

CHAPTER 8

Summary and conclusions

Introduction

Over the last three decades, immunization is the major focus of child survival programme and widely believed to be “the most cost-effective route to child’s better health” (WHO, 2004). However, immunization coverage remains very low in many developing countries including India, which is a matter of considerable concern to governments. The fourth Millennium Development Goal (UN, 2007) emphasises hundred per cent full immunization coverage among children aged 12-23 months. However, 23.5 million of the world’s children were not immunized with DPT3 and of these 8.7 million children were from India (UNICEF, 2008). According to UNICEF estimates, India has one of the lowest immunization rates in the world (UNICEF 2007), and this is because of large inter-provincial disparity (NFHS, 2007). If this inequality is conceptualized as a “measure of difference” in access or outcomes based on social or economic exposures such as wealth, education level and location of residence, then it could be termed as social determinants, which are the best predictors of health service access and health outcomes for populations. Recent systematic reviews addressing the reasons for under- or non-vaccination of children from low- and middle-income countries (Rainey *et al.*, 2011) and in India (Mathew, 2012; Nayar, 2007) also suggest that social determinants may have a substantial impact on childhood vaccination.

Previous research studies have identified numerous socio-economic and demographic factors at individual level as being associated with uptake of childhood immunization. For example, systemic barriers viz., vaccine supply, distribution, costs, and provider skills (Casey, Thiede and Klingner, 2001); individual-level factors (poor understanding of immunization, suspicions, myths, and rumours); low maternal education (Luman *et al.*, 2003; Chhabra *et al.*, 2007); maternal employment and working outside the home; younger maternal age (Luman *et al.*, 2003); delivering away from a health facility and not possessing an immunization card (Suarez *et al.*, 2007) that determine immunization uptake. Social group affiliation in India is considered broadly a proxy for

socio-economic status (Nayar, 2007). SCs and STs and in some cases the OBCs are considered as socially disadvantaged groups which have a higher probability of living under adverse conditions (Nayar, 2007) and coverage of immunization among their children is observed to be low (IIPS, 1995; IIPS & ORC Macro 2002; IIPS & ORC Macro 2007). According to the NFHS-3 2007, coverage of immunization at national level is significantly low among SC and ST children (42 and 33 per cent respectively) as compared with children belongs to OC (54 per cent).

Some researchers argue that the health and health behaviour are influenced by intermediary health determinants such as education, occupation and other dimensions of socio-economic position (Galobardes *et al.*, 2006; Krieger *et al.*, 1997) rather than social group disparities (Dressler *et al.*, 2005). However, there is a necessity to recognize the contingency of the relations between social group affiliation and particular health outcomes (Smith, 2000) by controlling inequalities between social groups (Voko *et al.*, 2009). If significant social group differences in child immunization remain even after controlling socio-economic characteristics, then it can be concluded that socio-economic position partially mediates the association between social affiliation and immunization uptake, and additional factors related to caste/tribe can then be hypothesised as partial determinants. This calls for an assessment of the effect of caste/tribe on intake of child immunization after controlling for the other socioeconomic and demographic factors. Understanding the effect of social determinants on routine immunization is important for the development of modalities to address them with the purpose of optimizing vaccination coverage, particularly among weaker sections of the society. With this background, this study attempts to examine the role of social determinants particularly social group affiliation on the coverage of child immunization using the data from NFHS-3 in the three EAG states of Odisha, Rajasthan and Madhya Pradesh where the level of vaccination is low and child mortality (4q_1) is highest among 28 states of India.

Objectives

The principle objective of the study is to understand the role of social determinants, particularly social group affiliation on child vaccination laying emphasis on SC and ST in the three EAG states. The specific objectives are as follows:

- To examine the differentials in coverage of different vaccines and patterns of partial vaccination (drop-out, left-out and missed-out) across social groups;
- To understand the effect of social determinants on child immunization, particularly the role of caste/tribe sequentially controlling for other risk factors;
- To understand whether social group affiliation and programme factors interact with each other in predicting child immunization; and,
- To understand the effects of coverage of full immunization and social determinants, particularly the role of caste/tribe on Vitamin A supplementation coverage, sequentially controlling for other risk factors.

Conceptual framework

This study has been conceptualized on the basis of two major conceptual models - health belief model (Rosenstok, 1990) and Tanahashi model for health services coverage (Tanahashi, 1978) to address the differentials in the coverage of child immunization between different social groups in the three states using the data from NFHS-3. Both the models primarily contain three aspects of health services coverage –(a) modifying factors,(b) individual perception and (c) cues to action (related to coverage, availability, accessibility, acceptability and contact). The perception of threat is conceived as two components, perceived severity and susceptibility to an adverse outcome; modifiers are demographic, social or psychological in nature that is likely to influence the health outcome resulting from some action; and cues to action is a facilitative mechanisms and contexts for introducing a protective behaviour. On the other hand, the Tanahashi health service coverage model expresses the extent of interaction between the health service and the people for whom it is intended.

In this study, social group affiliation is the primary variable of interest in the analysis. Based on the availability of data in the NFHS-3, following variables were considered as modifiers, viz., place of residence, household structure, households standard of living (index), father's education, mother's education, mother's work status, mother's age at the time of child birth, birth order and sex of the child (socio-economic and demographic characteristics at household, parental and child levels). Information on availability and quality of services in the NFHS-3 data is limited. Therefore, this study focused solely on three 'demand side' cues to action variables (programme exposure

factors such as exposure to electronic media, place of delivery and mother's access to health facility).

Hypotheses

This study has examined the relationship between social group affiliation (caste/tribe) and child immunization in the context of two hypotheses, '*characteristics hypothesis*' and '*interaction hypothesis*' in Rajasthan, Odisha and Madhya Pradesh using the data from NFHS-3. The '*characteristics hypothesis*' states that social group affiliation by itself has little or no independent influence on child immunization, rather it is the difference in the socio-economic and demographic composition of social groups that largely accounts for observed differences in child immunization. Thus, the characteristics hypothesis discusses whether the differentials in the child immunization coverage among SC, ST, OBC, and OC are attributable to socio-economic factors. Interaction hypothesis, on the other hand suggests that interaction between social groups and cues to action variables (programme factors such as exposure to electronic media, place of delivery and access to health facility) could affect child immunization coverage.

Methodology

This study has utilized the data from the NFHS-3, a large-scale survey conducted in 2005-06 and confined to Madhya Pradesh, Odisha and Rajasthan. The NFHS-3 collected information from a representative sample of 6427, 4540 and 3892 women aged 15-49 years respectively in these states. It obtained information on population, health and nutrition. Information was also collected on children who were born during the preceding five years. To address the objectives, study focused on the living children aged 12 to 59 months. Out of a total of 5,887 children who were born during this period in the three states, valid data on immunization were available for 5,405 children (1,519 children in Rajasthan, 1,366 in Odisha and 2,520 in Madhya Pradesh).

Analysis of data

The conceptual framework calls for examining the role of social group affiliation (caste/tribe) after controlling the other socio-economic and demographic characteristics of mothers and children along with and programme factors on child immunization coverage in the three states. Coverage of specific (DPT3, and measles) vaccination, immunization

status and VAS are considered as dependent variables in the analysis. According to the WHO guidelines, children are considered fully immunized if they receive one BCG vaccine injection to protect against tuberculosis three doses each of diphtheria, pertussis, and tetanus (DPT), polio and one dose of measles vaccine. Thus, immunization status was categorised into (a) fully immunized, if a child at any time before his/her first birth day received all the eight doses, (b) partially immunized, if a child who missed at least one dose out of the eight vaccines and (c) unvaccinated/not immunized, if a child who did not receive any dose of the eight vaccines. VAS is categorised into two whether a child received VAS or not.

The NFHS-3 data provide information on caste/tribe and most of the women belonged to one of the four castes, namely, SC, ST, OBC, and those who are neither SC nor ST nor OBC and are designated as OC. From this information, different categories of social groups are considered for analysis. In addition to the caste/tribe, following other socio-economic characteristics (residence, household structure, household standard of living, father's education, mother's education, mother's work status) and demographic characteristics (mother's age at the time of child's birth, birth order and sex of the child) were used as independent variables. Besides, socio-economic and demographic characteristics, three programme variables (such as exposure to electronic media, place of delivery and access of health facility to mother) were used as cues to action indicators.

Methods of analysis

First, gross differentials were analysed through bivariate analyses in source of vaccination data, coverage of specific vaccination and immunization status, drop-out rates during multiple doses of vaccines, missed-out only one dose of vaccination, coverage of DPT-3, measles, vaccination, immunization status, and coverage of vitamin A supplements across the four/three categories of social groups. Later, to examine the net effects of social group affiliation (caste/tribe) on the dependent variables (DPT3, measles vaccination, immunization status and VAS) controlling all other modifying and cues to action factors, multiple logistic regression analysis and multinomial logistic regression analysis carried out with four models (Model 1-4), in line with the HBM conceptual framework. Since most of the HBM based research has incorporated only selected components of the HBM, thereby not testing the model as a whole, in the study within the limitation of the HBM, analysis was carried out with separately with four models. Briefly, Model 1 assesses the

effect of caste/tribe only, Model-2 contains caste/tribe (Model 1) along with three programme variables (cues to action), Model-3 caste/tribe (Model 1) along with other modifying variables (socio-demographic variables), and Model 4 contains all the variables from the three previous models (Model 1 + Model 2 + Model 3). Finally, to examine whether the social group affiliation interacts with programme characteristics, multiple logistic regression analysis carried out separately for three interaction variables ('Caste/tribe and exposure to media', 'Caste/tribe and place of delivery' and 'caste/tribe and access to health facility') independent of other background factors on the full immunization with four models (Model 1-4). As the emphasis is primarily on the role of social group affiliation (caste/tribe), results are discussed in detail only on the net effect of caste/tribe on the dependent variables.

Summary of findings: Results from bivariate and multivariate analyses

The principal objective of the study is to understand how underlying socio-economic disadvantage among social groups may influence the uptake of child vaccinations in Madhya Pradesh, Odisha and Rajasthan using the NFHS-3 data. To have a bird eye view of the analysis performed, a comparative statement and a summary of results from both bivariate and multivariate analyses on the coverage of childhood immunization using the NFHS-3 data in the three select states is presented in a tabular form and summary of each chapter briefly discussed below.

Background characteristics of the study population studied

ST children comprised 15, 24 and 27 per cent in Rajasthan, Madhya Pradesh and Odisha, respectively. About one-fifth of the children in these states belonged to SC. More than two-fifths of them in Madhya Pradesh and Rajasthan, and 27 per cent of children in Odisha belong to OBC. Little more than one-quarter of children in Odisha and 16-18 per cent of them in Rajasthan and Madhya Pradesh, do not belong to SC, ST or OBC. Most children were from rural areas in the three states. About three-fifths of them were from the nuclear families. The proportion of children from nuclear families was large among SC (65-68 per cent) and ST (59-64 per cent) than OC children (50-52 per cent). More than half of the children in Odisha followed by 46 and 39 per cent of children in Madhya Pradesh and Rajasthan respectively were from low standard of living households. The proportion of illiterate mothers and mothers from low household living standard in the states were quite large among ST (79-85 and 58-79 per cent, respectively) than OC

children (24-41 and 24-33 per cent, respectively). Mothers were more than one-fourth in Odisha and more than two-fifths in Madhya Pradesh and Rajasthan were working, i.e., they participated in works other than their regular housework. Average age of the mother at the time of birth of index child was around 24 years and there were not much differentials in the age distribution in the states and also across the social groups. The proportion of mothers who were exposed to electronic media (watch television and listen radio programmes) in the states ranges from 70 per cent in Odisha to 55 and 46 per cent in Madhya Pradesh and Rajasthan respectively. Almost three out of every four births in Madhya Pradesh and Rajasthan took place at home, while 64 per cent of mothers in Odisha delivered at home. In Odisha and Madhya Pradesh, more than half of the OC children were born in institutions than 8-10 per cent of ST children. The proportions of mothers who were exposed to electronic media (TV and Radio sets), delivered at institutions and had access to health facility were less among children of STs and SCs than OCs. Thus, significant social group differences are observed across socio-economic and demographic characteristics (other modifying factors) and cues to action variables (access to programme exposure factors) in the three states and the differences are large between OCs-STs and OCs-SCs than OCs-OBCs.

Levels and social group differentials of childhood immunization coverage

The study has focused on the effect of social group affiliation on the coverage of child immunization in Rajasthan, Odisha and Madhya Pradesh. It has examined the levels and gross differentials in the coverage of specific vaccinations and immunization status, along with the reasons for partial coverage of immunization among children aged 12-59 months by source of immunization data and across social groups using the information collected from vaccination cards and mother's memory. The card was available for only 13 and 15 per cent of the children in Rajasthan and Madhya Pradesh and 40 per cent of the children in Odisha. The proportion of children card was much less among the STs as compared with OC children, particularly in Rajasthan and Madhya Pradesh.

Coverage of specific vaccinations

Coverage rate varied by the type of vaccine and the coverage rates for DPT3 and measles were much lower than for other vaccinations. Coverage of BCG and first dose of polio vaccinations were satisfactory in the states. Most of the children (82-93%) had received first dose of Polio vaccinations, which had gradually decreased thereafter. A large gap

between coverage of DPT and polio vaccinations were observed between the first and all the consecutive doses in the study states and the coverage rates are higher for Polio than DPT. An unusual feature was that measles coverage was notably higher than the DTP3 in the three states and polio 3 coverage rate in Odisha.

Among social groups, large differences in the coverage of specific vaccinations observed between the SC, ST and OC children. However, the difference between SC and OBC groups were small in Madhya Pradesh and Rajasthan. On the other hand, no such uniformity was observed in the coverage of specific vaccinations in the state of Odisha. There a higher coverage of specific vaccinations observed among SC children compared with OC children and the coverage among SC children was marginally less than the OBC children. On the other hand, in Rajasthan coverage for each type of vaccination was less among all the social groups compared with the social groups in Odisha and Rajasthan. SC and ST children were disadvantaged groups and immunization coverage among them was lower than for children from OC groups.

Coverage of full immunization

Among the three states, the coverage of full immunization/vaccination was the highest in Odisha (46 per cent), followed by Madhya Pradesh (46 per cent) and the lowest in Rajasthan (27 per cent). Significant gross differentials observed between the social groups in the coverage of specific and full immunization in the states. The coverage was lowest among children of STs as compared with OC in the three states and the differences were much more pronounced in Rajasthan and Madhya Pradesh. For instance, in these two states large differences observed in the coverage of full immunization between OC-ST children (37 and 35 per cent respectively), followed by OC-SC children (13 and 18 respectively) and OC-OBC children (20 and 12 per cent respectively). In Odisha, corresponding differences between OC-ST children were 20 per cent and the differences between OC-SC and OC-OBC children were small (1 and 6.5 per cent respectively).

Table 8.1: Summary of findings on gross and net effects of caste/tribes on child immunization among children aged 12-59 months, Rajasthan, Odisha and Madhya Pradesh

Outcome variables	State	Gross differentials (in comparison to 'Other' caste [OC])	
A). Full immunization Coverage (%Total)	Rajasthan	Less among SC, ST and OBC by 13.4, 37.4 and 20.2%, respectively than OC (coverage among OCs = 44.8% & Total coverage = 26.9%)	
	Odisha	Less by 20.4% among STs, and the difference are small (1 and 6.5%) between OC and SC, OBC (OC = 50.1%; Total coverage = 46.3%)	
	Madhya Pradesh	Less among SC, ST and OBC by 17.8, 34.8 and 12.1%, respectively than OC. (coverage among OCs = 62.1%; Total coverage = 45.5%)	
B). Overall drop-out rates between:	Rajasthan	More among SC, ST and OBC by 12.6, 44.7 and 18.3%, respectively (Total drop-out rate = 42.3% and among OCs=26.4%)	
	Odisha	More among SC, ST and OBC by 10.0, 13.5 and 6%, respectively than OC (OC=11.6% and total =18.5%)	
	Madhya Pradesh	More among SC, ST and OBC by 9.4, 24 and 6.5%, respectively than OC (OC=19.1% and total =28.1%)	
<i>Polio-1 and Polio-3</i>	Rajasthan	Differences between OC-SC/ST/OBC are small (SC 2.2% less; more 4.1 and 2.6% among ST, OBC (OC=20.6%; Total =15.8%)	
	Odisha	More among SC and ST by 6% and 14.5%, respectively (OC=20.6%; Total = 24.9%)	
	Madhya Pradesh	More among SC and ST by 5.3% and 5.1%, respectively. (OC=5.8%; Total = 8.3%)	
<i>BCG-Measles</i>	Rajasthan	More for SC, ST and OBC by 9.2, 46.3 and 14.1%, respectively. (OC=17.2%; Total = 31.5%)	
	Odisha	SC and OBC less by 2.5%; More among ST by 9.3%, respectively (OC=14%; Total = 14.8%)	
	Madhya Pradesh	More among SC, ST and OBC by 15.1, 28.3 and 9.1%, respectively (OC=11.4%; Total = 24.0%)	
C). Missed-out one dose of vaccination(%)	Rajasthan	More among ST and OBC by 5 and 2.8%, respectively (OC=8.5%, Total = 10.9%)	
	Odisha	Less among SC and OBC by 4.6% and 2.7%, respectively (OC=19.2%, Total = 17.2%)	
	Madhya Pradesh	Less among SC and ST by 6.2 and 2.2%, respectively (OC=12.8%; Total = 11.9%)	
Outcome variables and categories	State	Gross and net effect caste/tribe on immunization (In comparison to 'Other' caste)	
D). Third dose of DPT (DPT-3) vaccination - Yes/No [Multiple logistic regression analysis]	Rajasthan	Gross differentials (OC-SC/ST/OBC)	Net effect & changes of caste/tribe between Models 1-4
	Odisha	Less among SC, ST, OBC by 12.5, 39.4 and 18.9% (Total = 34.2%; OC= 51.5%)	OR (odds ratio) increased for STs from 0.130 to 0.310 (Models 1-4); 0.455-0.611 for OBCs (M 1-2); OR=0.60 for SC (M-1)
	Madhya Pradesh	Less among STs by 23.2, SC and OBC are small (Total=63.5%; OC=69.7%)	OR increased for STs from 0.310 to 0.674 (M1-3)
E). Measles vaccination - Yes/No [Multiple logistic regression analysis]	Rajasthan	Less among SC, ST, OBC by 16.4, 37.5 and 13.1% (Total=52.4%; OC=69.8%)	OR increased for ST from 0.207 to 0.654 (Models 1-4); 0.497-0.696 for SC (M 1-2); OR=0.568 to 0.784 for OBC (M 1-2)
	Odisha	Less among SC, ST, OBC by 12.6, 39.5 and 15.7% (Total= 42.2%; OC = 58.1%)	OR increased for ST from 0.164 to 0.346 (Models 1-4); 0.531-0.694 for OBC (M 1-2); OR=0.602 for SC (M-1);
	Madhya Pradesh	Less among STs by 20.9% and more among SC, OBC by 5-6% (Total= 67.0%; OC=70.0%)	OR increased for ST from 0.408 to 0.659 (Models 1-3)
F). Coverage of Vitamin A Supplements - Yes/No [Multiple logistic regression analysis]	Rajasthan	Less among SC, ST, OBC by 16.0, 35.6, and 14.0% (Total =60.5%; OC=77.7%)	OR increased for ST from 0.208 to 0.554 (Models 1-4); 0.462-0.631 for SC; OR=0.503-0.670 for OBC (Models 1-2)
	Odisha	Less among non-immunized by 60.8%; and among SC, ST, OBC by 11.2%, 31.6 and 15.5% (Total=34.8%; Fully immunized = 79.2%; OC=49.1%)	OR increased for non-immunized (Reference= Fully immunized) from 0.059 to 0.079 (Models 1-4); for ST from 0.525-0.585 (M 2-3)
	Madhya Pradesh	Less among non-immunized 30.4%; and among SC, ST and OBC by 1.2, 14.7, 4.6% (Total = 70.6%; fully immunized= 86.9%; OC= 76.0%)	OR increased for non-immunized from 0.196 to 0.226 (M 1-4); for OBCs increased from 0.692-0.733 (M 2-3); for ST 0.643 (M-1)
		Less among non-immunized 57.0% and among SC, ST, OBC by 20.0, ST-31.7 and 11.5% (Total = 48.5%; immunized 79.5% & OC=64.5%)	ORs increased for non-immunized from 0.075 to 0.091 (Models 1-4); for SCs increased from 0.548 to 0.709 (M 1-4); for STs from 0.477 to 0.695(M 1-4); for OBCs 0.731 (M-1)

Table 8.1: Summary of findings on gross and net effects of caste/tribes on child immunization among children aged 12-59 months, Rajasthan, Odisha and Madhya Pradesh

Outcome variables	State	Gross differentials (In comparison to 'Other caste')	Net effect of caste/tribe & changes in Models 1-4 (Ref: Other caste)
G). Immunization status <i>Full immunization/ vaccination</i>	Rajasthan	Less among SC/ST and OBC by 23.6 & 20.2% (OC=44.8; 27%)	Reference category (Fully vaccinated/immunized) <i>(Multinomial logistic regression analysis)</i>
	Odisha	Less among SC/STs by 12.9%; More among OBCs by 5.9% (OC=50.7%; Total= 46.3)	
	Madhya Pradesh	Less among SC/ST & OBC by 27.3 & 12% (OC=62.7;T=45.5%)	
<i>No vaccination (No Vs. Full)</i>	Rajasthan	More among SC/ST and OBC by 6.5% & 3.6% (OC=5.9; 9.9%)	OR for No immunization decreased for SC/ST from 4.416 to 2.646 (M1-2); for OBCs 2.899-2.074 (Models 1-2)
	Odisha	More among SC/ST by 3.5%; OBC less by 7%; (OC=16.5;16.3)	OR decreased for OBC from 0.509 to 0.412 (M1-4);for SC/STs 1.625(M 1)
	Madhya Pradesh	More among SC/ST and OBC by 4.3 and 3% (OC=3.7; T=6.8%)	ORs = 3.858-1.731 (M1-2) for SC/ST and; 2.223 OBCs, respectively (M-1)
<i>Partial vaccination (Partial Vs. Full)</i>	Rajasthan	More among SC/ST and OBCs by 17% each (OC= 49.3; 63.2%)	OR decreased for SC/ST from 2.839 to 1.918; for OBC 2.439-1.843(M1-2)
	Odisha	More among SC/ST by 9.5% (OC=32.8; Total=37.5%)	OR decreased for SC/STs from 1.728-1.366 (M 1-2)
	Madhya Pradesh	More among SC/ST& OBC by 23 and 9.1% (OC=34.2)	OR decreased for SC/ST from 2.985 to1.813 (M 1-2); OBC 1.573 (M 1)
Interaction variables		Gross differentials	Net differences (in comparison to 'Non-SC/ST & High program')
H). Interaction effects of Caste/ tribe with program variables on full immunization <i>Caste/tribe and exposure to media (Multiple logistic regression analysis)</i>	Rajasthan	Less by about 31% each among SC/ST and non-SC/STs children whose mothers were not exposed to media; 15% among SC/STs exposed (exposed Non-SC/STs=45.9%)	ORs increased for children of unexposed mothers of SC/ST from 0.211 to 0.659 and from 0.198 to 0.501 for Non-SC/STs (Models 1-4); and among exposed SC/ST's from 0.536 to 0.615 (M 1-2)
	Odisha	Less by 28% and 8.6% among unexposed SC/ST and non-SC/STs; 11% among exposed SC/STs (coverage of full immunization among exposed non-SC/STs =55.6%)	ORs increased among SC/STs unexposed to media from 0.298 to 0.567 (Models 1-4) and Non-SC/STs OR = 0.710 (M 1); and among SC/ST children of mothers exposed to media from 0.638 to 0.727 (M 1-2)
	Madhya Pradesh	Less by 39% and 30.5% among SC/ST and non-SC/ST unexposed to media; 21% among exposed SC/STs (coverage among exposed Non-SC/STs=65.4%)	ORs increased among children of SC/ST mothers unexposed to media from 0.190 to 0.546; Non-SC/STs from 0.248 to 0.660; among children of SC/ST mothers exposed to media 0.423 to 0.722 (Models 1-4)
<i>Caste/tribe and place of delivery (POD) on coverage of full immunization</i>	Rajasthan	Less immunized by 34% each among SC/ST and non-SC/ST children born in Home; 23% less among SC/STs born in institutions (non-SC/STs born in institution=52.5%)	OR increased among children born at home from 0.211 to 0.605 for SC/ST and for Non-SC/STs from 0.210 to 0.486 (Models 1-4); and among SC/ST children born at institution from 0.378 to 0.462 (M 1-2)
	Odisha	Less by 23.3 and 7.8% among SC/ST and non-SC/ST children born in home; less by 4.4% among SC/STs born in institutions (% coverage non-SC/STs born in institution=57.5)	OR increased among SC/ST children born at home from 0.385 to 0.738 (Models 1-4); Non-SC/ST children born in institutions OR=0.74 (M1)
	Madhya Pradesh	Less by 42.3 and 30.3% among SC/ST and non-SC/ST born in home; 18.2% among SC/STs children born in institutions (% non-SC/STs born in institutions=18.2%)	OR increased among children born at home for SC/STs from 0.163 to 0.468; Non-SC/STs from 0.273 to 0.576; and among SC/ST children born in institutions from 0.446 to 0.628 (Models 1-4)
<i>Caste/tribe and access to health facility on coverage of full immunization</i>	Rajasthan	Coverage of full immunization less by 35.5%, 31.6%, and 13.6%, among SC/STs with low, medium, high access, respectively; Less by 29% each among Non-SC/STs with low and medium access (Non-SC/STs with high access = 48.9%)	OR increased from 0.162 to 0.433 and 0.218 to 0.524 for SC/STs with low and medium access; from 0.258 to 0.529 and 0.258 to 0.374 among non-SC/STs with low and medium access (Models 1-4); and for SC/STs with high access, OR =0.572 (M 1)
	Odisha	Less by 18.4%, 19.5 and 10.1% among SC/STs with low, medium and high access, respectively (Non-SC/ST with high access=54.5)	OR increased among SC/STs with low and medium access from 0.472 to 0.615 and 0.450 to 0.593, respectively (M 1-2); and for SC/STs with high access OR = 0.669 (M 1)
	Madhya Pradesh	Less by 31.1, 30.5 and 17.4% among SC/STs with low, medium and high access to health facility, respectively; Less by 19 and 11 % among Non-SC/STs with low and medium access	OR increased for SC/STs with low, medium and high access from 0.275 to 0.737, 0.283 to 0.698 &0.494 to 0.746, respectively(M1-4);among non-SC /STs with low and medium access from 0.45 to 0.729 & 0.64 to 0.787 (M1-2)

Drop-out rates during multiple doses of vaccinations

Coverage for specific vaccines (BCG, DPT, OPV) was much higher than the proportion of fully immunized children, suggesting a significant decline in coverage for each subsequent dose of DPT/OPV, and between the third dose of DPT/OPV and measles vaccination in the states. Therefore, the drop-out of vaccinations, while receiving multiple doses of vaccines, is a major reason for the lower coverage of immunization in Rajasthan, Odisha and Madhya Pradesh. In order to see the magnitude of drop out between vaccinations, drop-out rates were calculated as the difference in percentage coverage in between the consecutive vaccines divided by coverage of the first dose of vaccination.

Overall a significant proportion of children in Rajasthan (42 per cent), followed by Madhya Pradesh (28 per cent) and Odisha (19 per cent) had dropped out between the first and third doses of DPT vaccination. On the other hand, similar drop-out rates observed between the first and third doses of polio vaccination. The drop-out rates during polio vaccination was the highest in the state of Odisha (25 per cent), followed by Rajasthan (16 per cent) and in Madhya Pradesh (8.3 per cent). The children were largely missed measles vaccine. The overall drop-out rates between BCG and measles vaccination was the highest in the state of Rajasthan (32 per cent), followed by Madhya Pradesh (24 per cent) and Odisha (15 per cent). It means that a large number of children who had contact with service providers were missed subsequent services. This clearly shows that notwithstanding the availability and accessibility of vaccine, the children did not avail themselves of the service.

Large differences in social groups observed in the drop-out rates between first and third doses of DPT and polio. Among children who received the first dose of DPT or polio vaccine, SC/ST children were less likely to complete the full series than OC/OBC children in the states. Similarly, among children who received the BCG vaccine, SC/ST children were less likely to receive measles vaccine than OC/OBC children in the states. In Rajasthan, drop-out rates during DPT vaccinations (DPT1-DPT3) were observed to be more by 12.6, 44.7 and 18.3 per cent among SCs, STs and OBCs respectively than OC children. Similarly, in the state of Rajasthan, drop-out during BCG-measles vaccination was observed to be more for SCs, STs and OBCs by 9.2, 46.3 and 14.1 per cent respectively than OCs.

As like drop-out of multiple doses of vaccines, missing-out of any one dose of Polio or DPT or measles vaccine is another reason for lower coverage of immunization in the states. Significant proportion of children in the study states (17 per cent in Odisha and 11-12 per cent in Rajasthan and Madhya Pradesh respectively) failed to reach full immunization and partially immunization due to miss-out of only one vaccination. If these children had not missed the one dose of vaccination, the coverage rate of full immunization would have increased from 27 to 38 per cent in Rajasthan; 46 to 58 per cent in Madhya Pradesh, and 46 to 64 in Odisha. Across the social groups also, similar proportions of children who were eligible for vaccination but failed due to missing out of only one vaccination were observed in the states. If these children had not missed-out one dose of vaccination, then the coverage rate of full vaccination would have reached to satisfactory levels among the social groups in the states, particularly in Odisha and Madhya Pradesh. In Odisha and Madhya Pradesh it would have increased to 44.4 and 37.9 per cent for ST children respectively. The corresponding figures would have been 67.9 and 57.3 per cent for SC children respectively. For, OBC children, they would be 73.1 and 61.9 per cent respectively and finally for OC children 69.8 to 75.0 per cent respectively. In Odisha, the coverage of fully immunized children of STs, OBCs, SCs and OCs would have increased to 16.3, 35.8, 44.9 and 53.3 per cent respectively.

Social differentials and determinants of childhood immunization

An attempt was also made to examine the gross social group differentials and to assess the net effect of caste/tribe after controlling background characteristics and programme factors in the coverage of the third dose of DPT, Measles vaccination, immunization status and Vitamin A supplements to understand whether the differences in the DPT3, measles and full immunization coverage among social groups are due mainly to differences in other socio-economic and demographic characteristics and programme factors, or social group affiliation *per se* in the states.

Coverage of third dose of DTP vaccination

The proportion of children who received the third dose of DPT vaccination among the states was highest in Odisha (64 per cent), followed by Madhya Pradesh (52 per cent) and Rajasthan (34 per cent). By caste/tribe, significant differences observed in the coverage of DPT3 vaccination and the coverage is lowest among STs, followed by SCs and highest among OCs in all the three states. In Rajasthan and Madhya Pradesh, a large difference

(37 and 39 per cent respectively) was observed between OC-ST children compared with the differences between OC-OBC (12-13 per cent) and OC-SC children (12 and 16 per cent) in the coverage of DPT3 vaccination. However, the differences in the coverage of the third dose of DPT vaccination between SC and OBC, and OBC-ST children were not vary much in all the three states, and SC children have marginally higher coverage of DPT3 in Rajasthan. The difference between SCs, OBCs and OCs are small in Odisha. After controlling for other socio-economic, demographic and programme variables also, the differences persist across the social groups. As compared with the OC children, ST children were significantly less likely to receive third dose of DPT vaccination in all the three states; and SC and OBC in Rajasthan and Madhya Pradesh. As compared with OC children in the states, ST children had a lower likelihood of receiving the third dose of DPT3 vaccination in all the three states. Likewise, in Rajasthan and Madhya Pradesh, SC children and OBC children had a lower likelihood of receiving the third dose of DPT vaccination as compared with OC children. Moreover, the odds of uptake of third dose of DPT had increased for ST from 0.130 to 0.310 (Models 1-4); and from 0.455-0.611 for OBCs (Models 1-2) in Rajasthan. In Madhya Pradesh, the likelihood of receiving DPT3 vaccination increased for STs from 0.207 to 0.654 (Models 1-4); for SCs from 0.497-0.696 (Models 1-2) and for OBCs from 0.568 to 0.784 (Models 1-2). While in Odisha, the likelihood of receiving the third dose of DPT vaccination among SC and OBC children was not significant (Models 3-4).

Coverage of Measles vaccination

As such observed in the coverage of the third dose of DPT vaccination, similar results observed for separate analysis of uptake of measles vaccination among social groups. Lowest coverage of measles observed among the ST children in the three states, highest coverage among OC children in Rajasthan and Madhya Pradesh, and OBC children in Odisha. Between social groups significant differentials were observed and these differences were more pronounced in Rajasthan and Madhya Pradesh compared with Odisha. In Rajasthan and Madhya Pradesh, large differences in coverage of measles vaccination were observed between OCs-STs (36 and 39 per cent respectively) compared with OCs-SCs and OCs-OBCs (13 and 16 per cent respectively). In Odisha, the differences between OCs-STs (21 per cent) and between OCs-SCs and OCs-OBCs (5 and 6 per cent respectively) were small.

Results from the multivariate logistic regression analysis also show that the social group differentials persist even after controlling other modifying and cues to action variables and ST children in all the three states, SC and OBC children in Rajasthan and Madhya Pradesh were significantly least likely to receive measles vaccination compared with the OC children. Moreover, the likelihood of receiving measles vaccination increased among ST in Rajasthan (from 0.164 to 0.346 between Models 1 and 4), Madhya Pradesh (from 0.208 to 0.554 between Model 1 and 4) and Odisha (from 0.408 to 0.659 between Models 1 and 3). Similar results observed among OBC children in Rajasthan (from 0.531-0.694 between Models 1-2) and Madhya Pradesh (OR=0.503-0.670 between Models 1-2); and SC children in Madhya Pradesh (from 0.462-0.631 between Models 1-2) and Rajasthan (OR=0.602 in Model-1).

Coverage of VAS

The proportion of children who received Vitamin A supplements was highest (71 per cent) in the state of Odisha, followed by Madhya Pradesh (49 per cent) and Rajasthan (35 per cent). The bivariate results show that most of the children who received full immunization also received VAS in the three states. However, children who were not fully immunised were significantly less likely to receive VAS in the states. Of the children who were not fully immunized, only about one-fifth of children in the state of Rajasthan, and about one-fourths in Madhya Pradesh received VAS compared with about three-fifths in Odisha. By caste/tribe also, substantial differences are observed in the coverage of VAS and the coverage were lowest among ST and OC children had the highest coverage in the three states. The differences in the coverage of VAS between OC-SC and OC-OBC are small as compared with the difference in the coverage between OC-STs. In Rajasthan and Madhya Pradesh, a large difference (32 per cent each) is observed between OC-ST children compared with the differences between OC-SC children (11 and 20 per cent) and OC-OBC (16 and 12 per cent) in the coverage of VAS. The differences among SC, OBC and OC were small in Odisha.

Significant association is observed between full immunization intake and the likelihood of coverage of VAS even after sequentially adjusting for possible socio-economic and demographic confounders. Results from Multiple logistic regression analysis also shows that children who did not received full immunization were significantly less likely to receive VAS as compared with children who received full

immunization and the odds of receiving VAS increased among Models 1-4 in the states (from 0.059 to 0.079 in Rajasthan, from 0.196 to 0.226 (M 1-4) in Odisha and 0.075 to 0.091 in Madhya Pradesh). On the other hand, however, with the inclusion of demographic variables and mother's education, the effect of social group affiliation disappeared in Rajasthan and Odisha, clearly exhibiting the effects of mother's education on the coverage of VAS. Thus, the results clearly show that the coverage of VAS is highly dependent on the coverage of full immunization. Moreover, it is clear from the above analysis that none of the affiliation of a socio group is an important factor in determining the coverage of VAS. Among other socio-economic covariates included, mother's education and household standard of living were significant predictors (social determinants) of coverage of VAS in all the three states.

Immunization coverage status (no, partial and full)

Wide differences were observed in the coverage of immunization in the states and the overall coverage of full immunization was lowest (27 per cent) in Rajasthan, while about half (46 per cent) of the children each in Odisha and Madhya Pradesh each were fully immunized. On the other hand, large proportions of children (63, 48 and 37 per cent in Rajasthan, Madhya Pradesh and Odisha respectively) were partially immunized, while 7 and 10 per cent of children in Rajasthan and Madhya Pradesh respectively and 16 per cent of children in Odisha did not receive any vaccine. As observed in the coverage of specific (DPT3 and measles) vaccines, clear social group differences are observed in the coverage of immunization (full, partial and no) and SC/ST children were most disadvantaged compared with OC/OBC children in the states, particularly in Rajasthan and Madhya Pradesh. In these two states large differences observed between OC-SC/ST in the proportion of coverage of full immunization (24 and 27 per cent respectively) and partial immunization (23 and 17 per cent respectively) compared with the differences between OC-OBC in the coverage of full (20 and 12 per cent respectively) and partial immunization (9 and 17 per cent respectively). Similarly, little difference is observed in the proportion of children who were not vaccinated in Rajasthan and Madhya Pradesh between OC-SC/ST (4 and 7 per cent) and between OC-OBC children (1 and 3 per cent). The differences between OC-SC/ST were small in the coverage of full immunization (13 per cent), partial (10 per cent) and not immunized (4 per cent) in Odisha.

Results from the multinomial logistic regression analysis estimating the effect of social group affiliation on child being not immunized, and being partially immunized (relative to fully immunized) in the states also corroborate with the observations from the bivariate analysis. They show that the SC and ST children were significantly more likely at risk of being not immunized (relative risk ratios = 4.416, 3.858 and 1.525 in Rajasthan, Madhya Pradesh and Odisha respectively) and partially immunized (RRR=2.839, 2.985 and 1.728, respectively) than their counterparts OC children. Moreover, the RRR of being not immunized attenuated between model 1 and 2, among SC/ST children (RRRs from 4.416 to 2.646 and from 3.858 to 1.731 in Rajasthan and Madhya Pradesh respectively) and among OBC children (RRRs from 2.899 to 2.074 in Rajasthan). Between Models 1 and 2, the RRR of child being partially immunized attenuated remarkably in all the three states (RRRs from 2.839 to 1.938 in Rajasthan; from 2.985 to 1.813 in Madhya Pradesh and from 1.728 to 1.366 in Odisha). While in Odisha, the relative risk of child being not immunized is significantly lower among OBC children than among OC children, it increases in Models 2-4 (RRRs from 0.407 in model 2 to 0.448 and 0.412 in Models 3 and 4 respectively).

Interaction effects of social group affiliation with programme factors on immunization coverage

To assess the effect of interaction between principal modifying factor and cues to action factors, an interaction analyses has been carried out. This chapter examines whether the social group affiliation interacts with programme factors and influences the child immunization coverage. It is possible that at least a portion of differentials in the child fully immunized among social groups are attributable to differences in the program related characteristics. Therefore, the effect of interaction variables (viz., ‘Caste/tribe-exposure to media’, ‘Caste/tribe and place of delivery’ and ‘caste/tribe-access to health facility’) on child immunization was accessed.

Results from the bivariate analysis show a clear distinction between SCs/STs and non-SCs/STs when observed with programme variables across the states. Exposure to electronic media, institutional deliveries and access to health facility were lower among mothers of SC/ST groups compared with mothers of non-SC/ST groups. However, the caste/tribe interaction with programme variables on the coverage of full immunization shows a positive association with mother’s exposure to (electronic) media, institutional

delivery and higher access to health facility. Irrespective of caste/tribe affiliation, higher coverage of full immunization is observed among children of mothers who were exposed to electronic media, institutional delivery and having medium/higher access to health facility. However, the magnitude of differences was much lower for SC/ST children than non-SC/ST children. For example, in Rajasthan, the coverage of full immunization among SCs/STs with poor, medium and high access is less by 35.5%, 31.6%, and 13.6% points respectively as compared with non-SCs/STs with high access of health facility (49%). However, these differences are 'unadjusted' without controlling for other socio-economic and demographic characteristics and each of the other programme exposure variables and such association confounds the differentials observed in bivariate analyses. Therefore, to access and quantify the net effect of these three new variables on the full immunization, independent of other modifying factors (background characteristics), multivariate logistic regression analysis carried out with Models 1-4.

Social group affiliation and exposure to media interaction on full immunization

Results from the multiple logistic regression analysis shows that both SC/ST and non-SC/ST children whose mothers were not exposed to media (in the three states) and SC/ST children whose mothers were exposed to media (in the state of Rajasthan and Madhya Pradesh) were significantly less likely to be fully immunized, as compared with the non-SC/ST children whose mothers were exposed to media.

Moreover between Models 1 and 4, the likelihood of children to be fully immunized increased markedly among SC/ST children whose mothers were not exposed to media increased from 0.211 to 0.659 in Rajasthan, from 0.298 to 0.567 in Odisha and from 0.190 to 0.546 in Madhya Pradesh respectively. Similarly, the odds of receiving full immunization among non-SC/ST children whose mothers were not exposed to media increased in Models 1 and 4 from 0.198 to 0.501 in Rajasthan and from 0.248 to 0.660 in the state of Madhya Pradesh. On the other hand, the odds of receiving full immunization increased among SC/ST' children whose mothers were exposed to media in Rajasthan (from 0.536 to 0.615 between Models 1-2), Odisha (from 0.638 to 0.727 between Models 1-2) and Madhya Pradesh (from 0.423 to 0.722 between Models 1-4). These results show that the difference in full immunization between SC/ST and non-SC/ST children whose mothers were not exposed to media was less and the gap increased with the exposure. Thus, interaction effect between social group affiliation and exposure to media exists.

Social group affiliation and place of delivery interaction on full immunization

Significant interactions reveal that after controlling for modifying and cues to action factors, SC/ST children born at home were 26, 39 and 53 per cent less likely to be fully immunized as compared with non-SC/ST children born in health facility in Odisha, Rajasthan and Madhya Pradesh respectively. Similarly, non-SC/ST children born at home (51 and 42 per cent in Rajasthan and Madhya Pradesh respectively) and SC/ST children born in health facility (37 per cent in Madhya Pradesh) were also less likely to be fully immunized as compared with the non-SC/ST children born in health facility. Moreover in comparison with Model 1, the likelihood of fully immunization among SC/ST children born at home in Model 4 increased further markedly in the states (from 0.211 to 0.605 in Rajasthan, from 0.385 to 0.738 in Odisha, and from 0.163 to 0.468 in Madhya Pradesh) as compared with the reference category (non-SC/ST children born in health facilities). In addition, the odds of fully immunized among non-SC/ST children born at home also increases remarkably between Models 1 and 4 in Rajasthan and Madhya Pradesh (from 0.210 to 0.486, and from 0.273 to 0.576 respectively) and among SC/ST children born in health facilities in Madhya Pradesh (from 0.446 to 0.628 in Models 1-4). Thus, the results show the existence of (some) interaction effect between ‘social group affiliation and place of delivery’ on coverage of childhood full immunization. Furthermore, above findings clearly indicate that irrespective of social group affiliation, if the service delivery (health facility/institutional delivery) in the community increase, the probability of a child to be fully immunized will also be increases and differences between social groups (SCs/STs and non-SCs/STs) may be reduced or disappear with increase in service delivery.

Social group affiliation and level of access to health facility interaction on full immunization

As like ‘Caste/tribe and exposure to media’, and ‘Caste/tribe and place of delivery’ interaction effects, mother’s access to health facility (own health care) also shows a positive effect on the coverage of full immunization across social groups in the study states. Irrespective of caste/tribe affiliation, with an increase in access to health facility, the coverage of full immunization also increased. However, the tempo of increase in the coverage of full immunization was higher among non-SC/ST children than SC/ST children across the states. As compared to the non-SC/ST children whose mothers had higher access to health facility, SC/ST children whose mothers had low/medium/high access (in the three states) and non-SC/ST children whose mothers had low/medium

access (in Rajasthan and Madhya Pradesh) were significantly less likely to be fully immunized after controlling for modifying variables and two program factors.

Moreover in Models 1 and 4, the likelihood of children to be fully immunized increased further remarkably in the states. For instance, between Models 1 and 4, among SC/ST children whose mothers had low and medium access to health facility, the odds ratios increased from 0.162 to 0.433 and 0.218 to 0.524 respectively in Rajasthan; and from 0.275 to 0.737 and 0.283 to 0.698 respectively in Madhya Pradesh. Similarly, between Models 1 and 4, among non-SC/ST children of mothers who had low and medium access to health facility the odds ratios increased from 0.258 to 0.529 and 0.258 to 0.374 respectively in Rajasthan. Thus, the results show the existence of strong interaction effect between 'social group affiliation and different levels of access to health facility (index)' on the coverage of childhood full immunization.

Discussion and conclusion

From the aforesaid analysis, substantial differences are observed between the social groups and individual-level and household-level contexts in the coverage of DPT3, measles, VAS and full immunization. The coverage of each vaccine was significantly lower among SC, ST and OBC children compared with OC children in the states. Children with partial immunized or not immunized were also highest among SC/ST and OBC children compared with OC children in the three states. Differences in the coverage of specific vaccinations, VAS and full immunization between OC-ST were much more pronounced than OC-SC and OBC-OC, particularly in Rajasthan and Madhya Pradesh.

Gross differentials make it that affiliation of a particular social group is an important social determinant that has direct effect on the coverage of child immunization in the study states. The coverage of child immunization was lowest among children belonging to tribal community. Variation in the coverage of specific as well as aggregate level because of affiliation of a particular social group observed very high in the three states. It may be because social group differences in these states not only generally reflect differences in social identity, attitudes and health-seeking behaviour, but also show disparities in socio-economic position. Across the states OC have high economic power, which is a characteristic that increases their propensity to migrate from areas with poor economic opportunities into areas with higher economic opportunities more often

than most other social groups. Therefore, with an improvement in the socio-economic position of these households, the likelihood of child immunization coverage also increased. This finding of the study is very close to the 'characteristics hypothesis' that states social group affiliation by itself has little or no independent influence on child immunization, rather it is difference in the socio-economic and demographic composition of the group which largely accounts for observed differences in child immunization. This argument may be accepted because if the average access to full immunization in India is seen in the light of social groups, then it is significantly higher for children belong to OC (54 per cent) as compared with children of SCs, STs and OBCs (40, 31 and 41 per cent, respectively) during 2005-06. Coverage of full immunization has increased between NFHS-1 and NFHS-3 (1992-93 to 2005-06) among all the social groups. For instance, between NFHS-1 and 2, (1992-93 to 2005-06), full immunization increased from 26.8 per cent to 39.7 per cent among SC, from 24.8 per cent to 31.3 per cent among ST and among OC 38.2 to 53.8 per cent. Thus, the recorded increase for OCs is 16 per cent points, followed by SCs at 13 and STs at 7 per cent points.

Multivariate analysis also shows a significant association between social groups and the likelihood of children receiving specific vaccinations, VAS and full immunization. This association remained only slightly attenuated even after sequentially adjusting for possible individual, household level characteristics and programme related confounders. Thus, the caste/tribe has an important role in the coverage of specific (DPT3 and measles) vaccinations and full immunization independently or interacting with other factors. Moreover, simultaneously adjusting for both socio-economic and demographic characteristics of mothers and children along with program factors, the net effect of social groups decreased with the interaction of other socio-economic and background characteristics (with educational status of mother, households' standard living status, lower birth order of the child) and further changed with the intervention through good program factors (exposure to mass media, institutional delivery and accessibility of health facility). Clearly, all these programme factors working as catalyst towards full immunization. In the three states after inclusion of programme factors in the model, the effect of social group affiliation either got reduced or diluted markedly. In addition to social groups, results in the models show that there are a number of other major social determinants which include parents' education, households' standard of living, place of

delivery and mother's exposure to electronic media which were significantly associated with specific vaccinations and full immunization in the states. Thus, it is concluded that social group affiliation has a significant effect on coverage of specific vaccinations and full immunization in the three states, apart from their different socio-economic, demographic and ecological background.

Apart from the social group differentials, significant differentials are observed in the coverage of specific (DPT3, measles) vaccinations, full immunization by other modifying factors (socio-economic-demographic characteristics) and cues to action variables (programme factors) in the three study states. Significantly, coverage of the third dose of DPT, measles vaccination and coverage of full immunization increases steadily with the parents' education, standard of living, accessibility to health facility and mother's exposure to media. Similarly, coverage of the DPT-3, measles vaccination and full immunization was much higher among children living in urban areas, children living in joint families, children of non-working mothers (housewives) and children at lower birth orders, children who were born in medical institutions. On the other hand, there is not much difference between social groups (SCs/STs, OBCs and OCs) in the coverage rates of DPT3, measles and immunization status by selected demographic and socio-economic characteristics. This suggests that differences in the coverage of DPT3, measles and full immunization among social groups is due mainly to differences in other demographic and socio-economic characteristics rather than social group affiliation (SCs/STs, OBCs and OCs) *per se*.

Further, the role of gender and sex discrimination in immunization coverage has been a subject of much debate. There is ample evidence of female children being neglected by their families in comparison to the male children, when it comes to provide basic facilities which includes child immunization. In India also, the desire for having a boy is stronger which lead to gender discrimination in getting immunization. Studies in North and South India have found that boys are much more likely to take the health facility when they are sick in comparison with girls. However, in the present study, sex of the child does not show any significant effect on the likelihood of receiving specific vaccinations (DPT-3 and measles) and coverage of full immunization in the states after controlling for other covariates, clearly exhibiting strong evidence showing lack/vanishing gender differences in the study states on immunization coverage. These

findings are in line with the recent findings observed in the other studies (Borooah, 2004, Choi and Lee, 2006 among others). For instance, Borooah (2004) advocates that if mothers' education favours a fuller immunization of children, it does not affect the boy preference pattern that prevail in immunization practices. Thus, these findings suggest that the gender differences in immunisation have been virtually wiped out through a strong programme intervention strategy.

Finally, it is evident that social group affiliation has a strong effect on the coverage of child immunization. SC/ST children are significantly less likely to be fully immunized than the OC children in the three states. Results from the multivariate analysis show that the caste/tribe affiliation *per se* does not have independent effect on child immunization and it interacts with other socio-economic and demographic and programme factors. This supports the characteristics hypothesis that points that the observed social group differences in uptake of child immunization are largely due to the differences in demographic, social and economic composition of the social groups. Second, there is clear evidence of learning by doing among SC and ST mothers which is also associated with availability, accessibility, affordability and awareness about child vaccination across the social groups. Although the SC/ST children were significantly less likely to be fully immunized, mothers having higher exposure to mass media or institutional delivery or access to health facility were found to be more likely to immunize their children. There is clear evidence of the impact of good exposure to mass media, institutional delivery and higher accessibility of health facility on childhood immunization. These variables create favourable demand for immunization services, particularly among SC and STs.
