‘WHEN WILL THEY EVER LEARN?’: THE GREAT INDIAN EXPERIENCE OF UNIVERSAL IMMUNISATION PROGRAMME[#]

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Abstract: The study attempts to analyse the effects of some selected demographic and socioeconomic predictor variables on the *likelihood of immunisation* of a child for six vaccine-preventable diseases covered under Universal Immunisation Programme (UIP). It focuses on immunisation coverage across India with special emphasis on three groups of states, viz., *Empowered Action Group*, *North-Eastern* and *Other* states. The study applies a *logistic regression* model to the three rounds of *National Family Health Survey* unit-level data. The results are robust across different models. The likelihood of immunisation increases with urban residence, mother’s education level, mother’s age, mother’s exposure to mass media, mother’s awareness about immunisation, antenatal care during pregnancy, SLI or wealth index, household electrification, mother’s empowerment index, and caste/ tribe hierarchy. It is also higher for boys than girls but it decreases for higher birth-order children irrespective of the sex of the child. Interestingly, sex of household headship has no effect. Religion and zone of states also have some effects. Emphasis on these demand

enhancing factors is necessary to make the immunisation programme universal.

[Keywords: Immunisation, UIP, NFHS, Logit, Unadjusted and Adjusted Likelihood]

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1. INTRODUCTION:

Immunisation programme is one of the essential interventions for protection of children from life threatening diseases, which are avertable. The immunisation programme in India was flagged off in 1978 as Expanded Programme on Immunisation (EPI). It gained impetus in 1985 as the Universal Immunisation Programme (UIP) and was carried out in phased manner to cover all districts in the country by 1989-90 (MoHFW 2006-07: 58). In India, under the UIP, vaccines for six vaccine-preventable diseases (tuberculosis, diphtheria, pertussis (whooping cough), tetanus, poliomyelitis, and measles) are available free of cost to all. Lots of effort and fund have been exhausted on the UIP but several survey results testified to a glaring gap between the goals aspired for and the targets touched. This paper tries to find out the determinants of immunisation coverage rate in India so that it is possible to stimulate the rate from the demand-side as well. It will use the same method to analyse three different cross-sections of the National Family Health Survey (NFHS) data that covers 13 years period to check the consistency of robustness of the determinants over time.

There are some bottlenecks from both supply and demand sides. In a developing country like India, any programme like UIP could be affected by supply-side financial constraints when the overall Central and State budgetary allocations on health care are meagre. Moreover, the availability of supply-side data at the disaggregated level is rare. Thus

supply-side analysis is beyond the scope of the present study. It focuses purely on the demand-side, assuming the *ceteris paribus* supply-side constraints.

The report of the sub-committee on national health prepared for the consideration of National Planning Committee of the Indian National Congress had advocated state intervention to preserve and maintain health of the people by organising and controlling health care to achieve the proper integration of curative and preventive services (National Planning Committee 1948: 224-5). The UIP, a carefully planned strategy launched in 1985-86, aimed at systematic district-wise expansion to cover all the districts by 1989-90 (Govt. of India (GoI), MoHFW 1985; Sokhey 1985). More than 90 million pregnant women and 83 million infants were to be immunised over a five year period under the UIP (Sokhey 1988). The programme was given the status of a *National Technology Mission* in 1986 (GoI 1988) to provide a sense of urgency and commitment to achieve the goals within the specified period. UIP became a part of the *Child Survival and Safe Motherhood* (CSSM) Programme in 1992-93 (MoHFW 2002-03: 176). Since 1997, immunisation activities have been an essential part of the *National Reproductive and Child Health* (RCH) Programme (MoHFW 2005-06: 54). The GoI constituted a *National Technical Committee on Child Health* on 11th June, 2000 and launched *Immunisation Strengthening Project* on the recommendation of the Committee (MoHFW 2002-03: 173). The *Department of Family Welfare*

established a *National Technical Advisory Group on Immunisation* on 28th August, 2001 to assist GoI in developing a nationwide policy framework for vaccines and immunisation (MoHFW 2002-03: 174).

Vaccine-preventable diseases have many socio-economic costs: sick children miss school and may cause parents to lose time from work. These diseases also result in doctor's visits, hospitalisations, poor health and even premature deaths. Vaccinations are one of the best ways to put an end to the serious effects of certain diseases. Vaccination not only protects children of today, but it also helps protect future generations. Immunising individual children helps to protect the health of our community. In a community with higher immunisation coverage, chances of unvaccinated children getting exposed to disease germs passed around by other unvaccinated children are less. Since vaccination of one child confers health benefits for others, in free market vaccinations will be under-supplied, as the true marginal costs will not be recouped by providers (private marginal benefit will be less than social marginal benefit). Preventive interventions by the Government can offset both the *pure infection externality* and the *pure prevention externality* (Gersovitz et al 2001) and ensure optimal level of service delivery. Expenditures for health care are imperative because they contribute to human welfare both directly and indirectly. Health expenditure can improve the health status of the population directly by reducing fertility, morbidity, and mortality. It improves social welfare indirectly via the

effects of increase in labour productivity, decrease in population growth, superior human capital to raise per capita GNP. A healthy health sector will build a healthy economy and *vice-versa*. Health of population is a product of society and has an indispensable contribution to economic growth and political stability. UIP is often cited as 'the most cost-effective route to child's better health' (WHO 1998). 'Universal immunisation of children … is crucial to reducing infant and child mortality' (IIPS 2007: 227).

'Despite large resource allocation and mass immunisation campaigns, efforts to increase the number of fully immunised children in India have met with limited success, raising concerns about the effectiveness of public health delivery systems' (Parashar 2005: 998). To quote, '…achievement of the target of protecting … 85 percent of infants with vaccines …remains a distant dream' (Gupta et al 1989: 160). This *National Review* mentioned some *supply side bottlenecks* that may hinder the UIP to achieve its goals. Even then in its Annual Report (MoHFW 2005-06), mentions some supply side constraints as major causes for poor immunisation. To strengthen routine immunisation, GoI has planned some strategies, again to address some supply side issues, as a part of the *State Programme Implementation Plan* (MoHFW 2005-06: 54). The Annual Reports (year 2000 onwards), still talk about the same supply-side constraints as major causes for poor immunisation (MoHFW 2005-06). But the mere focus on supply-side issues alone has evidently

failed to achieve the desired goals of UIP. This paper hence tries to explore if it is possible to raise immunisation coverage rate from the demand-side with a simplifying assumption of *ceteris paribus* supply-side constraint as we have a long history of Government negligence in health spending. This assumption is more realistic in the present scenario of global economic meltdown causing crunching foreign aid. Padmanabha (1992) also argues that '…the Programme suffers not so much from lack of funds as from functional isolation'. Public health should not be treated as the sole responsibility of the health sector. Policies and programmes in other sectors such as environment, education, welfare, industry, labour, information, *etc*, have to be informed and influenced by public health considerations (Gopalan 1994).

No matter how noble the idea of UIP, a seemingly 'non-controversial' programme of GoI, it faces severe criticism from many scholars. As Banerjee (1986, 1993) pointed out, it is a part of 'ill conceived and unimaginative global venture' and '… revealed many serious flaws in the programme itself'. 'The most outstanding among them was that a massive, expensive and a very complicated programme had been recommended for launching without even finding out what the problem was, leave alone the other important epidemiological considerations, such as incidence rates under different ecological conditions and time trends of the chosen diseases' (*ibid*). Banerjee (1993) mentioned that the programme is an 'onslaught' of the totalitarian

approach of the developed *North* to 'sell' their 'social' products in the vast 'market' of developing *South*, deviating from the *Alma Ata Declaration* (WHO 1978). Banerjee (1990) dubs UIP as 'an unholy alliance of national and international power brokers (who) could impose their will on hundreds of millions of human beings living in the poor countries of the world …'. Madhavi (2003) also noted strongly that the immunisation policy in India, instead of being determined by disease burden and demand, is increasingly driven by the supply push, generated by industry and mediated by international organisations.

2. DATA AND METHODOLOGY:

The present study uses data from *National Family Health Survey* (NFHS)-I (1992-93), NFHS-II (1998-99), and NFHS-III (2005-06). 'NFHS-III collected information from a nationally representative sample of 109,041 households, 124,385 women age 15-49, and 74,369 men age 15-54. The NFHS-III sample covers 99 percent of India's population living in all 29 states' (IIPS 2007: xxix). 'The NFHS-II survey covered a representative sample of more than 90,000 eligible women age 15-49 from 26 states that comprise more than 99 percent of India's population' (IIPS 2000: xiii). The NFHS-I survey covered a representative sample of 89,777 ever-married women age 14-49 from 24 states and the NCT of Delhi, which comprise 99 percent of the total population of India (IIPS 1995: xix). It is worth to noting that NFHS-II (1998-99), the second round

of the series, is regarded as 'storehouse of demographic and health data in India' (Rajan et al 2004).

Data on immunisation is based on vaccination card for each living child or on mother's report in case of non availability of the card[1] (IIPS 2007: 227; IIPS 2000: 203; IIPS 1995: 247). The 12-23 month age group is taken for the present analysis because both international and GoI guidelines specify that children should be fully immunised by the time they complete their first year of life.

According to the guidelines developed by World Health Organisation, children who received BCG, measles, and three doses each of DPT, and Polio (excluding Polio 0[2]) are considered to be fully vaccinated. Immunisation coverage rate in India has been improving very tardily since the time of NFHS-I (1992-93) when the proportion of fully vaccinated children was 35.4 percent to 42 percent in NFHS-II (1998-99) to 43.5 percent in NFHS-III (2005-06) (an increase by only eight percentage points in thirteen years!). These marginal improvements indicate that achievement is lagging way behind the goal of UIP in India.

However, state-wise coverage rate of immunisation has shown considerable convergence over time. As shown in Table-1 and Figure-1, standard deviation in state-wise coverage rate changes from 21 in NFHS-

[1] Vaccination coverage rates are calculated from information on immunisation cards where these are available, and mother's report where there are no cards. This is the practice usually followed by the Demographic Health Survey (DHS) (Boerma et al 1993; Boerma et al 1996) and validated by other research (Langsten et al 1998) (mentioned in Pande et al 2003:2078).

[2] Polio 0 is administered at birth along with BCG.

I to 25 in NFHS-II to 17 in NFHS-III. The states where coverage rate of full immunisation was lower than the national average in NFHS-II, experienced an increase in the rate in NFHS-III, but they are still below the national average. On the other hand, the states where coverage rate of full immunisation was higher than national average in NFHS-II witnessed a fall in the rate in NFHS-III (and they are mostly big states!) excepting Manipur, Chhattisgarh, Tripura, Orissa, Uttarakhand, West Bengal, Haryana, Sikkim, Jammu and Kashmir. This declining trend is also revealed by MoHFW which mentions '… recent household survey conducted in the year 2002-03 (RCH-II) has indicated that the coverage levels in most of the districts have been declining with respect to district level coverage reported in the year 1998-99 (NFHS-II)' (MoHFW 2006-07: 60) and also supported by Dasgupta et al 2001. The same state-wise coverage rates are also shown in figure-2-4 for the three rounds of NFHS. These maps clearly show that the immunisation coverage improved for most of the states over time. The contiguous regions of states (with low coverage rate) of the so called BIMARU states and the north-eastern states have been declining over the years. Still in 2005-06 the large patch with low coverage includes the large states of Rajasthan, Uttar Pradesh, Madhya Pradesh, Bihar, Jharkhand and the north-eastern states excluding Tripura, Mizoram and Manipur. Tamil Nadu is the only state in India that achieved herd immunity (> 85 percent) once in 1998-99 but lost that subsequently too.

An immunisation coverage model is used in this study to estimate the effects of the selected background variables on immunisation coverage. The measure of a child's immunisation is a binary variable that indicates whether a child has been administered all the six vaccinations or not. The analyses use *bivariate* (*unadjusted*) and *multivariate* (*adjusted*) *binary logit regression* tools. Logit regression results are presented in *multiple classification analysis* (MCA) form. Probability of immunisation (P) is presented in percentage form (multiplying by 100).

Unadjusted values are calculated from logit regressions incorporating only one predictor variable. Adjusted values are calculated from logit regressions incorporating all the selected predictor variables simultaneously. While calculating the adjusted values for a particular predictor variable, all other predictor variables are *controlled* by setting them to their mean values in the underlying regression (Patra 2005; Retherford and Choe 1993).

3. DETERMINANTS OF FULL IMMUNISATION IN INDIA:

Children are the units of the present analysis, which uses the children's recoded file. The analysis focuses on 10,419 children for NFHS-III, 10,076 children for NFHS-II, and 11,853 children for NFHS-I aged 12-23 months during the respective Survey.

The analysis of immunisation coverage uses a number of demographic and socioeconomic variables. The dependent variable is full immunisation that says whether a particular child is fully immunised or

not. The selected predictor variables are sex of the child (female, male), birth order of the child (1, 2, 3, 4 and above), residence (rural, urban), mother's education (Illiterate, Primary, Secondary, Higher), mother's age (15-19 (14-19 for NFHS-I), 20-24, 25-29, 30-49), antenatal care (no, yes), religion (Hindu, Muslim, Christian and other minorities), caste/ tribe (general, other backward castes, scheduled caste, scheduled tribe), standard of living index[3] (low, medium, high, not *de jure* resident), wealth index (poorest, poorer, middle, richer, richest), media exposure (no, yes), mother's awareness (no, yes), sex of household head (female, male), mother's empowerment index (MEI) (low, medium, high), zone of states (Central, North, East, Northeast, West, South) and household electrification (no, yes). Mean values (in percentage) of the variables are presented in Table-2.

The definitions of variables for NFHS-I are as follows: Antenatal care includes if mothers' had at least one antenatal visit for pregnancy. Media exposure of children's mother includes whether a child's mother listens to radio every week or watches TV every week or goes to cinema hall at least once in a month. Mother's awareness includes whether child's mother heard family planning messages on radio or TV or had antenatal check ups at home by health workers or had antenatal visits for pregnancy. Definition of variables for NFHS-II and NFHS-III will be available at Patra (2008) and Patra (2008a) respectively.

[3] Details of its calculations are given in IIPS 2000: 39-41. SLI is calculated for NFHS-I using the same method, but it excludes the following variables—agricultural land ownership and household ownership.

The hypothesised direction of relationship between the dependent variable and each of the predictor variables is presented in Table-3.

Before going to the regression results, it is important to look at the possible collinearities among the predictor variables to avoid the problems of *multicollinearity*. As a thumb rule, when two predictor variables are correlated and both are relevant for explanation from a theoretical point of view, one should not eliminate one of the variables to reduce multicollinearity, unless the correlation coefficients are higher than about 0.8 (Retherford et al 1993: 39-40; Hill et al 2001: 264 (threshold to be 0.9)). But the *Pearson Correlation Matrix* (not reported) shows that none of the correlation coefficients is higher than the threshold magnitude. Also given the large sample-size in the data, the present analysis enjoys the luxury of keeping all the predictor variables.

3.1 *Effect on Full Immunisation Coverage in India*

There is evidence of gender discrimination in childhood immunisation in India (see Table-4) though the vaccines are freely available. In India, boys are still significantly more likely to be fully immunised than girl children though the gender gap fell to five percent in NFHS-III from 10 percent in the previous two rounds. Other researchers have also noted such behaviour of families in neglecting and discriminating against girl children (Choi et al 2006 (in rural areas only); Das Gupta 1987; Gatchell et al 2008, Islam et al 1996; Lloyd 1993; Rajeshwari 1996). Gender bias is an important obstacle against

improving immunisation coverage. However, Hill et al (1995) noted that although there are substantial varied variations in immunisation coverage by sex, the median difference across all countries is very close to zero.

There is a consistent inverse relationship between immunisation coverage and birth order of a child. The different likelihoods of immunisation for different birth orders are also strongly significant. One can think of two countervailing effects of higher-order births on the likelihood of vaccination. The positive one could be some kind of *learning effect* about immunisation which almost does not vary or may increase marginally with higher birth-order. The negative one could be some kind of *negligence effect* and this effect perhaps increasingly increases with higher birth-order. Thus for higher order births, it seems that the *negligence effect* more than offsets the *learning effect*.

Another variable namely, sex-wise birth-order, is constructed to see whether the likelihood of vaccination decreases with the increase in birth-order for girls only or not. The likelihood (unadjusted) of vaccination decreases with increase in birth-order irrespective of the sex of a child (see Table-5). Such an inverse relationship is also supported by Gatchell et al 2008, Partha et al 2002. However, Bronte-Tinkew et al 2005 finds a positive relationship between immunisation coverage and birth order.

Higher immunisation coverage in urban areas is affirmed by many researchers (Padhi, 2001; Pebley et al 1996). But, after controlling for other variables, the rural-urban disparity is not statistically significant (except NFHS-I in Table-4). This suggests that the unadjusted effect of rural-urban residence is actually due to the other predictor variables correlated with residence.

There is a strong positive relationship between mother's education and children's immunisation coverage. Such a positive effect of maternal education is also hypothesised by Akmatov et al 2007, Desai et al 1998, Gage et al 1997, Gatchell et al 2008, Islam et al 1996, Lee 2005, Low et al 2006, Mosley et al 1984, Padhi 2001, Parashar 2005, Pebley et al 1996, and Racine et al 2007 though Gauri et al 2002 finds a spurious effect.

Another variable, father's education, was also considered to examine its effect on the likelihood of vaccination as around half of Indian mothers are illiterate. This effect of father's education (unadjusted) is significantly positive but its impact is less than that of mother's education (see Table-5).

The chance of immunisation of children increases with their mother's age. A positive relationship is also noted by Steele et al 1996. In the context of rural Bangladesh, Islam et al 1996 show that the likelihood of vaccination decreases for the mothers older than 28 years.

Antenatal care during pregnancy is positively associated with childhood immunisation. Such a positive relationship is also noted by Choi et al 2006 (in rural areas only), Gatchell et al 2008, and Islam et al 1996. This shows the possibility of positive *information spillover* or *learning-by-doing* (Lee et al 2005) from antenatal care during pregnancy on childhood immunisation. Mothers who receive antenatal care may also receive counselling about the need for child immunisation.

The chance of immunisation also seems to vary with religion. The likelihood of being fully immunised is higher for children from Christian and other minority communities and lower for children from the Muslim community compared to their counterparts from Hindu households. Caste/ tribe also affects immunisation coverage. The chance of being fully vaccinated is consistent with the relative traditional social hierarchy of castes/ tribes.

The chance of immunisation increases with the standard of living index of the child's household. But for NFHS-III, incorporation of wealth index in the model wipes away the adjusted effect of SLI. The wealth index also has a significantly strong positive effect on immunisation. Mosley et al 1984 also argues for household income as a proximate determinant of immunisation coverage. Islam et al 1996, Bronte-Tinkew et al 2005 also noted such a positive relationship with household income. Though vaccines are freely available under UIP, household

income (as measured by SLI or wealth index) does have a positive effect on childhood immunisation.

Media exposure has a significantly positive effect on immunisation. The chance of full immunisation is higher for children of mothers' who have some media exposure compared to children whose mothers are not exposed to mass media. But Gauri et al 2002 do not find any significant effect of media. Mothers' awareness about immunisation has significantly strong positive effect on vaccination. Mother's empowerment index also has a positively significant effect on immunisation coverage in NFHS-III but not in NFHS-II.

The sex of household head does not have any statistically significant effect on immunisation. However, in the context of rural Orissa, Panda 1997 shows that children from male headed households are more likely to be immunised than those from female headed households. Moreover, he shows that the gender inequality (boys are more likely than girls) in preventive health care persists regardless of the gender of the household head.

The immunisation rate varies widely across different zones too. The chance is highest for West, followed by South, North, East, Central, and North-east. Household electrification has also a significantly strong positive role on full immunisation in India. Such a positive effect possibly works through availability of electronic mass media, establishment of an

institutional health facility in the vicinity, higher wealth index, *etc*. Islam et al 1996 also noted such a positive relationship.

3.2 *Effect on Full Immunisation Coverage in Rural and Urban India*

Separate regressions for rural and urban areas have tried to show clearly how the effects vary due to change in place of residence in lieu of a residence *dummy*. These regression results are compared with the all-India 'baseline' regressions. Unadjusted and adjusted effects on full immunisation coverage for rural and urban India are presented in Table-6 and -7.

Gender discrimination in immunisation against girl child prevails in rural India but in urban India it disappears after controlling for other variables. Media exposure does not have any significant effect on immunisation in urban India after controlling for other variables. The effects of the other variables remain the same as the baseline regression.

3.3 *Adjusted Effect of Demographic Factors on Full Immunisation in India*

Here a separate model is tried, incorporating only the demographic factors to see their independent effect. The adjusted effects of demographic factors on full immunisation coverage in India are shown in Table-8.

Urban children are significantly more likely to be vaccinated even if the rural-urban gap vanished after controls in the baseline regression. This implies that the unadjusted likelihoods for residence in baseline

regression capture mainly the effects of the selected socioeconomic variables. Hence it can be concluded that the rural-urban disparity is not due to demographic factors but to socioeconomic factors. The effects of the other variables remain the same as in the baseline regression.

3.4 *Adjusted Effect of Socioeconomic Factors on Full Immunisation in India*

Here a different model is tried, incorporating only socioeconomic factors to see their independent effect. The adjusted effects of socioeconomic factors on full immunisation coverage in India are shown in Table-9. MEI has a strictly positive effect on immunisation for both in NFHS-II and -III. Hence, we can argue that mother's empowerment occurs through the demographic factors (*e.g.,* caste, religion, etc.) along with the socioeconomic factors. The effects of all the variables remain the same as in the baseline regression.

4. Extension: Region-Specific Pattern

4.1 *Adjusted Effects on Full Immunisation in Three State-wise Groups*

A group of eight backward states with poor socio-demographic indicators was formed as *Empowered Action Group* (EAG). This consists of Bihar, Jharkhand, Madhya Pradesh, Chattisgarh, Orissa, Rajasthan, Uttar Pradesh, and Uttarakhand. The group was formed on 20th March, 2001 under the *Ministry of Health and Family Welfare* (MoHFW) to design and implement area-specific programmes to strengthen the primary health care infrastructure. The group of *North-Eastern* (NE) states

consists of eight states namely, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura. The remaining thirteen states (AP, Goa, Gujarat, Haryana, HP, J&K, Karnataka, Kerala, Maharashtra, Punjab, TN, WB, and Delhi) are clubbed as *Other* states. Mean values (in percentage) of the variables are presented in Table-10. Immunisation coverage rates for EAG and NE states are almost half of the rate for Other states.

Effects on full immunisation for EAG, NE and Other group of states are given in Table-11 and these are compared with the baseline model. Male children are significantly more likely to be vaccinated in EAG states only. Children of higher birth-order are less likely to be vaccinated, except for the children from NE states. Residence does not have any significant effect in each case. Children of more educated mothers are more likely to be immunised. The effect of mother's age has a positive effect except for the children of NE states. Children of mothers with some antenatal care are more likely to be vaccinated. Muslim children are the least likely to be immunised in each case. Children from backward caste/ tribal households are also deprived in terms of vaccination except in the NE states. The effects of household SLI or wealth index are significantly positive in EAG and other group of states. The effect of media exposure does not have any significant effect in NE and Other states and mother's awareness does not have any significant effect in NE states only. The gender of the household head does not have

any significant effect in any case. The likelihood of immunisation increases with MEI except for the NE states. Household electrification has a positive effect except in the NE states.

5. CONCLUSION AND DISCUSSION:

Six vaccine-preventable diseases are covered under UIP, and vaccination is given free of cost to every child in India. Though vaccines are available for free, the goals of UIP are far from being achieved even in two decades after its inception. The present study attempts to investigate the demographic and socio-economic determinants of immunisation in India. It is possible to give a *big push* to the immunisation uptake, only when one understands the demand-side factors well, to achieve the chartered goals of UIP. Though the supply-side factors play a crucial role, the present study provides a justification for concentrating on the demand-side as well since the supply-side factors alone has evidently failed to achieve the goals.

This study analyses the effects of some selected demographic and socioeconomic predictor variables on the chance of immunisation of a child. It focuses on immunisation coverage for children (a) in all India, (b) in rural and urban areas in India, (c) for three groups of states, namely, *Empowered Action Group*, *North-Eastern* and *Other* states. The study applies *binary bivariate* and *multivariate logit* model to the three rounds of *National Family Health Survey* data. Except for a few cases, the results are consistently robust across the different models.

ROBUST RESULTS:

- Boys are more likely to be immunised than girl children.
- Children of higher-order births are less likely to be vaccinated. This is true irrespective of the sex of a child. It seems that the *negligence effect* more than offsets the *learning effect*. The result perhaps shows the greater apathy on part of the parents to immunise subsequent children.
- The likelihood of immunisation is higher for children from urban areas. The rural-urban disparity in vaccination is not due to demographic factors but due to socioeconomic factors.
- The likelihood of vaccination increases with mother's education level, mother's age, mother's exposure to mass media and mother's awareness about immunisation.
- Some antenatal care during pregnancy raises immunisation chances significantly. This increases the possibility of meeting health personnel who help mothers to raise their awareness by disseminating information regarding immunisation.
- Among the religious groups, Muslim children are least likely to be immunised whereas children from Christian and other religious minority communities are most likely to be immunised in comparison of the Hindu children.
- The standard of living index or wealth index has a positive effect on immunisation.

- Children from households with electricity are more likely to be immunised.
- Compared to general caste children, OBCs are less likely to be immunised, followed by the SCs and STs.
- The gender of the household head has no effect on childhood immunisation.
- The likelihood of immunisation increases with the mother's empowerment index.

TENTATIVE RESULT:

- Children from the West zone are most likely to be immunised, followed by South, North, East, Central, and North-east.

These results suggest that a synergistic effort incorporating a number of other sectors is needed to achieve universal immunisation. Policies and programmes in other sectors such as education, welfare, industry, labour, information, environment, *etc*. have also to be informed and influenced by public health considerations (Gopalan 1994; Bose 2001). To stimulate immunisation coverage, policy makers should also try to improve mothers' education, media exposure, mothers' awareness, mothers' empowerment, wealth index of the household, electrification and to promote a small family norm. It is also necessary to target girl children, children from backward castes and Muslim religious community and children from EAG and NE states.

The provision of basic survival needs should be complementary with universal immunisation. For instance, measles in a healthy child is a negligible disease but mortality due to measles is 400 times greater in an undernourished population and the spread and severity of the epidemic is directly linked to overcrowding. Similarly, if an adequate amount of safe drinking water is made available, poliomyelitis will cease to be a problem (Sathyamala 1989: 27). It has been noted (EPW 1986) that 'health improvements brought about by immunisation … can only be sustained by availability of food, water and shelter and the political and economic power of the people to obtain them'. This is why it has been argued that the imposition of these techno-centric approaches to deal with the problems of child health in the third world operated to divert attention from the lack of basic survival needs.

As UIP is a 'massive, expensive and very complicated programme', the Government should focus on a long-term vision of providing basic survival needs universally instead of only filling up our children's intestines with the 'myopic' 'techno-centric' doses of vaccines. Preventive health care, therefore, requires immunisation as well as good sanitation, proper nutrition, availability of safe drinking water and shelter as the common minimum social needs that must be met before we embark on an ambitious plan of government outlay for development (Ghosh 1991). Let us hope that the Government learns from its experience in the past two-and-a-half decades and, soon embarks on such a long term vision.

The sustainability of the Indian growth experience is undeniably dependent on the quality of its human resources. In order to garner the optimum gain from its growth process as well as the well-documented 'demographic dividend', India needs manpower that is healthy and educated. Achieving universal immunisation is one of the early hurdles that the country needs to overcome in order to reap the benefits of rapid economic growth.

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APPENDIX:

TABLE-1: CHILDHOOD VACCINATIONS BY STATE, VARIOUS NFHS ROUNDS

Percentage among the living children age 12-23 months who received specific vaccinations at any time before the interview (from 'either source') by States						
	Full Vaccination			No Vaccination		
	NFHS-I (1992-93)	NFHS-II (1998-99)	NFHS-III (2005-06)	NFHS-I (1992-93)	NFHS-II (1998-99)	NFHS-III (2005-06)
India	**35.4**	**42.0**	**43.5**	**30.0**	**14.4**	**5.3**
North						
Delhi	57.8	69.8	63.2	6.7	5.1	9.8
Haryana	53.5	62.7	65.3	17.5	9.9	7.8
H.P.	62.9	83.4	74.2	8.7	2.8	1.9
J.& K.	65.7	56.7	66.7	16.2	10.4	4.5
Punjab	61.9	72.1	60.1	17.5	8.7	6.6
Rajasthan	21.1	17.3	26.5	48.5	22.5	6.2
Uttarakhand	19.8	21.2	60.0	43.3	29.4	9.1
Central						
Chhattisgarh	29.2	22.4	48.7	34.3	13.9	2.5
M.P.	29.2	22.4	40.3	34.3	13.9	5.0
U.P.	19.8	21.2	23.0	43.3	29.4	3.5
East						
Bihar	10.7	**11.0**	32.8	**53.4**	16.9	7.1
Jharkhand	10.7	**11.0**	34.2	**53.4**	16.9	4.4
Orissa	36.1	43.7	51.8	28.0	9.4	11.6
W.B.	34.2	43.8	64.3	22.4	13.6	5.9
Northeast						
Arunach.P.	22.5	20.5	28.4	47.5	28.7	**23.6**
Assam	19.4	17.0	31.4	43.6	33.2	15.6
Manipur	29.1	42.3	46.8	32.3	17.2	6.5
Meghalaya	9.7	14.3	32.9	54.9	**42.3**	17.0
Mizoram	56.4	59.6	46.5	14.5	10.5	7.0
Nagaland	**3.8**	14.1	**21.0**	75.0	32.7	19.7
Sikkim	NA	47.4	69.6	NA	17.6	3.2
Tripura	19.0	40.7	49.7	42.1	23.5	15.3
West						
Goa	**74.9**	82.6	78.6	5.4	**0.0**	**0.0**
Gujarat	49.8	53.0	45.2	18.9	6.6	4.5
Maharashtra	64.1	78.4	58.8	7.5	2.0	2.8
South						
Andhra P.	45.0	58.7	46.0	17.5	4.5	3.8
Karnataka	52.2	60.0	55.0	15.2	7.7	6.9
Kerala	54.4	79.7	75.3	11.4	2.2	1.8
Tamil Nadu	64.9	**88.8**	**80.9**	**3.3**	0.3	**0.0**

Number of observation: 11,853 for NFHS-I; 10,076 for NFHS-II; 10,419 for NFHS-III.

Note: In HFHS-I, survey was not done in Sikkim and J & K represents Jammu region only. In NFHS-I and –II, the three states of Uttarakhand, Chhttisgarh and Jharkhand were part of undivided Uttar Pradesh, Madhya Pradesh and Bihar respectively. Data for former three states are same as the latter three for NFHS-I and -II.

FIGURE-1: STATE-WISE COVERAGE RATE OF FULL VACCINATION, VARIOUS NFHS ROUNDS

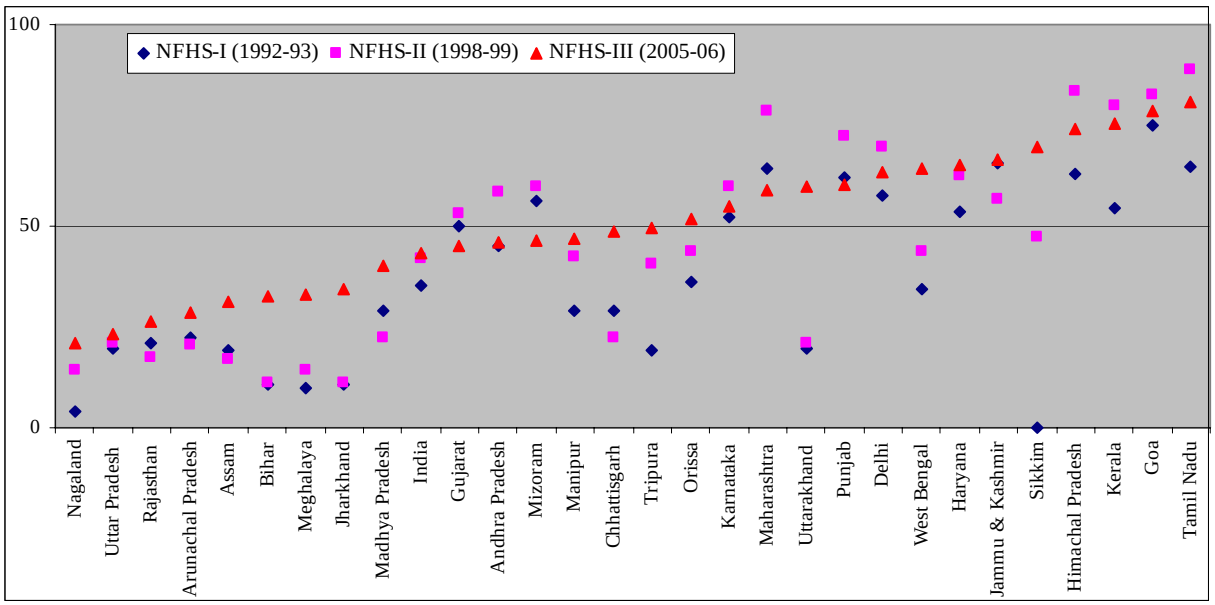
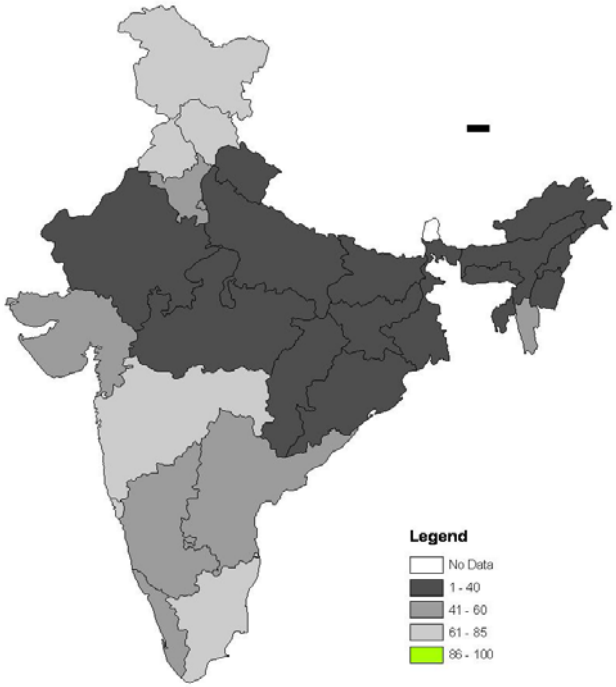


FIGURE-2: STATE-WISE FULL IMMUNISATION COVERAGE RATE IN NFHS-I (1992-93)



Note: In HFHS-I, survey was not done in Sikkim and J & K represents Jammu region only.

FIGURE-3: STATE-WISE FULL IMMUNISATION COVERAGE RATE IN NFHS-II (1998-99)

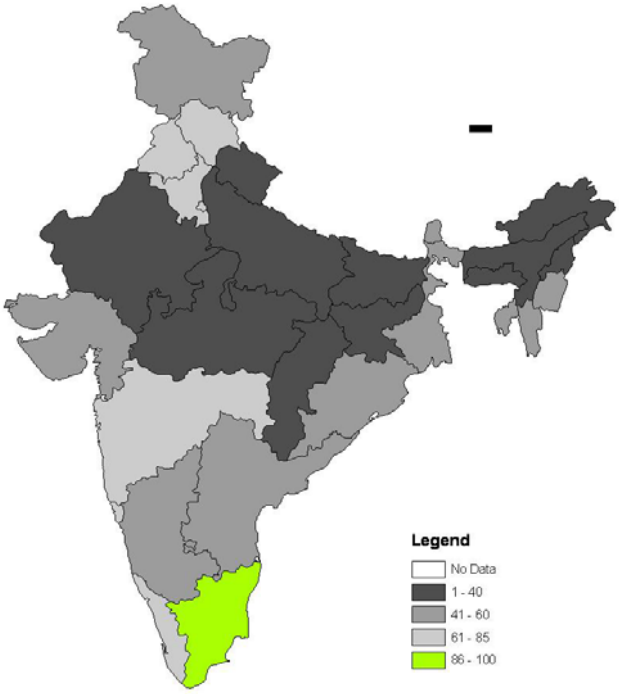


FIGURE-4: STATE-WISE FULL IMMUNISATION COVERAGE RATE IN NFHS-III (2005-06)

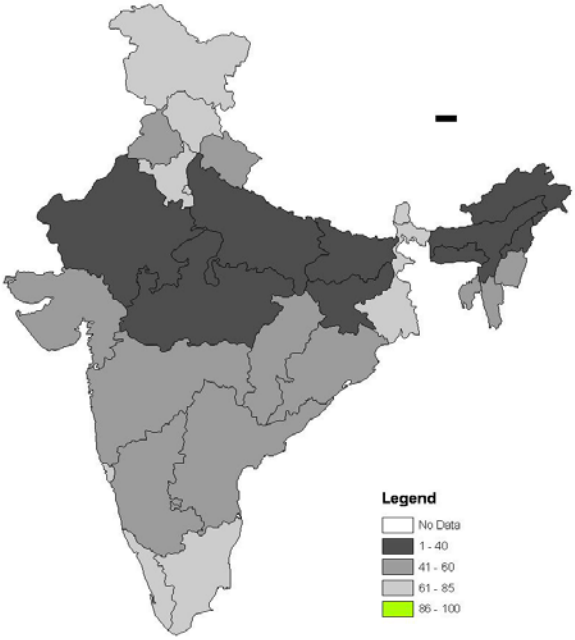


TABLE-2: MEAN VALUES* (IN PERCENTAGE) OF THE SELECTED VARIABLES

Variables	India			Rural			Urban		
	NFHS-I (1992-93)	NFHS-II (1998-99)	NFHS-III (2005-06)	NFHS-I (1992-93)	NFHS-II (1998-99)	NFHS-III (2005-06)	NFHS-I (1992-93)	NFHS-II (1998-99)	NFHS-III (2005-06)
Full Immunisation (Yes)	**35.4**	**42.0**	**43.5**	**30.9**	**36.6**	**38.6**	**50.7**	**60.4**	**57.6**
Sex of child (Male)	**51.1**	**51.2**	**53.2**	**50.7**	**51.4**	**52.8**	**52.2**	**50.7**	**54.4**
Birth order									
1#	**27.9**	**29.3**	**31.4**	**26.8**	**27.4**	**29.0**	**32.0**	**36.1**	**38.3**
2	**24.1**	**26.4**	**27.9**	**22.9**	**25.6**	**25.9**	**27.9**	**29.3**	**33.3**
3	**17.5**	**17.9**	**16.6**	**18.0**	**18.3**	**17.6**	**15.6**	**16.6**	**13.8**
4+	**30.5**	**26.3**	**24.1**	**32.3**	**28.7**	**27.5**	**24.5**	**18.0**	**14.6**
Residence (Urban)	**22.9**	**22.6**	**26.1**	—	—	—	—	—	—
Mother's education									
Illiterate#	**63.6**	**58.2**	**47.8**	**71.2**	**65.3**	**55.8**	**38.1**	**34.2**	**25.0**
Primary	**14.6**	**17.7**	**13.6**	**13.9**	**17.2**	**14.3**	**16.7**	**19.2**	**11.7**
Secondary	**18.8**	**9.1**	**32.9**	**14.0**	**8.1**	**27.5**	**35.1**	**12.5**	**48.2**
Higher	**3.0**	**14.9**	**5.7**	**0.9**	**9.3**	**2.3**	**10.1**	**34.1**	**15.1**
Mother's age									
15-19#	**11.7**	**12.2**	**9.1**	**12.7**	**13.3**	**10.3**	**8.3**	**8.3**	**5.7**
20-24	**38.8**	**39.6**	**41.5**	**38.8**	**39.6**	**41.3**	**38.7**	**39.5**	**42.0**
25-29	**28.6**	**29.8**	**30.3**	**27.5**	**28.7**	**28.9**	**32.4**	**33.4**	**34.3**
30-49	**21.0**	**18.4**	**19.0**	**21.0**	**18.3**	**19.4**	**20.7**	**18.7**	**17.9**
Antenatal care (Yes)	**65.8**	**62.3**	**72.5**	**60.3**	**55.5**	**68.2**	**84.3**	**85.5**	**84.5**
Religion									
Hindu#	**79.9**	**78.8**	**77.7**	**82.7**	**81.0**	**79.7**	**70.5**	**71.4**	**71.8**
Muslim	**14.9**	**15.9**	**17.4**	**12.7**	**14.1**	**15.6**	**22.4**	**22.1**	**22.5**
Christ and minorities	**5.2**	**5.3**	**4.9**	**4.6**	**4.9**	**4.7**	**7.2**	**6.4**	**5.7**
Caste/ Tribe									
General#	**77.6**	**37.9**	**27.6**	**74.6**	**34.3**	**23.2**	**87.4**	**49.8**	**39.9**
OBC	—	**20.4**	**41.2**	—	**21.6**	**42.4**	—	**16.2**	**37.7**
SC	**13.1**	**9.4**	**21.8**	**14.3**	**10.8**	**22.8**	**9.3**	**4.6**	**18.9**
ST	**9.3**	**32.3**	**9.4**	**11.1**	**33.2**	**11.6**	**3.3**	**29.4**	**3.5**
SLI									
Low #	**44.1**	**36.5**	**30.1**	**51.1**	**42.6**	**36.4**	**20.7**	**15.7**	**12.0**
Medium	**34.4**	**47.0**	**30.8**	**35.8**	**46.7**	**32.6**	**29.6**	**48.0**	**25.6**
High	**21.5**	**16.5**	**30.3**	**13.1**	**10.7**	**21.6**	**49.7**	**36.3**	**54.9**
NDR	—	—	**8.9**	—	—	**9.4**	—	—	**7.5**
Wealth Index									
Poorest#	—	—	**24.8**	—	—	**31.8**	—	—	**5.0**
Poorer	—	—	**22.3**	—	—	**27.4**	—	—	**8.0**
Middle	—	—	**19.5**	—	—	**21.0**	—	—	**15.3**
Richer	—	—	**17.7**	—	—	**13.7**	—	—	**29.0**
Richest	—	—	**15.8**	—	—	**6.3**	—	—	**42.7**
Media Exposure (Yes)	**47.3**	**54.9**	**55.1**	**38.8**	**46.2**	**45.5**	**76.0**	**84.7**	**82.1**
Mother's awareness(Yes)	**72.7**	**35.7**	**59.3**	**67.3**	**33.6**	**57.7**	**90.8**	**42.8**	**63.8**
Sex of HH-Head (Male)	**94.5**	**93.5**	**88.8**	**94.8**	**94.0**	**88.2**	**93.5**	**91.6**	**90.6**
MEI									
Low #	—	**77.4**	**38.1**	—	**80.3**	**41.7**	—	**67.6**	**28.0**
Medium	—	**12.4**	**24.7**	—	**11.3**	**24.7**	—	**16.2**	**24.7**
High	—	**10.2**	**37.1**	—	**8.4**	**33.6**	—	**16.2**	**47.3**
Zone									
Central#	**30.4**	**28.1**	**28.8**	**32.6**	**29.9**	**30.9**	**22.8**	**22.1**	**22.9**

North	**11.7**	**12.4**	**12.8**	**11.2**	**11.3**	**12.6**	**13.4**	**16.0**	**13.2**
East	**21.8**	**22.0**	**25.3**	**23.6**	**24.9**	**28.9**	**15.6**	**11.9**	**15.2**
Northeast	**4.0**	**3.3**	**3.6**	**4.6**	**3.8**	**4.2**	**2.1**	**1.5**	**2.1**
West	**13.5**	**13.8**	**13.6**	**11.2**	**11.1**	**10.3**	**21.3**	**23.0**	**23.0**
South	**18.6**	**20.5**	**15.9**	**16.8**	**19.0**	**13.2**	**24.7**	**25.6**	**23.7**
Electricity[$]									
No[#]	**—**	**—**	**36.4**	**—**	**—**	**46.2**	**—**	**—**	**8.9**
Yes	**46.9**	**55.4**	**54.8**	**37.2**	**45**	**44.6**	**79.7**	**90.8**	**83.7**
Number of children	**11853**	**10076**	**10419**	**9138**	**7795**	**7696**	**2715**	**2281**	**2723**

[#]: Reference category; *: Mean value of a variable represents the set of proportions of children falling in each category of that variable. Standard deviations of the variables are not reported. [$]: For electricity, the proportions do not add up to 100 because of the category of 'Not *de jure* resident' (NDR) that is not taken into the analysis (for NFHS-III).

TABLE-3: HYPOTHESISED RELATIONSHIP OF VARIABLES WITH FULL IMMUNISATION

Variable	Hypothesised Sign
Sex of Child	+
Birth Order	+
Residence	+
Mother's Education	+
Mother's Age	+
Antenatal Care	+
Religion	+/-
Caste/ Tribe	+/-
SLI	+
Wealth Index	+
Media Exposure	+
Mother's Awareness	+
Sex of HH-Head	-
MEI	+
Zone	+/-
Electricity	+

Note: See text for description of the variables.

TABLE-4: SUMMARY OF EFFECTS (P IN %) ON FULL IMMUNISATION COVERAGE IN INDIA

Background Variables		NFHS-I (1992-93)		NFHS-II (1998-99)		NFHS-III (2005-06)	
		Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Sex of Child	Female#	**34***	**29**	**41***	**39**	**41***	**41**
	Male	**37***	**32***	**43****	**43****	**45***	**43*****
Birth Order	1#	**46***	**37**	**54***	**49**	**55***	**50**
	2	**42***	**33***	**49***	**43***	**49***	**42***
	3	**34***	**29***	**39***	**35***	**39***	**39***
	4 & +	**22***	**24***	**24***	**35***	**26***	**33***
Residence	Rural#	**31***	**31**	**37***	**41**	**39***	**42**
	Urban	**51***	**29*****	**60***	**42**	**58***	**41**
Mother's Education	Illiterate#	**23***	**26**	**28***	**36**	**26***	**33**
	Primary	**45***	**35***	**52***	**45***	**46***	**44***
	Secondary	**63***	**42***	**63***	**52***	**62***	**51***
	Higher	**76***	**50***	**73***	**52***	**80***	**59***
Mother's Age	15-19#	**34***	**25**	**37***	**28**	**39***	**35**
	20-24	**39***	**29****	**45***	**38***	**45***	**38*****
	25-29	**38****	**34***	**46****	**47***	**46***	**45***
	30-49	**27***	**33***	**33***	**47***	**38**	**47***
Antenatal Care	No#	**11***	**17**	**18***	**30**	**23***	**30**
	Yes	**48***	**40***	**57***	**48***	**51***	**46***
Religion	Hindu#	**36***	**32**	**42***	**42**	**44***	**44**
	Muslim	**26***	**23***	**33***	**32***	**36***	**33***
	Christ &	**53***	**34**	**64***	**56***	**56***	**46**
Caste/ Tribe	General#	**38***	**32**	**47***	**42**	**55***	**46**
	OBC	—	—	**43***	**41**	**40***	**40***
	SC	**26***	**27***	**40***	**44**	**39***	**41****
	ST	**25***	**29**	**26***	**31***	**32***	**39***
Standard of Living Index	Low#	**23***	**28**	**30***	**39**	**28***	**41**
	Medium	**36***	**31*****	**43***	**40**	**42***	**43**
	High	**60***	**36***	**65***	**46***	**62***	**43**
	NDR	—	—	—	—	**39***	**37**
Wealth Index	Poorest#	—	—	—	—	**24***	**36**
	Poorer	—	—	—	—	**33***	**38**
	Middle	—	—	—	—	**47***	**44***
	Richer	—	—	—	—	**55***	**43***
	Richest	—	—	—	—	**71***	**51***
Media Exposure	No#	**22***	**29**	**25***	**38**	**29***	**40**
	Yes	**50***	**33***	**56***	**43***	**55***	**43****
Mother's Awareness	No#	**10***	**29**	**33***	**36**	**35***	**35**
	Yes	**45***	**31**	**58***	**51***	**50***	**47***
Sex of HH-Head	Female#	**42***	**29**	**48**	**40**	**41***	**41**
	Male	**35***	**31**	**42***	**41**	**44**	**42**
MEI	Low#	—	—	**39***	**41**	**40***	**39**
	Medium	—	—	**51***	**40**	**43***	**42****
	High	—	—	**58***	**43**	**47***	**45***
Zone	Central#	**22***	**24**	**22***	**28**	**29***	**32**
	North	**43***	**36***	**43***	**39***	**46***	**40***

	East	**22**	**23**	**27***	**31*****	**45***	**55***
	Northeast	**20**	**19****	**20**	**21****	**34****	**31**
	West	**59***	**48***	**71***	**66***	**54***	**39***
	South	**54***	**41***	**70***	**60***	**60***	**46***
Electricity	No[#]	**21***	**27**	**24***	**37**	**28***	**37**
	Yes	**51***	**35***	**57***	**44***	**55***	**45***

[#]: Reference category; Significance level (two tailed): ***10%, **5%, *1%.

TABLE-5: UNADJUSTED EFFECTS (P IN %) ON FULL IMMUNISATION COVERAGE IN INDIA

Background Variables		**NFHS-I (1992-93)**	**NFHS-II (1998-99)**	**NFHS-III (2005-06)**
Sex-wise Birth-order	Female, Birth-1[#]	**45***	**53****	**54***
	Female, Birth-2	**39***	**49****	**48***
	Female, Birth-3	**33***	**36***	**32***
	Female, Birth-4 & +	**20***	**23***	**24***
	Male, Birth-1	**46**	**55**	**55**
	Male, Birth-2	**44**	**49*****	**50****
	Male, Birth-3	**34***	**42***	**44***
	Male, Birth-4 & +	**24***	**25***	**27***
Father's Education	Illiterate[#]	**20***	**27***	**27***
	Primary	**35***	**40***	**40***
	Secondary	**45***	**47***	**50***
	Higher	**65***	**56***	**66***

[#]: Reference category; Significance level (two tailed): *** 10%, ** 5%, * 1%.

TABLE-6: SUMMARY OF EFFECTS (P IN %) ON FULL IMMUNISATION COVERAGE IN RURAL INDIA

Background Variables		**NFHS-I (1992-93)**		**NFHS-II (1998-99)**		**NFHS-III (2005-06)**	
		Unadjusted	**Adjusted**	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**
Sex of Child	Female[#]	**29***	**24**	**35***	**31**	**37***	**34**
	Male	**33***	**27***	**38***	**34***	**40***	**37****
Birth Order	1[#]	**41***	**31**	**48*****	**42**	**49**	**44**
	2	**36***	**27****	**44***	**36***	**44***	**37***
	3	**30***	**25***	**34***	**29***	**37***	**35***
	4 & +	**20***	**21***	**22***	**24***	**24***	**27***
Mother's Education	Illiterate[#]	**22***	**23**	**26***	**29**	**25***	**29**
	Primary	**43***	**31***	**48***	**36***	**44***	**39***
	Secondary	**59***	**37***	**59***	**43***	**60***	**47***
	Higher	**80***	**55***	**69***	**44***	**80***	**60***
Mother's Age	15-19[#]	**34***	**23**	**35***	**22**	**37***	**28**
	20-24	**35**	**24**	**40***	**30***	**41****	**32*****
	25-29	**31**	**28***	**40***	**39***	**39**	**38***
	30-49	**22***	**27****	**25***	**36***	**33**	**44***
Antenatal Care	No[#]	**11***	**15**	**17***	**23**	**21***	**25**
	Yes	**44***	**35***	**53***	**41***	**47***	**41***
Religion	Hindu[#]	**32***	**27**	**37***	**33**	**39***	**38**
	Muslim	**20***	**18***	**25***	**25***	**32***	**26***

	Christ &	**47***	**30**	**59***	**49***	**48***	**38**
Caste/ Tribe	General[#]	**33***	**27**	**40***	**34**	**50**	**40**
	OBC	—	—	**38**	**32**	**36***	**34***
	SC	**24***	**22***	**37*****	**37*****	**35***	**36*****
	ST	**24***	**24**	**24***	**23***	**30***	**34****
Standard of Living Index	Low[#]	**23***	**25**	**29***	**31**	**27***	**34**
	Medium	**34***	**26**	**39***	**33**	**40***	**37**
	High	**56***	**30***	**58***	**37****	**58***	**38**
	NDR	—	—	—	—	**35***	**30**
Wealth Index	Poorest[#]	—	—	—	—	**24***	**32**
	Poorer	—	—	—	—	**33***	**34**
	Middle	—	—	—	—	**48***	**41***
	Richer	—	—	—	—	**55***	**37**
	Richest	—	—	—	—	**69***	**43***
Media Exposure	No[#]	**21***	**24**	**24***	**30**	**29***	**35**
	Yes	**46***	**29***	**52***	**35***	**50***	**37*****
Mother's Awareness	No[#]	**10***	**23**	**28***	**28**	**30***	**29**
	Yes	**41***	**27**	**53***	**42***	**45***	**41***
Sex of HH-Head	Female[#]	**40***	**26**	**40***	**32**	**36***	**34**
	Male	**30***	**26**	**36*****	**33**	**39**	**36**
MEI	Low[#]	—	—	**34***	**32**	**37***	**33**
	Medium	—	—	**44***	**32**	**40****	**37****
	High	—	—	**50***	**34**	**40****	**39***
Zone	Central[#]	**20***	**21**	**19***	**23**	**25***	**25**
	North	**37***	**30***	**36***	**31***	**41***	**34***
	East	**20**	**19**	**25***	**25**	**42***	**50***
	Northeast	**17**	**16****	**17**	**15***	**33***	**27**
	West	**59***	**47***	**68***	**61***	**46***	**31****
	South	**50***	**35***	**66***	**52***	**57***	**40***
Electricity	No[#]	**21***	**23**	**24***	**30**	**27***	**32**
	Yes	**48***	**30***	**52***	**36***	**51***	**40***

[#]: Reference category; Significance level (two tailed): ***10%, **5%, *1%.

TABLE-7: SUMMARY OF EFFECTS (P IN %) ON FULL IMMUNISATION COVERAGE IN URBAN INDIA

		NFHS-I (1992-93)		**NFHS-II (1998-99)**		**NFHS-III (2005-06)**	
Background Variables		**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**
Sex of Child	Female[#]	**52**	**50**	**61***	**64**	**56***	**59**
	Male	**50**	**50**	**60**	**63**	**59*****	**59**
Birth Order	1[#]	**60***	**58**	**69***	**71**	**66***	**64**
	2	**58**	**53*****	**65****	**64****	**61****	**58****
	3	**49***	**47***	**58***	**59***	**47***	**53***
	4 & +	**31***	**37***	**38***	**49***	**36***	**51***
Mother's Education	Illiterate[#]	**29***	**40**	**39***	**51**	**33***	**46**
	Primary	**50***	**49***	**65***	**67***	**52***	**58***
	Secondary	**67***	**57***	**71***	**71***	**65***	**62***
	Higher	**75***	**60***	**76***	**69***	**80***	**69***
Mother's	15-19[#]	**36***	**34**	**47**	**45**	**52**	**56**

Age	20-24	**52***	**47***	**61***	**58***	**56**	**57**
	25-29	**56***	**54***	**64***	**66***	**63***	**63**
	30-49	**46****	**55***	**60***	**74***	**54**	**57**
Antenatal Care	No[#]	**15***	**24**	**28***	**52**	**36***	**49**
	Yes	**57***	**55***	**66***	**65***	**62***	**60***
Religion	Hindu[#]	**53***	**51**	**63***	**65**	**60***	**61**
	Muslim	**38***	**43***	**49***	**55***	**45***	**49***
	Christ &	**66***	**54**	**77***	**69**	**73***	**67**
Caste/ Tribe	General[#]	**52***	**50**	**63***	**64**	**64***	**62**
	OBC	—	—	**63**	**65**	**54***	**57****
	SC	**42***	**45**	**53***	**62**	**52***	**56*****
	ST	**36***	**47**	**46***	**51*****	**53****	**55**
Standard of Living Index	Low[#]	**27***	**37**	**43***	**65**	**34***	**61**
	Medium	**45***	**48***	**57***	**60**	**52***	**61**
	High	**64***	**56***	**72***	**66**	**67***	**57**
	NDR	—	—	—	—	**52***	**62**
Wealth Index	Poorest[#]	—	—	—	—	**27***	**53**
	Poorer	—	—	—	—	**33**	**48**
	Middle	—	—	—	—	**44***	**51**
	Richer	—	—	—	—	**56***	**56**
	Richest	—	—	—	—	**72***	**66*****
Media Exposure	No[#]	**31***	**50**	**38***	**61**	**36***	**55**
	Yes	**57***	**49**	**65***	**64**	**62***	**59**
Mother's Awareness	No[#]	**13***	**55**	**52**	**56**	**49**	**51**
	Yes	**55***	**49**	**72***	**71***	**63***	**63***
Sex of HH-Head	Female[#]	**45**	**43**	**65***	**64**	**60***	**62**
	Male	**51**	**50**	**60**	**63**	**57**	**58**
MEI	Low[#]	—	—	**56***	**63**	**52**	**56**
	Medium	—	—	**68***	**62**	**53**	**55**
	High	—	—	**72***	**65**	**63***	**62****
Zone	Central[#]	**36***	**37**	**36***	**42**	**45***	**52**
	North	**58***	**56***	**58***	**58***	**60***	**58**
	East	**35**	**37**	**44****	**46**	**56***	**64***
	Northeast	**40**	**37**	**46**	**45**	**39**	**40**
	West	**60***	**58***	**75***	**76***	**64***	**60***
	South	**63***	**60***	**79***	**77***	**65***	**63***
Electricity	No[#]	**29***	**49**	**32***	**46**	**28***	**48**
	Yes	**56***	**50**	**63***	**65***	**61***	**61***

[#]: Reference category; Significance level (two tailed): ***10%, **5%, *1%.

TABLE-8: ADJUSTED EFFECTS (P IN %) OF DEMOGRAPHIC FACTORS IN INDIA

Background Variables		**NFHS-I (1992-93)**	**NFHS-II (1998-99)**	**NFHS-III (2005-06)**
Sex of Child	Female[#]	**29**	**38**	**40**
	Male	**32***	**41****	**43***
Birth Order	1[#]	**42**	**53**	**55**
	2	**35***	**44***	**45***
	3	**29***	**34***	**37***
	4 & +	**21***	**25***	**26***
Residence	Rural[#]	**29**	**38**	**39**
	Urban	**37***	**46***	**49***
Mother's Age	15-19[#]	**22**	**23**	**28**
	20-24	**28***	**36***	**37***

	25-29	**35***	**47***	**48***
	30-49	**36***	**47***	**50***
Antenatal Care	No[#]	**14**	**25**	**27**
	Yes	**43***	**49***	**48***
Religion	Hindu[#]	**32**	**40**	**44**
	Muslim	**22***	**29***	**30***
	Christ &	**37****	**58***	**52***
Caste/ Tribe	General[#]	**33**	**43**	**51**
	OBC	**—**	**39***	**40***
	SC	**24***	**40****	**39***
	ST	**25***	**27***	**32***
Sex of HH-Head	Female[#]	**31**	**40**	**42**
	Male	**31**	**39**	**42**
Zone	Central[#]	**24**	**25**	**31**
	North	**40***	**39***	**40***
	East	**21****	**28**	**49***
	Northeast	**20*****	**19****	**33**
	West	**51***	**67***	**45***
	South	**41***	**61***	**52***

[#]: Reference category; Significance level (two tailed): ***10%, **5%, *1%.

TABLE-9: ADJUSTED EFFECTS (P IN %) OF SOCIOECONOMIC FACTORS IN INDIA

Background Variables		**NFHS-I (1992-93)**	**NFHS-II (1998-99)**	**NFHS-III (2005-06)**
Mother's Education	Illiterate[#]	**25**	**31**	**31**
	Primary	**37***	**47***	**46***
	Secondary	**48***	**55***	**55***
	Higher	**58***	**61***	**68***
Standard of Living Index	Low[#]	**32**	**43**	**43**
	Medium	**30*****	**38***	**43**
	High	**33**	**39****	**42**
	NDR	**—**	**—**	**40**
Wealth Index	Poorest[#]	**—**	**—**	**36**
	Poorer	**—**	**—**	**39*****
	Middle	**—**	**—**	**46***
	Richer	**—**	**—**	**45***
	Richest	**—**	**—**	**53***
Media Exposure	No[#]	**30**	**34**	**39**
	Yes	**34***	**46***	**45***
Mother's Awareness	No[#]	**15**	**33**	**36**
	Yes	**40***	**54***	**48***
MEI	Low[#]	**—**	**39**	**40**
	Medium	**—**	**45***	**43*****
	High	**—**	**49***	**45***
Electricity	No[#]	**25**	**29**	**38**
	Yes	**40***	**50***	**47***

[#]: Reference category; Significance level (two tailed): ***10%, **5%, *1%.

TABLE-10: MEAN VALUES (IN PERCENTAGE) OF THE SELECTED VARIABLES

	EAG States	**North-eastern States**	**Other States**

Variables	NFHS-I (1992-93)	NFHS-II (1998-99)	NFHS-III (2005-06)	NFHS-I (1992-93)	NFHS-II (1998-99)	NFHS-III (2005-06)	NFHS-I (1992-93)	NFHS-II (1998-99)	NFHS-III (2005-06)
Full Immunisation (Yes)	**20.5**	**20.1**	**31.6**	**19.5**	**20.2**	**34.1**	**53.2**	**65.7**	**59.4**
Sex of child (Male)	**51.9**	**51.5**	**53.0**	**49.6**	**56.8**	**53.2**	**50.3**	**50.6**	**53.5**
Birth order									
1#	**24.5**	**23.4**	**25.8**	**23.3**	**27.5**	**33.8**	**32.1**	**35.4**	**38.2**
2	**20.7**	**22.6**	**23.2**	**20.5**	**25.4**	**25.6**	**28.1**	**30.4**	**33.9**
3	**17.1**	**18.5**	**17.3**	**18.5**	**15.7**	**17.8**	**17.7**	**17.4**	**15.7**
4+	**37.7**	**35.5**	**33.7**	**37.7**	**31.4**	**22.9**	**22.0**	**16.8**	**12.2**
Residence (Urban)	**16.1**	**15.8**	**18.5**	**12.1**	**10.2**	**15.2**	**31.3**	**30.4**	**36.7**
Mother's education									
Illiterate#	**76.9**	**72.4**	**63.1**	**57.5**	**51.2**	**29.6**	**49.5**	**44.4**	**30.0**
Primary	**9.3**	**11.6**	**12.9**	**19.6**	**25.0**	**23.3**	**19.9**	**23.3**	**13.7**
Secondary	**11.3**	**6.4**	**20.2**	**21.2**	**13.6**	**43.2**	**26.9**	**11.6**	**48.1**
Higher	**2.5**	**9.6**	**3.8**	**1.7**	**10.2**	**4.0**	**3.6**	**20.7**	**8.2**
Mother's age									
15-19#	**9.7**	**11.7**	**8.9**	**14.0**	**11.7**	**8.2**	**13.6**	**12.7**	**9.5**
20-24	**35.8**	**36.8**	**38.3**	**31.4**	**32.4**	**37.4**	**42.7**	**42.9**	**45.9**
25-29	**28.3**	**28.5**	**30.8**	**28.2**	**30.0**	**29.0**	**29.0**	**31.1**	**29.9**
30-49	**26.2**	**23.0**	**22.1**	**26.4**	**25.8**	**25.4**	**14.7**	**13.3**	**14.7**
Antenatal care (Yes)	**47.8**	**39.4**	**60.7**	**56.4**	**60.2**	**70.3**	**86.3**	**85.7**	**87.5**
Religion									
Hindu#	**85.1**	**84.3**	**82.7**	**51.2**	**44.4**	**51.5**	**76.7**	**75.6**	**73.5**
Muslim	**13.5**	**14.4**	**15.4**	**29.2**	**31.2**	**22.5**	**15.2**	**16.4**	**19.5**
Christ and minorities	**1.4**	**1.30**	**1.9**	**19.6**	**24.3**	**26.0**	**8.2**	**8.0**	**7.0**
Caste/ Tribe									
General#	**74.4**	**32.4**	**19.8**	**69.2**	**47.7**	**30.3**	**81.8**	**42.7**	**37.8**
OBC	**—**	**21.5**	**48.6**	**—**	**8.9**	**18.7**	**—**	**20.1**	**32.9**
SC	**15.0**	**9.9**	**22.1**	**3.1**	**37.3**	**14.4**	**11.9**	**7.0**	**21.9**
ST	**10.6**	**36.2**	**9.4**	**27.7**	**6.1**	**36.5**	**6.3**	**30.2**	**7.4**
SLI									
Low #	**47.0**	**84.3**	**36.2**	**64.4**	**46.4**	**39.0**	**39.2**	**32.4**	**21.5**
Medium	**36.2**	**14.4**	**31.3**	**26.3**	**45.5**	**37.8**	**33.0**	**47.6**	**29.6**
High	**16.8**	**1.30**	**22.4**	**9.2**	**8.0**	**19.8**	**27.8**	**20.0**	**41.1**
Not dejure resident	**—**	**—**	**10.1**	**—**	**—**	**3.3**	**—**	**—**	**7.8**
Wealth Index									
Poorest#	**—**	**—**	**34.4**	**—**	**—**	**21.1**	**—**	**—**	**13.0**
Poorer	**—**	**—**	**25.8**	**—**	**—**	**33.1**	**—**	**—**	**17.0**
Middle	**—**	**—**	**17.2**	**—**	**—**	**25.6**	**—**	**—**	**21.8**
Richer	**—**	**—**	**12.4**	**—**	**—**	**13.2**	**—**	**—**	**24.7**
Richest	**—**	**—**	**10.2**	**—**	**—**	**7.0**	**—**	**—**	**23.6**
Media Exposure (Yes)	**32.5**	**39.0**	**42.4**	**36.4**	**51.5**	**50.8**	**64.6**	**71.2**	**71.3**
Mother's awareness (Yes)	**57.6**	**21.4**	**56.4**	**62.9**	**27.4**	**35.2**	**90.0**	**50.6**	**64.9**
Sex of HH-Head (Male)	**96.2**	**94.4**	**87.7**	**94.1**	**93.4**	**89.7**	**92.8**	**92.6**	**90.2**
MEI									
Low #	**—**	**84.6**	**40.9**	**—**	**82.9**	**20.9**	**—**	**69.8**	**36.1**
Medium	**—**	**9.2**	**25.0**	**—**	**9.8**	**21.6**	**—**	**15.9**	**24.7**
High	**—**	**6.2**	**34.1**	**—**	**7.3**	**57.5**	**—**	**14.3**	**39.2**
Electricity									
No#	**—**	**—**	**50.5**	**—**	**—**	**56.6**	**—**	**—**	**17.0**
Yes	**33.2**	**39.0**	**39.4**	**27.3**	**33.1**	**40.2**	**63.7**	**73.5**	**75.4**
Number of children	**5948**	**4901**	**5592**	**478**	**332**	**377**	**5427**	**4844**	**4450**

TABLE-11: ADJUSTED EFFECTS (P IN %) ON FULL IMMUNISATION COVERAGE

Background Variables		EAG States			North-eastern States			Other States		
		NFHS-I (1992-93)	NFHS-II (1998-99)	NFHS-III (2005-06)	NFHS-I (1992-93)	NFHS-II (1998-99)	NFHS-III (2005-06)	NFHS-I (1992-93)	NFHS-II (1998-99)	NFHS-III (2005-06)
Sex of Child	Female#	**14**	**15**	**27**	**12**	**11**	**30**	**53**	**68**	**60**
	Male	**19***	**18***	**30*****	**13**	**19*****	**27**	**54**	**69**	**61**
Birth Order	1#	**20**	**21**	**40**	**17**	**18**	**33**	**60**	**76**	**65**
	2	**17****	**20**	**31***	**17**	**15**	**30**	**56****	**69***	**59***
	3	**16****	**17****	**28***	**14**	**8**	**24**	**50***	**63***	**55***
	4 & +	**14***	**12***	**21***	**8**	**17**	**24**	**43***	**57***	**56***
Residence	Rural#	**16**	**16**	**29**	**12**	**14**	**30**	**55**	**68**	**61**
	Urban	**17**	**19**	**29**	**14**	**22**	**20**	**51****	**69**	**59**
Mother's Education	Illiterate#	**14**	**15**	**24**	**10**	**11**	**17**	**47**	**62**	**49**
	Primary	**23***	**19****	**32***	**12**	**16**	**25**	**53***	**71***	**62***
	Secondary	**25***	**28***	**42***	**20*****	**19**	**39***	**63***	**74***	**64***
	Higher	**35***	**25***	**48***	**33**	**39***	**49****	**69***	**76***	**73***
Mother's Age	15-19#	**12**	**11**	**18**	**10**	**23**	**32**	**47**	**56**	**60**
	20-24	**17***	**14*****	**25***	**12**	**15**	**27**	**51*****	**67***	**57**
	25-29	**18***	**20***	**34***	**16**	**16**	**28**	**58***	**73***	**62**
	30-49	**17****	**21***	**33***	**12**	**11**	**30**	**59***	**71***	**67*****
Antenatal Care	No#	**12**	**14**	**24**	**11**	**9**	**16**	**26**	**56**	**47**
	Yes	**23***	**23***	**32***	**14**	**20****	**35***	**58***	**70***	**62***
Religion	Hindu#	**17**	**18**	**31**	**18**	**16**	**36**	**55**	**70**	**62**
	Muslim	**12***	**11***	**19***	**8****	**10**	**17*****	**42***	**59***	**53***
	Christ &	**24**	**39***	**38**	**8*****	**21**	**26**	**56**	**75*****	**62**
Caste/ Tribe	General#	**18**	**18**	**30**	**13**	**19**	**32**	**54**	**67**	**64**
	OBC	**—**	**16**	**29**	**—**	**10**	**28**	**—**	**73***	**57***
	SC	**12***	**19**	**26****	**15**	**15**	**22**	**51**	**69**	**62**
	ST	**17**	**12****	**28**	**11**	**12**	**28**	**57**	**60****	**55****
Standard of Living Index	Low#	**15**	**14**	**27**	**10**	**17**	**28**	**49**	**69**	**65**
	Medium	**17*****	**18***	**30*****	**19*****	**14**	**30**	**52**	**66**	**62**
	High	**18**	**19****	**29**	**18**	**13**	**28**	**61***	**74*****	**60**
	NDR	**—**	**—**	**29**	**—**	**—**	**16**	**—**	**—**	**41***
Wealth Index	Poorest#	**—**	**—**	**25**	**—**	**—**	**18**	**—**	**—**	**49**
	Poorer	**—**	**—**	**28**	**—**	**—**	**31**	**—**	**—**	**49**
	Middle	**—**	**—**	**31****	**—**	**—**	**33**	**—**	**—**	**62***
	Richer	**—**	**—**	**31*****	**—**	**—**	**27**	**—**	**—**	**62***
	Richest	**—**	**—**	**35****	**—**	**—**	**42**	**—**	**—**	**71***
Media Exposure	No#	**16**	**16**	**27**	**13**	**12**	**29**	**52**	**67**	**60**
	Yes	**18*****	**18**	**32***	**12**	**19**	**28**	**54**	**69**	**61**
Mother's Awareness	No#	**15**	**15**	**25**	**9**	**14**	**25**	**57**	**62**	**52**
	Yes	**18**	**22***	**32***	**16**	**20**	**35**	**53**	**74***	**65***
Sex of HH-Head	Female#	**13**	**19**	**30**	**12**	**19**	**29**	**53**	**65**	**64**
	Male	**17**	**17**	**29**	**13**	**15**	**28**	**53**	**69**	**60**
MEI	Low#	**—**	**17**	**26**	**—**	**14**	**29**	**—**	**67**	**59**
	Medium	**—**	**13****	**30****	**—**	**16**	**29**	**—**	**72****	**59**
	High	**—**	**15**	**32***	**—**	**28**	**28**	**—**	**73***	**63****
Electricity	No#	**14**	**15**	**27**	**11**	**14**	**26**	**46**	**59**	**62**
	Yes	**22***	**20***	**31*****	**16**	**16**	**33**	**57***	**72***	**60**

#: Reference category; Significance level (two tailed): ***10%, **5%, *1%.