

CHAPTER 1

Introduction

Childhood immunization represents the gateway to provision of comprehensive health care, to which all children ought to be entitled. Immunization against childhood diseases is known to be one of the most important components of the efforts being made by the government to improve children's health and to reduce mortality, morbidity and permanent disability among children, especially in places where the general health status of children is poor. Moreover, paediatric immunization programmes have eradicated many the infectious diseases of childhood and have been one of the most remarkable public health accomplishments in the history of medicine (Edwards, 2000). Epidemiological investigations have indicated that outbreaks of vaccine-preventable diseases infect predominantly un-immunized or under-immunized children (Cochi, Preblud and Orenstein 1988; Gindler *et al.*, 1992). Not only that, it is also argued that deprived children suffer with impaired physical growth, cognitive development and socio-emotional development, thus the effects of high levels of deprivation among children are ultimately evident in their adult years (Lichter, 1997).

The planned immunization schedule not only makes children less susceptible to some of the most debilitating and fatal childhood diseases (Diphtheria, Tetanus, Pertussis [Whooping cough], Tuberculosis, Poliomyelitis and Measles), but it can also greatly reduce other health care costs (Eduard Bos and Amie Batson, 2000). Globally, it is estimated that immunization averted more than 2 million deaths in 2003 alone. It has been estimated that approximately 2.5 million children of less than five years of age die every year as a result of diseases that can be prevented by vaccination using currently available or new vaccines. It is one of the interventions that will help in achieving the Millennium Development Goal 4 (MDG - 4).

Concept of social determinants of health

Many inequalities in health care service utilization within and between low, middle and high income countries are the result of inequalities in social conditions in which people grow, live, and work and these social conditions are referred to as social determinants of health (Irwin *et al.*, 2006; McGinnis *et al.*, 2002; Marmot and Wilkinson, 1999; Show *et*

al., 1999). Social determinants of health include both social level influences on health (living and working conditions and the broader social structures in which they are embedded) as well as individual level risk factors, i.e., health behaviour (Graham, 2004). In March 2005, the World Health Organization (WHO) launched its own commission on the Social Determinants of Health (SDH) to investigate the underlying determinants of health inequalities in every country (Lee, 2005; Marmot, 2005; CSDH, 2008). It points to both specific features of and to the pathways by which social conditions affect health as well as how they can potentially be altered by informed action (Krieger, 2001; Marmot and Wilkinson, 1999). Therefore, health inequalities exist both in high and low income countries and the inequalities in health occur along several axes of social stratification including socio-economic, political and cultural axis. Though studies on health inequalities show poor health is not only restricted to people at the bottom of the socio-economic hierarchy, people who are at the bottom of the distribution of global and national wealth are also marginalized and excluded within the countries present an urgent moral and practical focus for action.

Multiple models describe how social determinants influence health outcomes. But all the models have emerged with some fairly consistent elements and pathways. The models which show social determinants of health broadly include both societal conditions and psycho-social factors such as opportunities for employment, access to health care, hopefulness and freedom from racism. These determinants can affect individual and community health directly through an independent influence or an interaction with other determinants, or indirectly through their influence on health-promoting behaviour, for example, determining whether a person has access to healthy food or a safe environment.

Policies and other interventions influence the availability and distribution of social determinants to different social groups, including those defined by socio-economic status, race/ethnicity/caste, sex, disability status, and geographic location. Principles of social justice influence these multiple interactions and the resulting health outcomes. Inequitable distributions of social determinants contribute to health disparities and health inequity, whereas equitable distribution of social determinants contributes to health equity. Appreciation of how societal conditions, health behaviour, and access to health care affect health outcomes can increase understanding about what is needed to move toward health equity.

Social determinants of child immunization

Immunization programmes around the world are often not fully utilized. Their successful implementation depends on multiple factors (Boerma *et al.*, 1990; Taylor, 2009). Although biological, epidemiological, economic and logistical factors related to vaccinations often attract most attention, social determinants can have a significant effect on immunization efforts around the world. A recent systematic review addressing the reasons for under- or non-vaccination of children from low and middle income countries suggested that social determinants may have a substantial impact on routine childhood vaccination (Rainey *et al.*, 2009). Social determinants may be similar in countries irrespective of their income levels, while others may be unique to specific populations Commission on Social Determinants of Health [CSDH], 2008). Therefore, understanding the effect of social determinants on routine immunization programmes is important for the development of modalities to address them with the purpose of optimizing vaccination coverage. These can, in turn, affect herd immunity and the introduction of new vaccines, because both of them are important for the reduction of childhood morbidity and mortality. For these reasons, it is of utmost importance to gain full understanding of the impact of social determinants and address them as a part of the overall task of overcoming barriers to immunization.

On the other hand, recognizing the magnitude of the effect of social determinants on immunization programme, it is essential for designing appropriate and effective interventions. The latter are particularly important for reducing inequalities in vaccination among different groups of people (Freedman and Nichols, 2012). Inequity in health has been conceptualized as a ‘measure of difference’ in access to it or outcomes based on social or economic exposures such as wealth, education level and location of residence. Many studies have indicated that these inequities are socially determined. Social exposures such as education, income level and rural residence are the best predictors of health service access and health outcomes for population. Among the Asian countries, evaluations from China (Cook and Drummer, 2003), India (Voral *et al.*, 2009), Indonesia (Heywood and Harahap, 2009; Kristiansen and Santoso, 2006), Cambodia (Grundy *et al.*, 2009), Vietnam (Fritzen, 2007) and Bangladesh (Karim *et al.*, 2006) emphasize persisting health inequities in access to health care and poorer health outcomes for the socially disadvantaged. Therefore, this study is focused on particularly social group affiliation (defined as caste/tribe) of households among all other social determinants of health. The

caste system in India is deeply rooted in Indian societal system. Two social groups are lowest in the Indian social hierarchy and they are Scheduled Castes (SCs) and Scheduled Tribes (STs), followed by castes which are categorized in other backward classes and the most advantaged castes which are referred as the upper castes or general category.

Caste system in India

Along with 'village communities' and 'joint families', caste has often been viewed as a defining feature of 'traditional social order' of India. Though it was only in the Hindu religious philosophy that the practice of caste was formally justified, social relations, as the popular sociological understanding of Indian society goes, were organized hierarchically almost everywhere in the subcontinent (Nehru, 1946; Jodhka, 1998). Christians, Muslims and Sikhs all practise caste system even though their religions decried it (Singh, 1977; Desai, 1976).

Stratification of the Indian population into sub-groups defined by caste, which is determined by birth, has been in existence for thousands of years. It is now considered as one of the major social hurdles in the development of the nation. The social distance among the caste groups varies from state to state but generally there is a well-established hierarchy of castes that can be considered into four broad headings, namely *brahmin*, *kshatriya*, *vaisya* and *sudra*, and such a stratification can be traced back to the Vedas. It appears that the major stratification in terms of castes (*varna*) was originally based on occupational division without a vertical social hierarchy. However, over the centuries the 'varna' system expanded and became rigid with many sub-castes (*jatis*) springing up within each major category.

Social reformers rose in revolt against the rigidities and injustices springing from the caste system. A particularly evil practice is that of treating many caste groups as 'untouchables' or social outcasts. During the past few centuries, many social reformers have agitated, written and canvassed against the evils of the caste system. One of the most recent crusaders of social reforms in the country was Mahatma Gandhi, who fought for the emancipation of the downtrodden castes as a part of the independence movement. Gandhi called the poorest and lowest among the caste hierarchy, who are considered untouchables by the rest, 'Harijans' or children of 'Hari' (God). With the attainment of independence in 1947, and his strong views prevailing within the Congress Party, the

Constitution of India in 1950, adopted special provisions for the upliftment of the weakest in the caste hierarchy. Articles 341 and 342 of the Constitution included a list of SCs and STs for whom special benefits were to be given to uplift them from their continued backwardness in society because of the caste structure. Those castes which were considered to be at the bottom end of the social order in the country were identified state by state for special benefits through reservations in educational institutions, employment, subsidized food and political representation in legislatures. The special privileges were intended to help the backward castes/tribes to join the mainstream of national development. The lists of SC & STs originally promulgated as a part of the Constitution, have been modified, amended and supplemented from time to time, and a more recent updated series has been published in the Scheduled Castes and Scheduled Tribes Orders (Amendment Act), 1976. The Mandal Commission, which went into the question of reservations, included many other castes which were not covered in the list of SC and STs, in of other backward classes (OBCs). It recommended special privileges to them in order to lift them from their socio-economic backwardness. The OBCs were identified by the Central Government in a common list and by each State in special State list.

Studied population – the scheduled castes and scheduled tribes

In India, there is a large diversity in terms of caste, religion and region. Existing literature on the subject suggests that Indian society suffers from inequalities based on caste and ethnicity (Desai and Kulkarni 2008). Untouchability is apparently a problem in a majority of the states of India, where the SC and ST population has been comparatively more vulnerable in the economic structure of the village. They are mostly landless and agricultural labourers. It is also observed that labour force participation rate for females is highest among scheduled tribes across the states (NSSO, 2012). In rural India, the worker-population ratio (WPR) according to usual status [principal + subsidiary] approach was 55.9% among males and 35.9% among females. The SCs in particular had been ostracized as ‘Untouchables’ for centuries. Most of them are rural inhabitants, illiterate, having low social mobility and backward social customs, unskilled, small sized landholders and/or landless agricultural labourers, and in the poorest stratum of the population. Majority of SC are engaged in agro-based industries. They lead miserable life, often falling far short of even minimum calorie needs in rural India. They have poor interaction and links with other sections especially upper castes of the society in various ways including demographic matters due to the prevalence of rigid caste system. Further,

their lower exposure to modern way of life and communication network, detains them in social customs and traditional cultural style. These conditions, in turn, determine their health status and health care behaviour.

Social scientists, especially sociologists and anthropologists, have studied extensively the social, cultural, political and economic life of the SCs and STs. But very few attempts have been made to study their behaviour on utilization of child health services. Since socio-economic and cultural characteristics of a society have considerable effect on utilization of these services, the health status of the SC/ST children is likely to be different from the non-SC/ST children. Inequality in health care is considered to have different dimensions, based on an individual's characteristics, place of residence, economic ability, caste and gender. If in a society, there is disparity in the extent and level of basic opportunities (such as immunization) among children belonging to different socio-economic groups, it is termed as inequality of opportunity (Barros *et al.*, 2009; Roemer 1998), deemed unacceptable and must be countered by policy interventions in terms of redistribution or other affirmative action's.

Concept of immunization

Immunity is the ability of the body to tolerate that is, indigenous to it and eliminates material that is, foreign. The immune system is comprised of organ and specialized cells that protect the body by identifying harmful substances, known as antigens and by destroying them by using antibodies and other specialized substances and cells. There are two basic things to acquire this protection-passive immunity and active immunity. Passive immunity results when antibodies are transferred from one person to another. The most common form of immunity occurs when the foetus receives antibodies from his or her mother across the placenta during pregnancy. Other sources of passive immunity include blood and blood products, immune or hyper-immune globulin and animal antitoxins. Passive immunity disappears over time, usually within weeks or months. Live micro-organisms or antigens bring about the most effective immune responses, but an antigen does not need to be alive for body to respond. Active immunity is provided by a person's own immune system. This type of immunity can come from exposure to diseases or from vaccination. Active immunity usually lasts for many years and often can be permanent.

The concept of increased immunity through vaccination was introduced into preventive health care on 14th May 1769 by Edward Jenner, a British physician (Jesty and Williams, 2011). He had performed an experiment that revolutionized public health in the world. During the research process he made two small cuts on the arm of an eight year old boy and inserted a material taken from a sore on a woman infected with cowpox, a mild disease common to daily workers. Six week later, Jenner injected the boy with fluid from a smallpox lesion and the boy did not contract small pox. With this experiment, Jenner discovered “Inoculation of a person with relatively harmless disease material could protect the person from a more dangerous disease”. He calls this process *Vaccination* derived from the Latin name of *cowpox vaccinia*.

Global situation of child immunization

The Expanded Programme on Immunization (EPI) was established by the World Health Assembly in 1974 at a time of great optimism for public health. The imminent certification for the eradication of smallpox was taken as a proof of the power of vaccines, delivered in well-managed programmes, to permanently improve health in the world (Okwo-Bele and Cherian, 2011). When EPI was established, only about 5% of the world’s children were protected from six diseases (polio, diphtheria, tuberculosis, pertussis, measles, and tetanus) targeted by four vaccines. Today, that figure is 83%, with some low-income countries reaching 99% immunisation coverage (WHO, 2012). The number of public health vaccines being used for universal protection has more than doubled since 1974. Today, WHO estimates that immunization programme saves the lives of 2.5 million people each year and protects many millions more from illness and disability (Duclos *et al.*, 2009). With the certification of WHO, the South-East Asia Region is declared as polio-free, eighty per cent of the world’s population nowadays lives in countries where polio has been eradicated (WHO, 2014). Overall, worldwide immunization coverage has improved considerably during the past decade. In 2000, for the first time since mortality data have been collected, annual deaths among children under five years of age dipped below 10 million. Nevertheless, the death of millions of children from preventable causes each year is unacceptable. A child born in a developing country is more likely to die within the first five years of life than a child born in an industrialized country.

However, in developing countries, children face a greater risk of illness and death due to incomplete immunization with severe implications for their growth potential and higher risk of morbidity and mortality in later years. Despite international thrust, universal immunization remains a dream in developing countries (WHO, 2002). It is observed from the latest global estimates of WHO/UNICEF (2005) that vaccine coverage for three doses of both Diphtheris-Pertussis-Tetanus (DPT-3) and Polio vaccines remains at virtually the same level as in previous years: 78 per cent. Global measles vaccine coverage stands at 77 per cent. An estimated 28 million infants worldwide have not been vaccinated with DPT-3. Seventy-five per cent of them live in ten countries (India, Nigeria, China, Indonesia, Pakistan, Ethiopia, Democratic Republic of Congo, Bangladesh and Philippines). Ninety per cent or more immunization coverage of DPT-3 was achieved in more than 100 countries for the first time: 112 in 2005 compared to 100 in 2004. Only two regions, the Americas and Europe, maintained over 90 per cent immunization coverage, with the Western Pacific reaching nearly that level (87%). For the first time, the Eastern Mediterranean Region achieved over 80 per cent immunization coverage (78 per cent in 2004). Countries reaching over 80 per cent in DPT-3 coverage numbered 151 in 2005, up from 143 in 2004.

WHO, UNICEF and others have expanded equitable access of routine immunization programme to low-income countries through rapid introduction of the newer and more expensive vaccines with the establishment of the Global Alliance for Vaccines and Immunization (GAVI) in 2000. For instance, the number of countries which introduced Haemophilus influenza type b (Hib) vaccines in their national programme increased from 29 in 1997 to about 190 in 2014, which includes nearly all low-income countries. Therefore, pre-GAVI Alliance era was an era of treatment and post-GAVI Alliance era is of prevention. On the other hand, now onwards EPI and its community of partners focus on the estimated 22 million children who are still not reached by immunization programmes (WHO, 2012). In doing so, they will be guided by the Global Vaccine Action Plan, which aims to extend the full benefits of immunisation to all the people (WHO, 2013a; WHO, 2013b).

Indian situation of child immunization

In India, the situation is no different than the global situation because of large regional imbalances regarding coverage of child immunization. The National Population Policy,

2000 (NPP) aimed to immunize 'hundred per cent' children against six common childhood diseases by 2010. In India, although immunization coverage has increased substantially in recent years the goal is still far from achieved. The coverage rates have still not reached the levels desired by MDG - 4 for complete immunization. The lack of access to and utilization of primary care services such as immunization puts children at risk of developing preventable conditions or having existing conditions needlessly worsened (De and Bhattacharya, 2002).

National Family Health Survey reports for India and states showed that there was a slow but straight increase from 35.4 per cent in NFHS-1 (1991-92) to 42.0 per cent in NFHS-2 (1998-99). However the tempo of increase became slow from NFHS-2 to NFHS-3 (2005-06), i.e., 42 per cent in NFHS-2 and 43.5 per cent in NFHS-3. But the proportion of children who received at least one dose of vaccine increased from 34.6 per cent in NFHS-1 (1991-92) to 43.6 per cent in NFHS-2 (1998-99) and further to 51.4 per cent in NFHS-3 (2005-06). There are considerable inter-state differentials in the coverage rates for different vaccines and for children who received all the vaccines. According to the NFHS-3, the percentage of children who are fully vaccinated ranges from 21 per cent in Nagaland to 81 per cent in Tamil Nadu. Goa, Kerala and Himachal Pradesh stand out in full immunization coverage as about three-fourths or more of children in each of these states are fully immunized. Among more populous states, Uttar Pradesh (23 per cent), Rajasthan (27 per cent), Assam (31 per cent), Bihar (33 per cent), Jharkhand (34 per cent) and Madhya Pradesh (40 per cent) stand out as having a much lower percentage of children fully vaccinated than the national average of 44 per cent.

Programmatic profile of child immunization in India

In India, improvement in child health and survival status is the two most crucial aspect of Family Welfare Programme. Till 1977, the major health activity was family planning in India, which was changed into Family Welfare Programme with maternal and child health become an integral part of family planning programme, with the vision that reduction in infant and child mortality would significantly contribute to fertility reduction. The major government initiatives towards improvement in child health status are listed below and also provided in Table 1.2.

I) The first national child health programme was of Diarrhoeal Disease Control started in 1978. Focal group was children under five years of age. The programme aimed at preventing death due to dehydration arising out of diarrhoeal diseases. Major initiative as taken were: (a) Health education aimed at rapid recognition and appropriate management of diarrhoea, which later has been taken as one of the major component in Child Survival and Safe Motherhood (CSSM) Programme; and (b) Under RCH, Oral Rehydration Saline is supplied in the kits to all sub-centres in the country.

National Health Policy (NHP), 1983 aimed at significant reduction in MMR, NMR and CMR by 2000. All child health programmes directed towards achieving this goal. Under 1983 National Health Policy, Universal Immunization Programme was launched to make children vaccinated against six preventable diseases; i.e., diphtheria, pertussis, childhood tuberculosis, poliomyelitis, measles and neonatal tetanus. The Programme was launched in 1985 in a phased manner. By 1990 it covered the entire country. Universal immunization against six vaccination preventable diseases (VPD) by 2000 was one of the goals set by NHP-1983. UIP became a part of CSSM Programme since 1992 and of RCH Programme since 1997.

II) National Health Policy (2002): The NHP 2002 is directed towards achieving an acceptable, affordable and sustainable standard of health through an appropriate health system (MoHF&W, GOI, 2005). Under this, country developed a comprehensive first Multi Year Strategic Plan (MYP) for Immunization in 2005 with an addendum in 2010 to achieve these targets of improving access and utilization of immunization in the country (MoHF&W, GOI, 2011). This document is a national strategy document to guide development of UIP plans at national and state levels. Ministry of Health and Family Welfare also revised the National Vaccine Policy and released the first National Vaccine Policy in 2011 (MoHF&W, GOI, 2011). The year 2012-2013 was declared as ‘Year of intensification of Routine Immunization (IRI) in India. The goal of this vaccine policy is to guide decision making in order to develop a long term plan to strengthen the UIP. This policy addresses issues of vaccine security, management, regulation guidelines, vaccine research and development and product development (MoHF&W, GOI, 2011, Lahariya, 2014). To ensure informed decision making for any modification in UIP schedule or inclusion of new vaccines, there is a National Technical Advisory Group on Immunization (NTAGI) which comprises of a number of technical experts, national

program leaders and managers, representatives from development partners and professional bodies. All issues related to the program and vaccines are presented to this group for review and discussions and final recommendations.

III) The ARI Control Programme was initiated in 1990. It sought to introduce scientific protocols for case management of pneumonia with co-trimoxazole. Initially 14 districts were included as pilot districts and later on new districts were included.

A review of health facilities in the country was done in 1992 which revealed that although 87 per cent of personnel were trained and the drug supply was regular, yet there was a problem in correct case classification and treatment. Since 1992, ARI control has been a part of CSSM Programme whereas from 1997 onwards it is a part of RCH Programme. Under these Programmes, cotrimoxazole tablets are supplied as a part of drug kit for use by different categories of workers for managing cases of pneumonia. Under RCH-II, activities are proposed to be implemented in an integral way with other child health intervention activities.

IV) CSSM Programme started in 1992-93 was jointly funded by the World Bank and UNICEF, for implementation up to 1997-98. It was implemented in the country in a phased manner and by 1996-97 it covered the entire country. Its major objective was to improve the health of infants and children and to reduce maternal mortality and morbidity. CSSM took the following major initiatives as follows:

- a) Universal Immunization Programme: It sought to sustain high coverage of UIP in better performing areas, where strengthening immunization services in poor performing areas were among the main focus.
- b) Augmented various activities towards Oral Rehydration Therapy programme
- c) Universalized prophylaxis schemes for control of anaemia among pregnant women and control of blindness among children.
- d) Initiated a programme for control of ARI in children
- e) Safe motherhood: training of TBAs, provision of aseptic delivery kits, strengthening First Referral Units to combat with high-risk obstetric emergencies.

It succeeded to achieve notable improvement for health of pregnant women, infant, children and made a dent in IMR, MMR and incidence of Vaccine Preventable Diseases (VPD).

V) Reproductive and Child Health for effective improvement of health status of women and children and to fulfil the unmet need for family welfare services in the country, especially for the poor and under-served by reducing infant, child and maternal mortality and morbidity, Government of India during 1997–98 launched RCH programme for the first time in the country, to be implemented during 9th plan period. The programme integrated the components of CSSM programme with other services. In addition, management of Reproductive Tract Infections (RTIs) and Sexually Transmitted Infection (STIs) were incorporated. At present round two of RCH programme is being operationalised in the country.

Under the RCH programme, special efforts were made to strengthen the routine immunization as well as Pulse Polio Immunization by launching a project with the World Bank's assistance, for strengthening immunization services and coverage. Major initiatives under RCH programme are as follows: (a). It incorporated the activities like, separate financial envelopes for different components of the programme; (b). Training of traditional birth attendants; (c). RCH camps and RCH out-reach services were started to address felt-gaps; and (d). Sector investment programmes geared up by European Commission's assistance. These were mainly effective at state/district level activities and urban RCH components. The activities under child health include control of deaths due to ARI, control of deaths due to diarrhoeal diseases, provision of Essential New-Born Care, Vitamin-A supplementation to children between the ages 6 months to 3 years, Iron-folic-acid supplementation to children under five years of age, and implementation of exclusive breast feeding up to the age of 6 months and appropriate practices related to complementary feeding.

VI) Integrated Management of Neonatal and Childhood Diseases (IMNCI) to reduce under five mortality due to ARI, pneumonia, diarrhoea, malaria, measles and malnutrition (which account for 70 per cent of childhood deaths), the WHO and the UNICEF have developed the Integrated Management of Childhood Illnesses (IMCI) approach. The approach involved reinforcement of skills and performance of outreach health workers in managing childhood illnesses. It also focuses at nutritional status among children,

immunization, prophylaxis against Vitamin A besides diagnosis and treatment of specific disease conditions. The approach is regarded as the best suited in a low resource based public health infrastructure prevailing in developing countries. The Indian adaptation group on IMCI-WHO approach developed a country specific version and renamed it as IMNCI. It is one of the vital parts of RCH programme. Major components include: (a). Strengthening skills of health care workers; (b). Strengthening skills of health care infrastructure; and (c). Involvement of the community.

The amendment in IMNCI invokes: (a). neonatal care components; (b). inclusion of 0-7 days infants as the focus of the programme; (c). national guideline on malaria, anaemia, vitamin A supplementation and immunization schedule; (d). shortening the schedule for training health workers from 11 days to 8 days; (e). Trainings are to begin with sick infants of aged 2 months; and (f). Proportion of training times devoted to sick infants and sick child is almost equal.

The recently launched National Rural Health Mission (NRHM) seeks to strengthen child health care through a variety of measures. This politically high priority mission reiterates the necessity of reduction of neonatal mortality, which at present accounts for two-thirds of infant mortality. NRHM thus calls for focused attention on neonatal health. The training of healthcare workers, strengthening of the health system and consistent efforts to augment community participation through ASHA and *Anganwadi* Schemes has been regarded as the crucial stepping-stones. Recently the neonatal component of NRHM has been marked out by giving certain focused attention through 'new-born-week', symposium on related aspects and releasing postage stamp on 'new-born health in India'.

VII) National Rural Health Mission: Government of India has launched multi-year plan (MYP) to strengthen routine immunization which is now a part of the NRHM to provide effective health care to rural population throughout the country with special focus on 18 states, which have weak public health infrastructure and very poor performance in respect of demographic and health indicators. The NRHM will cover all the villages through approximately 2.5 lakh village based "Accredited Social Health Activists" (ASHA) who would act as link between villages and health centres. ASHA will advise villagers about sanitation, hygiene, contraception and immunization.

Need for the study

In addition to malnutrition, the major cause of childhood mortality in India is vaccine preventable diseases. Childhood mortality can be significantly lowered, if routine vaccination is completed. Most of the analysis that has been made so far in the area of childhood immunization was on the role of socio-economic and demographic factors associated with childhood immunization. Only few attempts have been made so far to analyse the factors influencing the childhood immunization among social groups and no study has been made with reference to the Empowered Action Group (EAG) states of India. The present study tries to fill the gap in analysing the role of social group affiliation the childhood immunization in the select EAG states taking into consideration social determinants. Moreover, much of the research done on this was based on small, non-representative samples. Clearly, there is a need for further research based on large and representative samples that use multivariate methods to estimate effects while controlling potentially confounding variables by holding them constant, to inform programme managers and policy makers on the potential effects of social group affiliation and improved accessibility of maternal and child health services in the less developed areas of India.

The purpose of this study is to explore the role of social determinants, particularly social group affiliation, on immunization coverage among children aged 12-59 months and laying emphasis on SCs and STs in the three EAG states of India viz., Odisha, Rajasthan and Madhya Pradesh by using the data from the NFHS-3. It is confined to these three states because of their diversity in terms of social group composition, different ecological backdrop and poor health status of children (infant and child mortality rates are higher than the national average) and coverage of EPI vaccines lowest to medium. Based on the childhood mortality, childhood malnutrition, childhood immunization coverage, and socio-economic and demographic characteristics, states were chosen for the present research and information about the selection of studied areas and profile of the studied states along with different health indicators of social groups are provided in Tables 1.3 and 1.4.

Selection of study area

The study is confined to three major EAG states of India. On the way to select the states, first all the major states were ranked according to the per cent of ST population in the

state. The states where ST population was more than 50 per cent and less than 10 per cent were excluded, for comparison between social (SC, ST, OBCs and other caste) groups. Then, the states were ranked according to the percentage of children fully immunized in the state. At last, we restricted ourselves to three states, one state from western India (Rajasthan), another from central India (Madhya Pradesh and another from eastern India (Odisha) for the study. These states are important to study because among the 29 states and 7 union territories of India, five EAG states comprise of 40 per cent of India's total population and account for around 60 per cent of child deaths (5q_0) viz., Uttar Pradesh, Bihar, Madhya Pradesh, Rajasthan and Odisha. About 2.4 million children under the age of five die every year in India, of whom 1.4 million die in the 5 states with higher prevalence of vaccine preventable diseases and death among children under five years (CBHI, 2008). Rajasthan is the state, where coverage of full immunization among children aged 12-23 months is lowest among the major states of India. On the other hand, Madhya Pradesh and Odisha are the states, where child mortality is highest among 36 states of India with moderate coverage of full immunization among children 12-23 months. Basic health indicators in these states have been low. Putting them among the EAG states of India they pose an enormous challenge in implementation of child health programme because of the socio-economic factors, large inequalities, weak health system and poor programme management capacity (Tables 1.3, 1.4 and 1.5).

Organization of the thesis

The thesis is organized into eight chapters. Chapter-1 provides an introduction to the topic of research, justifying the need for the study and also describes the background of the study. An exhaustive review of literature is furnished on various social determinants affecting routine immunization programmes in low, middle and high income countries, along with the relationship between caste/tribe and child immunization in Chapter - 2. The research questions, objectives of the study, conceptual framework, hypotheses, sources of data, research plan, statistical methods used, etc., are described in Chapter-3 on Methodology.

Results from the analyses based on NFHS-3 data in the studied states are provided in Chapters 4–7. Chapter-4 focuses on characteristics of the studied population in three States - Rajasthan, Odisha and Madhya Pradesh. This chapter has been divided into two sections. Section 1 presents background characteristics (socio-economic demographic

characteristics and exposure to programme factors) of mothers and children born during the five years preceding the survey. Section 2 presents construction of women's access health facility index using principal component analysis.

Chapter 5 (**Levels and differentials of childhood immunization coverage**) presents differentials of immunization coverage across social groups with a comparative viewpoint among children of four social groups. It also focuses on the coverage of specific vaccine by source of vaccination coverage data and causes of partial immunization and differentials across the social groups. Social determinants of vaccination card coverage are also discussed.

Chapter 6 (**Social differentials and determinants of childhood immunization**) describes the role of social determinants, particularly of the caste/tribe on specific vaccines viz., third doses of DPT (DPT-3), measles vaccinations, immunization status (no/partial/full) and Vitamin A supplementation (VAS) in the three states with four models for each of the outcome variables. Finally, results from analyses of interaction effects between household's social group affiliation with programme variables (exposure to media, place of delivery and access of health facility to mother) on coverage of immunization are presented in Chapter 7 (**Interaction effects of social groups with programme variables on child immunization**)

Chapter 8 summarises the findings of the study and gives a precise account about child immunization coverage among SC/ST children in the selected study of India, along with references to the limitations of the study and scope for further research on the subject.

Table 1.1 : Ideal National Immunization Schedule

Vaccine	AGE				
	Birth	6 Weeks	10 Weeks	14Weeks	9 Months
Primary vaccination					
BCG	X				
Oral Polio	X ¹	X	X	X	
DPT		X	X	X	
Hepatitis B ²		X	X	X	
Measles					X
Booster doses					
DPT + Oral Polio	18 to 24 months				
DT	5 years				
Tetanus Toxoid	At 10 years and again at 16 years				
Vitamin A	9, 18, 24, 30 and 36 month				
Tetanus Toxoid (PW): 1st dose	As early as possible during pregnancy after 1 st trimester				
2 nd Dose	1 month after 1 st dose				
	Or				
Booster	If previously vaccinated within 3 years				

¹ In all institutional deliveries and in all endemic areas

² In pilot areas vaccination schedule may get modified if newer vaccine is introduced in future under National immunisation programme

Source: UIP Div. Dept. of Family Welfare, Ministry of Health & Family Welfare.

Table 1. 2. Brief history of child vaccination in India

Year	Programme initiated
1978	Expanded Programme on Immunization (EPI)
1979-80	Immunization against Poliomyelitis
1980-81	Tetanus Toxoid
1981-82	Immunization against Tuberculosis (BCG)
1985-86	Measles
1986	Universal Immunization Programme
1989-90	The program became operational in all over the country and became a part of CSSM
1990	ARI Control Program the program covered the entire country
1995	Pulse polio immunization campaigns
1997	Part of RCH programme to strengthen the routine immunization as well as Pulse Polio Immunization
2005	Government of India launched NRHM to provide effective health care to rural population throughout the country with special focus on 18 states, which have weak public health infrastructure and very poor performance in respect of demographic and health indicators. The NRHM will cover all villages through approximately 2.5 lakh villages based ASHAs who would act as link between villages and health centres. ASHAs will advise villagers about sanitation, hygiene, contraception and immunization.

Table 1.3. Background socio-demographic and nutrition profile of study states and India

State/Indicators	Madhya Pradesh			
	Rajasthan	Odisha	Pradesh	India
Total population, 2011 (in million)	68.54	41.97	72.63	1210.56
Per cent to total population of India	5.7	3.5	6.0	100.0
Child sex ratio (0-6 years), 2011	888	941	918	919
Population decadal growth rate, 2001-2011 (%)	21.31	14.05	20.35	17.69
% Average annual exponential growth rate, 2001-11	1.93	1.31	1.85	1.63
% Child (0-6 years) population to population	15.3	12.0	14.5	13.1
% Scheduled caste population, 2011	17.8	17.1	15.6	16.6
% Scheduled tribe population, 2011	13.5	22.8	21.1	8.6
% Urban population, 2011	24.9	16.7	27.6	31.2
% Literate – Total, 2011	66.11	72.87	69.32	74.04
% Literate – Males, 2011	79.19	81.59	78.73	82.14
% Literate – Females, 2011	47.76	62.46	54.49	65.46
<i>Total fertility rate (15-49)</i>				
NFHS-1(1992-93)	3.63	2.92	3.90	3.39
NFHS-2 (1998-99)	3.78	2.46	3.43	2.85
NFHS-3 (2005-06)	3.21	2.37	3.12	2.68
AHS (2012-13)	3.2	2.3	3.1	NA
SRS (2012)	2.9	2.1	2.9	2.4
<i>Infant mortality rate</i>				
NFHS-1 (1992-93)	72.6	112.1	85.2	78.5
NFHS-2 (1998-99)	88.1	89.5	92.5	67.6
NFHS-3 (2005-06)	65.3	67.7	69.5	57.0
AHS (2012-13)	55	56	62	NA
SRS (2012)	49	53	56	42.0
<i>Under-five mortality rate</i>				
NFHS-1 (1992-93)	102.6	131	130.3	109.3
NFHS-2 (1998-99)	124.9	115.7	144.7	94.9
NFHS-3 (2005-06)	85.4	94.7	94.2	74.3
AHS (2012-13)	74	75	83	NA
SRS(2012)	59	68	73	52.0
<i>Full immunization*</i>				
NFHS-1 (1992-93)	21.1	36.1	29.2	35.4
NFHS-2 (1998-99)	17.3	43.7	22.6	42.0
NFHS-3 (2005-06)	26.5	51.8	40.3	43.5
CES – 2009	53.8	59.5	42.9	61.0
AHS (2012-13)	70.8	55.0	54.9	NA
<i>No immunization</i>				
NFHS-1 (1992-93)	48.5	28.0	34.4	30.0
NFHS-2 (1998-99)	22.5	9.4	16.5	14.4
NFHS-3 (2005-06)	5.5	11.6	5.0	5.1
CES- 2009	15.6	5.8	5.9	7.6
AHS (2012-13)	5.9	0.9	4.3	NA
<i>Underweight</i>				
NFHS-1 (1992-93)	41.6	53.3	57.4	53.4
NFHS-2 (1998-99)	46.7	39.5	50.8	47.0
NFHS-3 (2005-06)	36.8	50.3	57.9	42.5

Notes: *Immunization*: % of children age 12-23 months received eight doses of (BCG+3 Polio+3 DPT+ Measles) vaccinations; *Underweight* (weight-for-age < -2 SD among children 0–35 months); *TFR*, per woman age 15-49 years, 1-36 months preceding the survey; *CBR* per 1,000 population; *IMR & U5MR*: Infant, child, and under-five mortality rates for the 10-year period preceding the survey; () Based on 25-49 un-weighted cases; *NFHS*: National Family Health Survey; *AHS*: Annual Health Survey; *SRS*: Sample Registration System; *CES-2009*: Coverage Evaluation Survey 2009

Source: **NFHS-1**: IIPS (1995), PRC and IIPS (1994a,b,c,d); **NFHS-2**: IIPS and ORC Macro (2000a,b,c,d); **NFHS-3**: IIPS and ORC Macro (2007a,b,c,d); **SRS**: India, Registrar General (2013); **AHS**: India, ORG & CC (2012a, b, c); **CES-2009**: UNCIEF (2010).

Table 1.4. Trends in immunization, fertility, infant and child mortality, social groups in the studied states and India

State	Rajasthan				Odisha				Madhya Pradesh				India			
Social groups	SC	ST	OBC	OC	SC	ST	OBC	OC	SC	ST	OBC	OC	SC	ST	OBC	OC
Trends in immunization																
<i>Full Immunization*</i>																
NFHS-1 (1992-93)	16.2	12.6	25.2!		25.2	28.5	39.8!		24.6	19.3	34.4!		26.8	24.8	38.2!	
NFHS-2 (1998)	13.4	10.3	14.4	22.8	44.5	26.4	48.5	49.3	17.9	11.1	23.6	40.1	40.2	26.4	43.0	46.8
NFHS-3 (2005-2006)	35.8	(3.3)	24.3	40.0	59.5	30.4	59.4	58.0	40.5	22.3	41.0	62.4	39.7	31.3	40.7	53.8
CES – 2009	41.8	43.3	56.6	61.2	60.4	46.2	64.2	71.1	50.5	23.8	47.3	43.0	58.9	49.8	60.6	66.3
<i>No immunization**</i>																
NFHS-1 (1992-93)	53.1	63.0	42.6!		33.7	36.9	24.6!		44.6	43.2	29.0!		36.9	41.8	27.4!	
NFHS-2 (1998-99)	21.9	34.5	23.7	18.6	8.6	18.2	8.1	5.3	11.7	26.2	10.0	7.0	15.1	24.2	11.6	13.3
NFHS-3 (2005-06)	2.8	(6.3)	6.0	6.2	3.7	22.3	3.1	15.9	2.6	7.8	6.7	0.0	5.4	11.5	3.9	4.3
<i>Infant mortality rate*</i>																
NFHS-1 (1992-93)	90.5	75.4	71.1!		160.8	113.4	115.3!		124.1	103.1	90.1!		107.3	90.5		82.2!
NFHS-2 (1998-99)	98.9	94.7	87.5	81.6	83.9	98.7	95.6	79.1	101.5	101.0	92.3	72.4	83.0	84.2	76.0	61.8
NFHS-3 (2005-06)	96.4	73.2	66.9	58.1	73.7	78.7	66.0	53.1	81.9	95.6	79.0	66.8	66.4	62.1	56.6	48.9
<i>Under five mortality rate*</i>																
NFHS-1 (1992-93)	121.7	123.8	96.9!		175.8	148.8	128.1!		167.8	166.6	129.8!		149.1	135.3	111.5	
NFHS-2 (1998-99)	140.7	155.0	123.2	109.3	122.7	138.4	113.8	92.9	156.0	179.6	139.8	94.8	119.3	126.6	103.1	82.6
NFHS-3 (2005-06)	123.1	113.8	80.8	69.9	91.8	136.3	83.5	64.2	110.1	140.7	97.6	79.9	88.1	95.7	72.8	59.2
<i>% underweight**</i>																
NFHS-2 (1998-99)	56.3	59.3	51.1	45.0	65.1	57.1	54.9	53.1	57.5	64.5	55.4	40.5	53.5	55.9	47.3	41.1
NFHS-3 (2005-06)	44.5	46.8	36.7	37.1	44.4	54.4	38.1	26.4	62.6	71.4	57.8	45.3	47.9	54.5	43.2	33.7
<i>Total fertility rate (15-49)</i>																
NFHS-2 (1998-99)	4.34	4.31	3.80	3.44	2.85	2.66	2.47	2.07	3.87	3.69	3.34	2.49	3.15	3.06	2.83	2.66
NFHS-3 (2005-06)	3.60	3.65	3.13	2.75	2.30	3.14	2.25	2.01	3.19	3.82	3.17	2.33	2.92	3.12	2.75	2.35

Notes: *Immunization*: % of children age 12-23 months received eight doses of (BCG+3 Polio+3 DPT+ Measles) vaccinations; *Underweight* (weight-for-age < -2 SD among children 0-35 months); *TFR*, per woman age 15-49 years, 1-36 months preceding the survey; *IMR & U5MR*: Infant, child, and under-five mortality rates for the 10-year period preceding the survey; (!) Based on 25-49 un-weighted cases; ! Combined figures for OBCs and OCs in NFHS-1

Source: **NFHS-1**: IIPS (1995), PRC and IIPS (1994a, b, c, d); **NFHS-2**: IIPS and ORC Macro (2000a, b, c, d); **NFHS-3**: IIPS and ORC Macro (2007a, b, c, d); **SRS**: India, Registrar General (2013); **AHS**: India, ORG & CC (2012a, b, c); **CES-2009**: UNICEF (2010).

Table 1.5. NSSO Indicators on economic disparities across social groups in the study states and India

State	Rajasthan				Odisha				Madhya Pradesh				India			
Social groups	SC	ST	OBC	OC	SC	ST	OBC	OC	SC	ST	OBC	OC	SC	ST	OBC	OC
Economic disparities																
Extent of landlessness (Rural) ¹	36	67	24	26	89	95	47	81	134	145	104	110	86	101	80	79
Agricultural labour (Rural) ²	101	56	35	58	347	288	212	112	511	469	244	93	369	334	233	159
Labour force participation rate (female) ³	274	401	336	192	244	392	223	106	286	333	243	116	256	349	241	171
Indebtedness (from non-institutional sources) ⁴	284	171	248	235	102	39	136	122	156	62	185	161	170	81	183	126

Note: 1 Per 1000 households of different social groups possessed 0.000 hectares land at rural areas. The households with size class of land possessed '0.000' hectares comprise households which possessed land less than 0.001 hectares as well as households which reported no information on land possessed; 2 Per 1000 household of different social groups rural agricultural labour.; 3 Labour force participation rate (per 1000 persons) according to usual status [principal (ps) + subsidiary status (ss)]. This indicator states total of rural and urban areas; 4 Number of rural households reporting cash loans outstanding as on 30.6.2002 per thousand households(P).

Source: National Sample Survey Office (NSSO), 2012. Employment and Unemployment Situation Among Social Groups in India, NSS 66th ROUND, (July 2009 – June 2010). National Statistical Organisation, Ministry of Statistics & Programme Implementation, Government of India, New Delhi.; National Sample Survey Office (NSSO), 2006, Household Assets Holding, Indebtedness, Current Borrowings and Repayments of Social Groups in India (as on 30.06.2002), All-India Debt and Investment Survey, NSS 59th Round. Report No. 503(59/18.2/4), National Statistical Organisation, Ministry of Statistics & Programme Implementation, Government of India, New Delhi.

Figure 1.1 Location of states in India considered for the analysis (Odisha, Madhya Pradesh, and Rajasthan)

