

Impact of Maternal Education on Child Immunization: Insights From NFHS-5

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Abstract

This paper tries to examine how maternal education influences child immunization rates in India, while also considering other significant variables. Using data from the National Family Health Survey (NFHS-5), the research employs logistic regression models to analyse the relationship between maternal education and child immunization, controlling for factors like household income and other socioeconomic factors. The analysis aims to reveal how maternal education correlates with immunization rates while accounting for other determinants. Expected results are likely to show a positive link between higher maternal education and improved immunization coverage, alongside insights into the effects of other control variables. These findings are crucial for informed public health policies, highlighting the need for targeted educational interventions and improved healthcare access. The study will provide actionable recommendations for policymakers to design effective strategies that address both educational and structural barriers to improve child health outcomes in India.

Keywords: Child Immunization, Maternal education, NFHS

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Introduction

Education plays a fundamental role in shaping health outcomes, particularly in developing countries where disparities in access to healthcare persist. Among the various socio-economic factors influencing child health, maternal education stands out as a crucial determinant. Extensive research highlights that higher educational attainment among mothers enhances their awareness of healthcare practices, increases health-seeking behavior, and ultimately leads to improved child health indicators. One of the most significant aspects of child healthcare is immunization, which serves as a preventive measure against life-threatening diseases and contributes to long-term health and well-being.

Immunization is a globally recognized cost-effective public health intervention, preventing millions of deaths annually. The World Health Organization (WHO) estimates that immunization prevents 4–5 million deaths each year from vaccine-preventable diseases such as diphtheria, tetanus, pertussis, influenza, and measles. Despite the availability of vaccines and national immunization programs, full immunization coverage remains an ongoing challenge in India. India's Universal Immunization Programme (UIP), initiated in 1978 and expanded under the National Rural Health Mission (NRHM), aims to provide immunization against seven vaccine-preventable diseases. Further, the Mission Indradhanush initiative, launched in 2014, set a goal of achieving 90% full immunization coverage, particularly targeting underprivileged and hard-to-reach populations.

Despite these efforts, the country has not yet reached the 90% full immunization target. As per the National Family Health Survey (NFHS)-5 (2019-21), the full immunization rate among children aged 12-23 months in India stands at 76.8%, showing progress from previous rounds but still falling short of the SDG target. One of the critical factors affecting immunization coverage is maternal education. Educated mothers are more likely to understand the importance of timely vaccinations, seek immunization services for their children, and adhere to immunization schedules.

This study aims to investigate the impact of maternal education on child immunization in India. Using data from NFHS-5, the research employs a logit regression model to assess how different levels of maternal education influence the likelihood of children receiving full immunization. Other socio-economic and demographic control variables are included in the analysis to provide a comprehensive understanding of the relationship between maternal education and child immunization. The study contributes to existing literature by providing empirical evidence on the role of maternal education in improving immunization rates, which can inform policy interventions aimed at increasing vaccine coverage and reducing child mortality.

Trends in Child Immunization

The trend in child immunization coverage in India from NFHS-3 (2005-06) to NFHS-5 (2019-21) reveals a steady increase in the proportion of fully immunized children. **Figure 1** presents the national trend of full immunization across NFHS rounds, highlighting the progress made over the years. Additionally, Figure 2 illustrates the state-wise variation in full immunization rates from NFHS-4 to NFHS-5, showcasing disparities in immunization coverage across different regions of India.

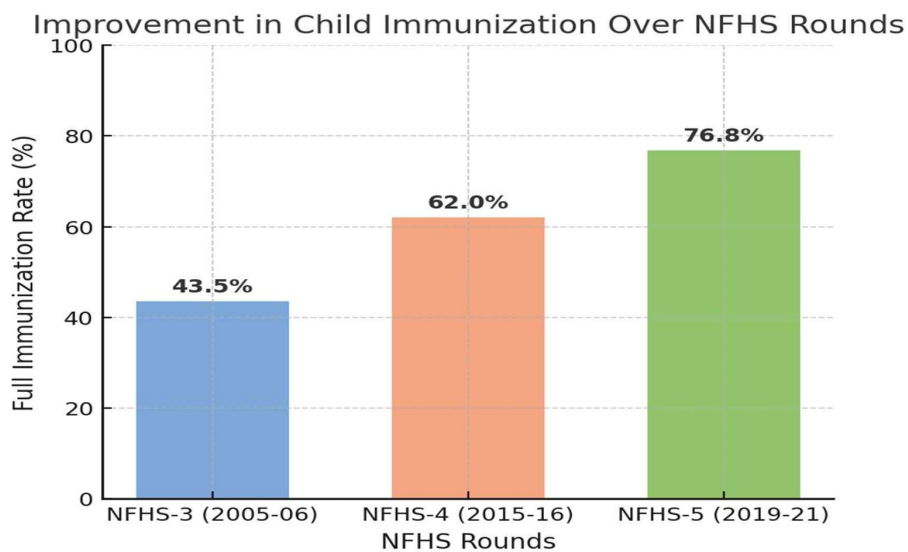


Figure 1: National Trend of Full Immunization (NFHS-3 to NFHS-5)

Excluding 11 States/UTs, full immunization coverage has increased across India from 2015-16 to 2019-21. However, certain states, including Manipur, Meghalaya, Punjab, Kerala, Sikkim, West Bengal, and Goa, witnessed declines in immunization rates. In 14 States/UTs, the proportion of fully immunized children remained below the national average (84%) in NFHS-5, indicating persistent gaps in vaccine coverage.

The highest immunization coverage was recorded in Ladakh, Jammu & Kashmir, Himachal Pradesh, and Andaman & Nicobar Islands, where more than 95% of children aged 12-23 months were fully immunized. Despite improvements, states such as Nagaland, Assam, Manipur, Arunachal Pradesh, Tripura, Uttarakhand, Jharkhand, and Delhi had immunization rates below 80%, ranking among the lowest in the country. Meeting the Sustainable Development Goal (SDG-3) target of achieving 90% full immunization by 2030 thus remains a significant challenge, as only 11 States/UTs had reached this goal by 2019-21. These disparities highlight the need for targeted interventions to improve vaccine outreach and healthcare access in lagging regions.

Thus, the analysis shows that though progress has been made over different rounds of NFHS, however disparities persist in terms of immunization coverage across India. This highlights the need for targeted policy intervention. Factors such as regional disparities, healthcare accessibility, socio-economic conditions and maternal education need to be taken into account while formulating the policies to enhance immunization uptake.

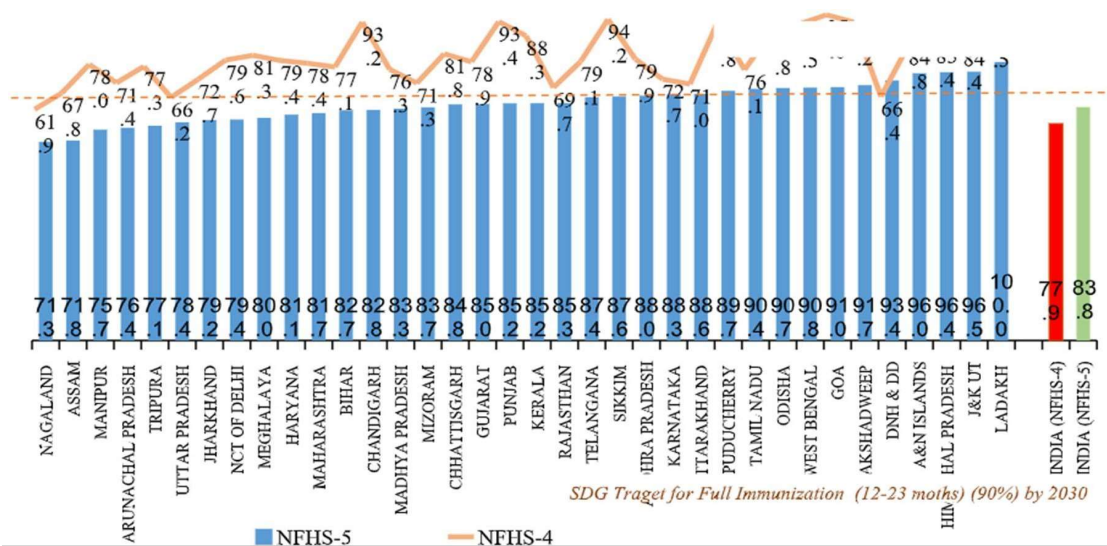


Figure 2: State-wise Trend of Full Immunization (NFHS-4 vs. NFHS-5)

Thus, understanding role of maternal education in shaping immunization outcomes is critical for designing effective public health strategies. Several studies have explored the correlation between maternal education and child health, particularly immunization coverage. The following section reviews existing literature on this subject, examining theoretical frameworks and empirical evidence that underscore the importance of education in promoting vaccine compliance and child well-being.

Literature Review

The relationship between maternal education and child health, particularly immunization, has been a subject of considerable research since the 1970s. One of the seminal studies in this area is by **Caldwell (1979)**, who demonstrated that, all other factors being equal, children of educated mothers experience lower mortality rates than children of uneducated mothers. Since then, numerous studies have explored the association between female education and various aspects of child health in both developing and developed countries.

Desai and Alva conducted an analysis of the causal relationship between child health and maternal education using demographic and health data from 22 developing countries. They examined child mortality, immunization status, and height-for-age as dependent variables while including maternal education, child’s age, paternal education, area of residence, marital status, and environmental factors as independent variables. Their findings indicate that

maternal primary education was statistically significant in 11 countries, while secondary education was significant in 15 countries for infant mortality reduction. Similarly, for child immunization, maternal primary and secondary education had significant positive effects in 9 and 11 countries, respectively, highlighting the crucial role of maternal education in improving child health outcomes.

In Yemen, Basaleem et al. evaluated the Expanded Programme on Immunization (EPI) in the Aden region and found contrasting results. Their study concluded that maternal education had no significant impact on determining a child's immunization status. Instead, factors such as the father's occupation, birth order, and place of residence played more prominent roles. These findings suggest that the impact of maternal education may vary depending on the local sociocultural and economic context.

Forshaw et al. performed a meta-analysis of 37 studies to examine whether the relationship between maternal education and child immunization varies by region and time. They reported that children of mothers with secondary or higher education were 2.3 times more likely to be fully vaccinated compared to children of uneducated mothers. Interestingly, their analysis found no significant difference in the odds of vaccination between rural and urban areas, indicating that education's effect is consistent across different settings.

Although many studies assert a positive relationship between maternal education and child immunization, the underlying pathways remain underexplored. For instance, Streatfield et al. observed in two Indonesian villages that knowledge of the functions of specific vaccines—such as the anti-polio vaccine—was higher among mothers with primary education or more. However, a nonlinear relationship between maternal education and immunization coverage was identified. While children of mothers with secondary education had the highest immunization coverage, those of mothers with primary education had lower coverage than both illiterate mothers and those with higher education levels.

Research from Kenya by Abuya et al. and Onsomu et al. aligns with these findings. Using data from the Kenya Demographic Health Survey (KDHS), they found that children born to mothers with primary education were more than twice as likely to be fully immunized compared to children of mothers with no formal education. Their analysis also underscored the role of broader socioeconomic factors, such as access to healthcare and community resources, in enhancing immunization coverage.

Kim et al. investigated the effects of maternal and provider characteristics on age-appropriate immunization completion rates. They found that children of single mothers had significantly lower vaccination rates compared to those whose mothers were married or in stable relationships. This highlights the importance of maternal socio-demographic characteristics beyond education.

In Nigeria, Babalola examined the role of household characteristics and maternal ideation in child immunization uptake. The study concluded that maternal literacy and decision-making power were more critical than the number of years spent in formal education. Similarly, Balogun et al. identified maternal literacy and household socioeconomic status as key mediators in the relationship between maternal education and child immunization. Their findings suggest that the ability to read and write, coupled with financial stability, substantially explains the positive impact of maternal education on immunization uptake.

Studies in South Asia also reflect a positive association between maternal education and immunization. Khan et al. examined polio vaccination coverage in Pakistan and reported that children of mothers with higher education were significantly more likely to be fully vaccinated. The likelihood of incomplete or no vaccination was higher among children of uneducated and unempowered mothers. In India, Patra found that maternal awareness and exposure to mass media significantly influenced immunization rates. Mothers with higher education levels were three times more likely to immunize their children compared to illiterate mothers.

Phukan et al. focused on the North-Eastern region of India, where immunization coverage is notably poor. Their study revealed that urban residency and maternal education significantly influenced immunization rates, with lack of information being a major barrier. Similarly, Sharma highlighted that children of mothers with secondary or higher education in Uttar Pradesh and Uttarakhand were more likely to be fully vaccinated. However, vaccination rates decreased with higher birth orders and among rural and Muslim households.

Finally, comparative studies between India and Pakistan confirm the consistent positive relationship between maternal education and child immunization. Women-headed households in urban areas demonstrated higher immunization coverage, indicating the role of maternal empowerment in improving child health outcomes.

In conclusion, the evidence overwhelmingly supports a positive relationship between maternal education and child immunization coverage. However, the strength of this relationship varies across regions and is mediated by factors such as literacy, socioeconomic status, and access to healthcare. Addressing barriers to female literacy and fostering awareness of immunization among women are critical for achieving full immunization coverage.

Data Source and Methodology

Data Source: The study uses data from the Fifth (2019-21) round of the National Family Health Survey (NFHS). NFHS is a nationally representative survey providing information on various health and demographic indicators. The NFHS-5 dataset is particularly useful for this analysis as it includes detailed information on child immunization coverage and maternal education levels. The total sample size for this study consists of approximately **43,181 observations**.

Variables:

- **Dependent Variable:** Full immunization among children aged 12-23 months, defined as receiving all recommended vaccines:
 - One dose of Bacille Calmette-Guérin (BCG) vaccine.
 - Three doses of DPT (Diphtheria, Pertussis, and Tetanus) vaccine.
 - Three doses of Polio (OPV) vaccine.
 - One dose of the measles-containing vaccine (MCV).

The variable is coded as a **binary outcome** (1 = fully immunized, 0 = not fully immunized).

- **Main Predictor Variable:** Maternal education level categorized into no education, primary, secondary, and higher education.
- **Control Variables:**
 - Mother's age
 - Sex of the child
 - Birth order
 - Health card status
 - Place of residence (urban/rural)
 - Religion
 - Caste
 - Wealth status
 - Mass media exposure
 - Place of birth

Methodology: To assess the relationship between maternal education and child immunization, a binary logistic regression model is employed. The regression equation is specified as follows:

$$\text{Complete Immunization} = \beta_0 + \beta_1 \text{Mother education} + \beta_2 \text{Mother Age} + \beta_3 \text{sex of child} + \beta_4 \text{Birth order} + \beta_5 \text{Health card status} + \beta_6 \text{Residence} + \beta_7 \text{Religion} + \beta_8 \text{Caste} + \beta_9 \text{Wealth} + \beta_{10} \text{Mass Media} + \beta_{11} \text{Place of birth} + u_i$$

where:

- Complete Immunization represents whether the child has received all required vaccines (binary outcome: 1 = fully immunized, 0 = not fully immunized).
- Mother Education represents the level of school education.
- Control Variables include mother's age, sex of the child, birth order, health card status, place of residence, religion, caste, wealth status, mass media exposure, and place of birth.
- u_i is the error term.

The analysis includes four model specifications with different sets of control variables:

1. **Model 1:** Baseline regression including only maternal education.
2. **Model 2:** Adds mother and child-specific controls (mother age at birth, sex, birth order, health card status).
3. **Model 3:** Further includes household and socio-economic factors (wealth, caste, religion, residence).
4. **Model 4:** Incorporates additional healthcare access variables (place of delivery, mass media exposure).

By estimating these models sequentially, we aim to understand the robustness of maternal education's effect on child immunization while accounting for various confounders.

4. Descriptive Statistics

This section presents the summary statistics of key variables, analyzing the distribution of child immunization rates across various socio-economic and demographic factors. The data provide valuable insights into patterns of immunization coverage, highlighting disparities based on maternal education, wealth, place of birth, religion, and mass media exposure. The summary statistics, supported by visual representations, offer a comprehensive understanding of the factors influencing full immunization rates among children in India.

4.1 Summary of Key Variables

Table 1 provides an overview of the dataset, which consists of **43,181 children aged 12–23 months**. The analysis reveals that **76.63% of children are fully immunized**, whereas **23.37% remain partially or completely unvaccinated**. The dataset includes variables related to maternal education, household wealth, caste, religion, and healthcare access, all of which have potential implications for immunization coverage.

A closer examination of the data suggests significant disparities in immunization rates based on maternal education. Children of mothers with no formal education exhibit the lowest immunization rates, whereas those whose mothers have attained secondary or higher education demonstrate significantly higher vaccination coverage. The association between socio-economic status and immunization rates is also evident, with wealthier households exhibiting higher immunization rates than poorer households.

The data further indicate that institutional births contribute positively to immunization coverage, while children born at home are more likely to be under-immunized. Additionally, religious differences in immunization rates are observed, with lower coverage among Muslim and Christian children compared to Hindu children. Finally, exposure to mass media appears to play a critical role in determining immunization status, as mothers with greater access to television, radio, or newspapers tend to have children with higher vaccination rates.

The influence of economic status on immunization rates is also quite evident from the data. Children from poorest households exhibit the lowest full immunization rate (70.33%), while those from the richest households have the highest coverage at 81%. The data reveal a clear gradient, with immunization rates improving progressively as household wealth increases.

These patterns are further explored in the following subsections, where key relationships are illustrated through visual representations.

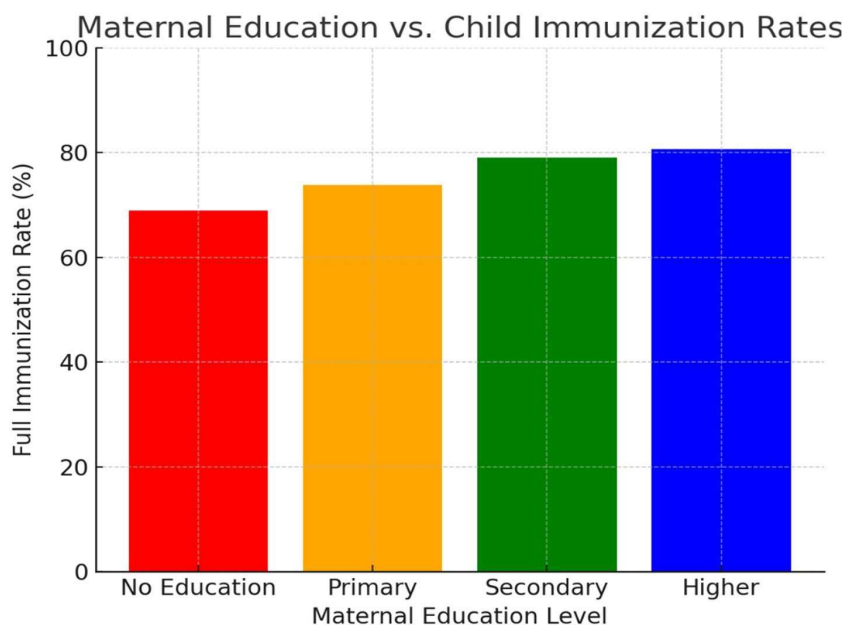
Variable	Obs	Mean	
Full Immunization	43,181	0.76(0.42)	
Mother age at birth	43,181	25.39(4.80)	
Proportions			
		Fully Immunized	Not Immunized
Mother Education	43,181		
No education	8,436	68.93	31.07
Primary Education	5,152	73.78	26.22
Secondary Education	23,046	78.97	21.03
Higher Education	6,547	80.59	19.41
Sex of the Child	43,181		
Male	22,421	77.12	22.88
Female	15,799	76.10	23.90
Birth Order	43,181		
1-2	31,202	78.51	21.49
3-4	9,564	73.38	26.62
5 and more	2,415	65.22	34.78
Residence	43,181		
Rural	34,346	76.68	23.32
Urban	8,835	76.46	23.54
religion	43,181		
Hindu	32,021	78.58	21.42
Muslim	6076	71.18	28.82
Christian	3324	67.90	32.10
Others	1760	76.48	23.52
caste	41,239		
Schedule Caste	8897	77.34	22.66
Schedule Tribe	8517	73.89	26.11
OBC	16597	77.79	22.21
Others	7228	77.61	22.39
Wealth Status	43,181		
Poorest	11,320	70.33	29.67
Poor	10,021	75.57	24.43
Middle	8,464	79.78	20.22
Rich	7,398	80.91	19.09
Richest	5,978	81.03	19.40
Place of birth	43,181		
public facility	28,453	78.92	21.08
private facility	9,719	77.56	22.44
no facility	5,009	61.85	38.85
Mass media	43,181		
0	12,491	69.64	30.36
1	30,690	79.48	20.52

Table 1. Summary Statistics

4.2 Maternal Education and Child Immunization Rates

The relationship between maternal education and full immunization coverage is evident in the data, as shown in Figure 3. The immunization rate is lowest among children whose mothers have no formal education, at approximately 69%. This rate increases to 74% for mothers with primary education, 79% for those with secondary education, and 81% for children whose mothers have attained higher education. This upward trend highlights the critical role of maternal education in determining healthcare decisions.

Educated mothers are more likely to have access to health information, understand the importance of vaccinations, and navigate the healthcare system effectively. They are also more likely to ensure that their children receive timely immunizations, benefiting from government programs and healthcare services. These findings suggest that improving female education could have significant spillover effects in enhancing child immunization rates, reinforcing the need for policies that promote schooling and literacy among women.



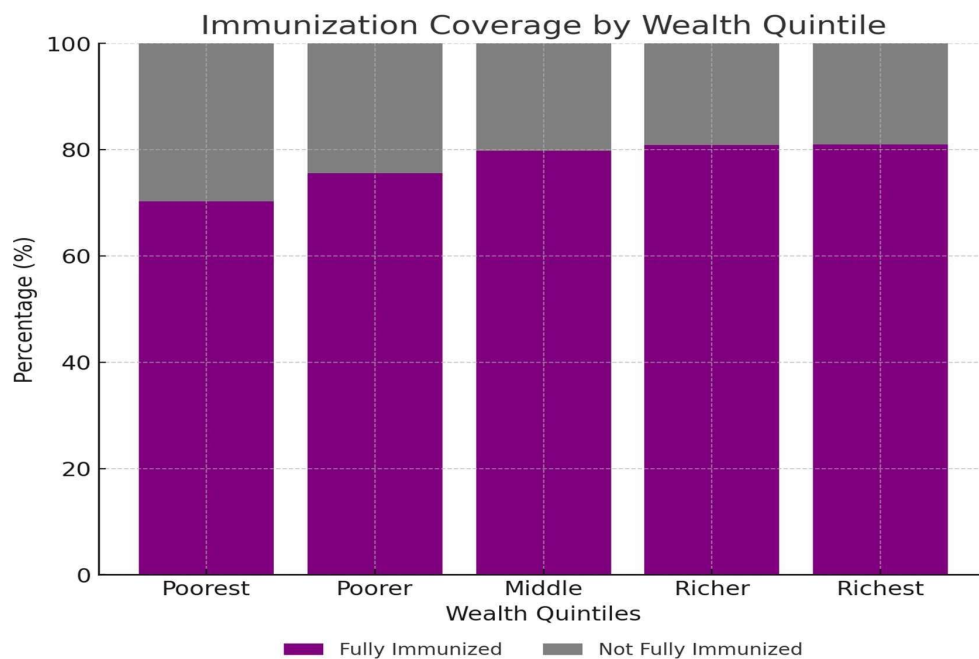
(Figure 3: Maternal Education vs. Full Immunization)

4.3 Wealth and Child Immunization

The influence of economic status on immunization rates is evident in Figure 4, which illustrates child immunization rates across wealth quintiles. Children from poorest households exhibit the lowest full immunization rate (70.33%), while those from the richest households have the highest coverage at 81%. The data reveal a clear gradient, with immunization rates improving progressively as household wealth increases.

One possible explanation for this trend is greater access to healthcare services among wealthier families. Higher-income households are more likely to afford transportation to healthcare

facilities, private medical care, and supplementary healthcare resources. In contrast, lower-income families may face financial barriers, such as the inability to take time off work for clinic visits or lack of transportation to immunization centres. These findings underscore the need for financial support mechanisms and outreach programs to ensure equitable immunization access for lower-income groups.

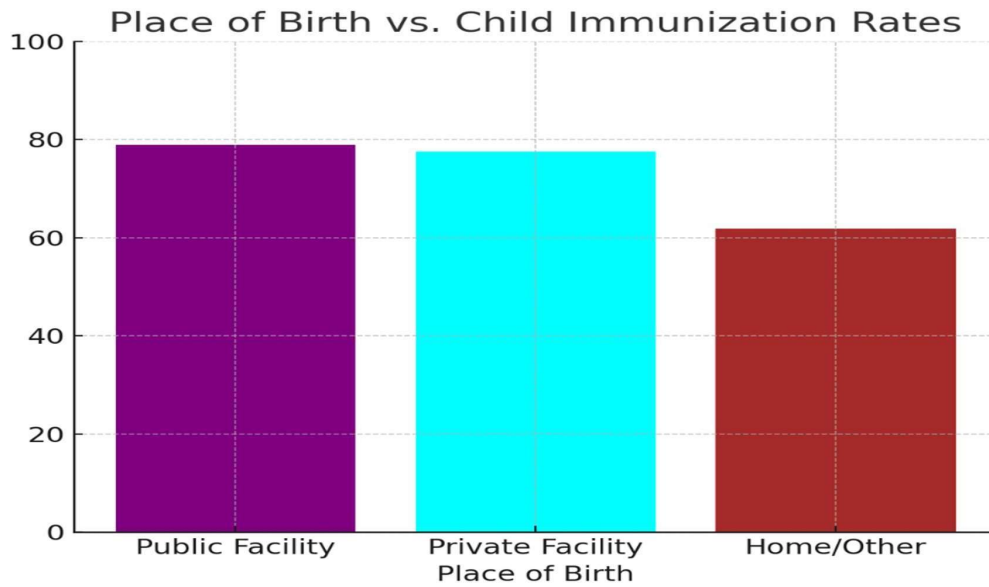


(Figure 4: Wealth Quintile vs. Full Immunization)

4.4 Place of Birth and Child Immunization Rates

The place of birth significantly influences a child's likelihood of receiving full immunization, as shown in Figure 5. The data indicate that children born in institutional settings, such as public or private healthcare facilities, have considerably higher immunization rates than those born at home. Specifically, 79% of children born in public facilities and 78% of those born in private healthcare institutions are fully immunized, whereas only 62% of children born at home receive full immunization.

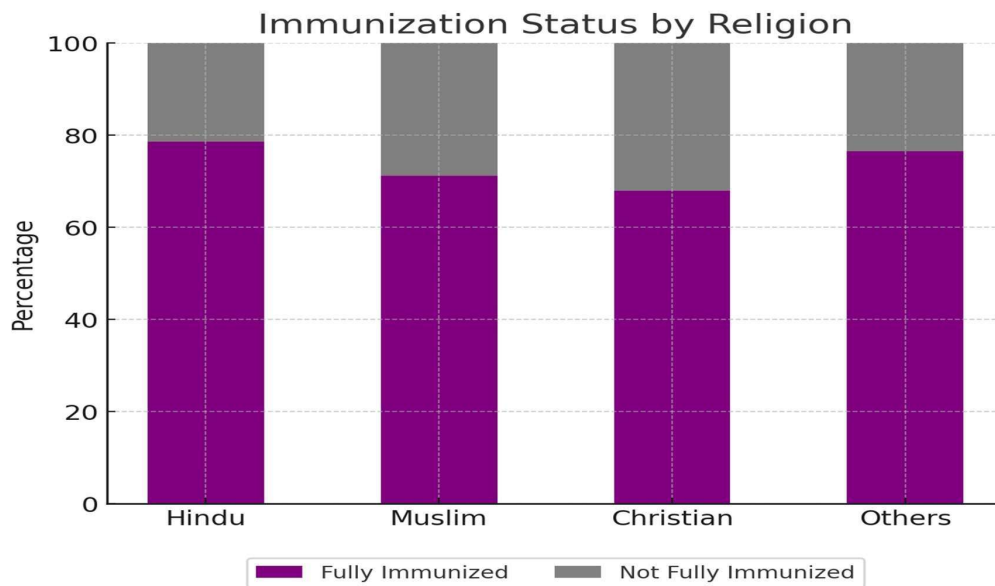
This disparity is likely due to differences in immediate postnatal healthcare access. Children born in hospitals are more likely to receive vaccinations at birth and during follow-up visits, whereas home births may lack structured postnatal care, resulting in missed vaccinations. These findings highlight the importance of promoting institutional deliveries and ensuring that even children born at home are integrated into immunization programs.



(Figure 5: Place of Birth vs. Full Immunization)

4.5 Religion and Child Immunization

Figure 6 presents the variation in immunization rates across religious groups. The data reveal that Hindu children have the highest immunization rate at 78.58%, followed by children belonging to 'Other' religious groups at 76.48%. In contrast, Muslim children have a lower immunization rate (71.18%), while Christian children exhibit the lowest full immunization coverage at 67.90%.

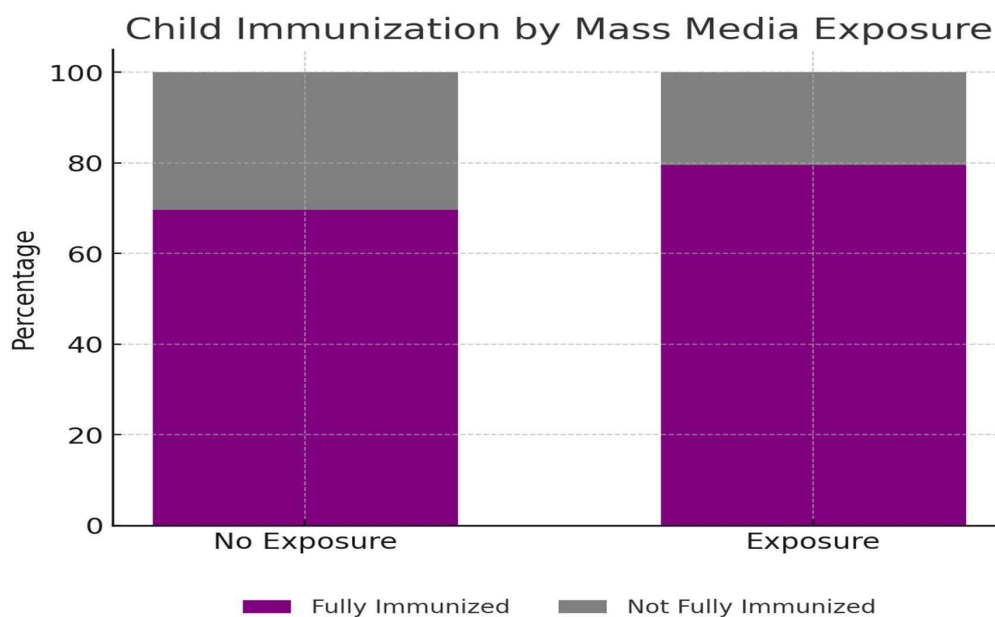


(Figure 6: Religion vs. Full Immunization)

These differences could be attributed to a combination of socio-economic, cultural, and healthcare accessibility factors. Lower immunization rates among certain religious groups may reflect varying levels of vaccine awareness, healthcare infrastructure, or trust in immunization programs. Policymakers must consider these disparities when designing immunization outreach programs, ensuring that all communities receive equitable access to vaccines and healthcare education.

4.6 Mass Media Exposure and Child Immunization

The impact of mass media exposure on immunization rates is displayed in Figure 7. The data indicate that children of mothers exposed to mass media (TV, radio, newspapers) have significantly higher immunization rates (79.48%), compared to children of mothers with no media exposure (69.64%). Furthermore, the proportion of not fully immunized children is notably higher among mothers with no media exposure (30.36%) compared to those with exposure (20.52%).



(Figure 7: Mass Media vs Full Immunization)

These findings suggest that mass media plays a critical role in raising awareness about immunization programs, reducing vaccine hesitancy, and encouraging adherence to vaccination schedules. Integrating immunization-related messaging into television and radio campaigns, particularly targeting low-literacy populations, could significantly improve vaccine uptake.

Results

This study examines the factors influencing child immunization likelihood using logit regression with marginal effects. The findings indicate a strong positive association between maternal education and child immunization.

In Table 2 - Specification 1, which includes only maternal education, children of mothers with primary, secondary, and higher education are significantly more likely to be fully immunized compared to children of mothers with no formal education. The magnitude of the coefficients declines as more controls are introduced in subsequent models (Specifications 2–4), but the effects remain statistically significant. For instance, in the final specification (Specification 4), children of mothers with primary education are 1.4 percentage points more likely to be fully immunized, those with secondary education 2.1 percentage points, and those with higher education 1.7 percentage points. The impact is more significant at secondary education level. These results reaffirm that higher maternal education does lead to increased immunization rates. Possible reasons include greater awareness, improved healthcare-seeking behaviour, and better access to immunization services.

Maternal age at birth is another significant factor, where each additional year of maternal age slightly increases the probability of full immunization. This suggests that older mothers may have more experience, better decision-making abilities, or greater access to healthcare services compared to younger mothers.

The sex of the child also plays a role in immunization likelihood, with female children slightly less likely to be fully immunized, as indicated by the negative coefficient. Although the magnitude of this effect is small, it is statistically significant in some specifications, suggesting a potential gender bias in healthcare-seeking behaviour, where parents may prioritize immunization for male children over females.

Birth order has a negative association with full immunization, with children of higher birth orders (three or more) being significantly less likely to receive complete immunization compared to firstborn children. The likelihood of immunization declines further for children of birth orders five and above. This could be due to resource constraints, lower parental attention, or diminishing adherence to immunization schedules in larger families.

Health card status has emerged as one of the significant determinants of immunization. Children whose health cards were seen as well as verified by healthcare providers exhibit the highest probability of full immunization, with a large positive coefficient (0.712 in Specification 4). Even children having health card, but not seen has a small but significant impact on immunization likelihood. This highlights the significance of record keeping and consistent follow-up throughout the immunization cycle, to enhance immunization uptake.

Place of residence also holds implications for immunization uptake, with children in rural areas slightly more likely to be fully immunized compared to those in urban areas. While this may seem bit surprising, it likely reflects the success of government-led immunization drives in rural areas under targeted outreach programs. Thus, more focus needs to be shifted towards urban areas, in policy formulation.

Religious affiliation has a statistically significant impact on immunization rates. Compared to Hindu children, Muslim and Christian children have a lower probability of full immunization, with the largest negative effect observed for Christian children. This finding aligns with descriptive statistics, suggesting possible disparities in healthcare access, cultural beliefs, or trust in immunization programs among different religious communities.

Caste-based differences seem to have no significant impact on immunization, with Scheduled Tribes (ST), Other Backward Classes (OBC), and other caste groups showing no statistically significant variation in immunization likelihood in the final specification. This suggests that caste may not be a primary determinant of immunization when controlling for other socio-economic and demographic factors.

Household wealth is one key determinant of child immunization. Results show that, as we move from poorer to richest household, the probability of child immunization increases significantly, aligning with the consistent upward trend, as seen in descriptive statistics. The effect size is largest for the richest households, reinforcing the idea that economic well-being facilitates better access to healthcare services, higher parental awareness, and improved adherence to vaccination schedules.

Mass media exposure is another strong determinant of full immunization, with children of mothers exposed to mass media being significantly more likely to be vaccinated. This finding highlights the role of mass communication in promoting vaccine awareness, countering misinformation, and encouraging healthcare-seeking behaviour. Expanding immunization campaigns through television, radio, and digital platforms could be an effective strategy to further increase vaccine coverage.

Finally, place of birth plays an important role in immunization rates. Children born in private healthcare facilities and those born at home are significantly less likely to be fully immunized compared to those born in public health facilities. This suggests that government healthcare institutions may be more effective in ensuring adherence to vaccination schedules, possibly due to structured postnatal care and immunization tracking mechanisms.

The overall model fit improves across specifications, with the pseudo R^2 increasing from 0.139 in Specification 1 to 0.264 in Specification 4, indicating a better explanatory power when additional controls are introduced. The log-likelihood values also show consistent improvement, confirming that the final specification is the most robust in explaining child immunization patterns.

The findings underscore the need for enhancing maternal education, strengthening health card utilization, reducing gender and birth-order disparities, and improving immunization access in lower-income and religiously diverse communities. Additionally, ensuring private hospitals integrate immunization services and expanding outreach for high-parity families are crucial policy recommendations to achieve equitable immunization coverage.

Variable	Speci.1	Speci.2	Speci.3	Speci.4
Mother Education				
Primary education	0.048*** (0.008)	0.017*** (0.006)	0.019*** (0.006)	0.014** (0.006)
Secondary education	0.100*** (0.006)	0.040*** (0.005)	0.030*** (0.005)	0.021*** (0.005)
Higher Education	0.116*** (0.007)	0.049*** (0.006)	0.025*** (0.007)	0.017 *** (0.007)
Mother age at birth		0.002*** (0.0004)	0.002*** (0.0004)	0.002*** (0.0004)
Sex of Child				
Female		-0.007** (0.003)	-0.006* (0.003)	-0.006* (0.003)
Birth Order				
3-4		-0.024*** (0.005)	-0.020*** (0.005)	-0.018*** (0.005)
5 and more		-0.059*** (0.006)	-0.041*** (0.009)	-0.033*** (0.009)
Health card status				
Has and was seen		0.725*** (0.008)	0.719*** (0.008)	0.712*** (0.009)
Has and wasn't seen		0.033*** (0.009)	0.031*** (0.010)	0.028*** (0.010)
Residence				
Rural			0.030*** (0.005)	0.031*** (0.005)
Religion				
Muslim			-0.028*** (0.006)	-0.024*** (0.005)
Christian			-0.059*** (0.008)	-0.051*** (0.008)
Others			-0.028*** (0.009)	-0.026*** (0.009)
Caste				
ST			-0.003 (0.006)	-0.003 (0.005)
OBC			0.003 (0.005)	0.001 (0.004)
Others			0.001 (0.006)	0.003 (0.006)
Wealth Index				
Poorer			0.019*** (0.005)	0.009* (0.005)
Middle			0.043*** (0.006)	0.030*** (0.006)
Richer			0.047*** (0.006)	0.034*** (0.007)
Richest			0.050*** (0.007)	0.039*** (0.008)
Mass Media				0.026*** (0.004)
Place of Birth				
Private				-0.019*** (0.005)
No Facility				-0.040*** (0.006)
Log Likelihood	-20268.28	-17502.35	-16468.78	-16416.61
Pseudo R^2	0.139	0.254	0.262	0.264

Table 2: Regression results

Conclusion

The regression results confirm that maternal education, economic status, health card possession, institutional birth settings, and mass media exposure significantly influence child immunization rates in India. The findings highlight the critical role of female education in improving health outcomes, suggesting that increasing educational attainment among women could lead to higher immunization coverage and better child health indicators. Additionally, the study identifies economic disparities and healthcare access as key determinants, emphasizing the need for financial assistance programs, community health initiatives, and targeted outreach efforts to improve vaccine coverage among disadvantaged groups.

The presence of religious disparities in immunization coverage underscores the necessity of culturally sensitive healthcare policies and interventions to bridge gaps in vaccine access and acceptance. The positive impact of mass media exposure suggests that leveraging television, radio, and digital platforms could be an effective strategy for promoting immunization awareness and countering vaccine hesitancy.

Overall, these findings have significant policy implications, emphasizing the need for integrated strategies that combine educational reforms, healthcare accessibility improvements, and targeted public health campaigns to achieve higher immunization coverage and reduce preventable childhood diseases.

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