.082 (0.000)	0.041 (0.007)	0.044 (0.000)	0.009 (0.002)
Higher	0.051 (0.485)	0.028 (0.443)	0.182 (0.000)	0.013 (0.359)	-0.041 (0.000)
Region					
North	0.307 (0.000)	0.211 (0.012)	0.568 (0.000)	0.087 (0.000)	0.008 (0.314)
Central	0.168 (0.0005)	0.363 (0.000)	0.117 (0.002)	0.077 (0.000)	0.016 (0.002)
East	0.278 (0.000)	0.101 (0.01)	0.154 (0.000)	0.045 (0.000)	0.012 (0.01)
Northeast	0.318 (0.000)	0.253 (0.000)	0.200 (0.000)	0.084 (0.000)	0.026 (0.000)
West	0.156 (0.000)	0.141 (0.000)	0.146 (0.000)	0.136 (0.000)	0.008 (0.3185)
South	0.096 (0.115)	0.134 (0.057)	0.098 (0.112)	0.048 (0.005)	0.041 (0.000)

Source: Authors' computations based on NFHS data (1992-2021)

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