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Child Immunizations: A Comparative Study Across States in India

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ABSTRACT

Childhood immunization programs have been suggested as an infrastructure to deliver vitamin, a supplement to children in developing countries. Health education and vaccinations prevent the spread of infectious disease. In long term, they can even lead to the end of those diseases in a given country. Thus, in this paper we have considered those vaccinations which are must for children against different types of serious disease suffered by them during their childhood days and have analyzed its coverage across states in India. The conclusion which we are able to draw is that the considered indicators have shown an improvement over the considered period i.e. from 2005-06 to 2015-16. Moreover, increment in the percentage of children who received most of the vaccinations by the public health facility over the decade has also increased in case of all the considered states.

Keywords: Childhood immunization, vitamin, diseases, vaccinations, public health facility

Childhood immunization programs have been suggested as an infrastructure to deliver vitamin, a supplement to children in developing countries. Immunization services provide an efficient and sustainable delivery channel for vitamin A supplements. Immunizing children against vaccine preventable diseases can greatly reduce childhood morbidity and mortality. To protect against the consequences of vitamin A deficiency, the World Health Organization recommends that high-dose vitamin A supplements should be given together with routine vaccines to children. Studies show that combining delivery of vitamin A supplementation with immunization is safe and does not have a negative effect on sero conversion of childhood vaccines. Vitamin A supplements are also given to treat sick children and xerophthalmia, and is recommended in the treatment of malnutrition. These time windows are dominated by three different childhood vaccines: BCG vaccine given at birth, diphtheria-tetanus-pertussis (DTP) vaccine given between 1-5 months of age, and measles vaccine given at 9 months of age. These vaccines have been shown to have strong effects on mortality from infectious diseases in general, so-called non-specific effects. The live BCG and measles vaccine protect against more mortality than can be ascribed to the prevention of tuberculosis and measles, respectively. The inactivated DTP vaccine worryingly has been associated with increased mortality from other infectious diseases. Both positive and negative effects are strongest for girls. Thus, to optimize the child health intervention policy in low-income countries a shift in paradigm is needed. Health interventions should no longer be seen as merely specific and independent, and the policy should probably not be the same for boys and girls. Information on vaccination coverage was collected from the child's health card and direct reporting from the mother.

Bhatia M.R., Yesudian C.A.K., Gorter A. and K.R. Thankappan (2006) analyzed the concept of demand side financing and recommends piloting of a competitive voucher scheme as a mechanism for RCH services in India as because demand side

subsidies not only overcome many drawbacks of the supply side financing but also provide the right incentives for efficiency. Borooah Vani K, Dilip Diwakar, and Nidhi Sadana Sabharwa (2014) presents econometric estimates regarding the relative strength of personal and household circumstances in determining the likelihood of utilizing the programmer's services and suggests a trade-off between quality and utilization by hypothesizing that the poor quality of services leads upper-caste mothers to exit the ICDS market and seek these services elsewhere. Ghoshal Rakhi and Anup Dhar (2012) explained that India's child sex ratio has gone awry despite several monitoring and corrective mechanisms and considered "undesirableness" of daughters as the root cause. Padhi Sakti (2001) explained that Infant and child mortality was not a simple function of the level of economic development, pace of economic growth or material prosperity. Further he continues that Proximate conditions have a direct bearing on infant and child mortality which cannot be influenced through increases in income and purchasing power alone and were outside the market domain. Shantha Sinha (2006) explained that in a democracy, every child must be regarded as indispensable and the government must be accountable for the deaths of children and mothers. Sinha Dipa (2015) explained that the Rapid Survey on Children conducted in 2013–14, released after an inexplicable delay and still in a summary fashion, show some but patchy progress between 2005–06 and 2013–14 in maternal and child health indicators. A preliminary analysis made by them indicates that in areas where special efforts, some results are seen. Thus, calling for greater investments in health and nutrition within a more comprehensive approach.

In this paper we have considered the basic vaccinations which are must for children against different types of serious disease suffered by a child during his childhood days and have analyzed its coverage across states in India. For this purpose, we have used the NFHS data. The basic vaccines which are must are given as follows:

- One dose of Bacillus Calmette–Guérin (BCG) vaccine, which protects against tuberculosis.
- Three doses of DPT vaccine, which protects against diphtheria, pertussis (whooping cough), and tetanus.
- Three doses of polio vaccine
- One dose of measles vaccine

DEMOGRAPHIC PROFILE OF CHILDREN

Percentage of population below the 15 years of age

Percentage of population below 15 years of age have been shown in Table 1. In India, there are 34.9 per cent people who were below 15 years of age in 2005-06 whereas this percentage has declined to 28.6 per cent in 2015-16. Across the states, this percentage varied from 23.9 per cent to 43.8 per cent in 2005-06 and 20.2 per cent to 39.3 per cent in 2015-16. In 2005-06 and 2015-16, the top five states in terms of children under 15 year's age were Bihar, Meghalaya, Nagaland, Jharkhand and Arunachal Pradesh while the bottom five states were Goa, Kerala, Tamil Nadu, Delhi and Madhya Pradesh. The percentage of population below 15 years age have decreased in all the states over the decade but the highest decrease was in Nagaland, Rajasthan, Sikkim, Arunachal Pradesh and Madhya Pradesh whereas the least decrease was in Goa, Tamil Nadu and Meghalaya.

Table 1: Percentage share of Population below age 15 years across State in India

States	NFHS-4 (2015-16)			NFHS-3 (2005-06)
	Urban	Rural	Total	Total
Andhra Pradesh	23.2	23.9	23.7	30
Arunachal Pradesh	29.4	32.4	31.7	39.1
Assam	22.7	31.5	30.3	34.9
Bihar	34	40.1	39.3	43.8
Chhattisgarh	26.1	30.1	29.2	35.6
Goa	25	20	23.2	23.9
Gujarat	23.7	27.8	26	31.6
Haryana	27.4	28.1	27.8	34.7
Himachal Pradesh	20.8	25	24.6	29.3
Jammu & Kashmir	23.4	29.1	27.4	32
Jharkhand	27.4	34.8	32.9	39.5
Karnataka	23.5	25	24.4	30.9
Kerala	20.3	20.1	20.2	25.4
Madhya Pradesh	26.9	31.6	30.3	37.3
Maharashtra	23.3	25.6	24.5	30.6
Manipur	27.5	31.4	29.9	33.3
Meghalaya	27.9	38.7	36.5	40.4
Mizoram	27.2	33.5	29.9	35

Nagaland	30	33.1	32	39.9
Odisha	23.5	27.2	26.6	32.1
Punjab	23.1	23.3	23.2	29.6
Rajasthan	27.1	32.6	31.2	38.9
Sikkim	22.2	23.5	23.1	30.7
Tamil Nadu	22.4	24.1	23.3	26.6
Tripura	20.8	26	24.5	30
Uttarakhand	26.9	29.9	28.9	34.6
Uttar Pradesh	29.1	35.4	33.8	42.3
West Bengal	22.6	26.8	25.4	31.9
India	24.9	30.5	28.6	34.9
Mean	25.1	28.3	27.6	33.3
SD	3.1	5.1	4.4	4.9

Sources: *NFHS (2005-06) and (2015-16).*

Percentage of Children under age 5 years whose birth was registered across State in India, 2005-06 and 2015-16

Information on birth registration of children under age five years is present in Table 2. At the time of the survey, 80 percentages of children under age five years had birth registered with the civil authority; this includes 62 per cent of children with birth certificates. Female and male children are equally likely to have their birth registered. Children in urban areas (89 per cent) are more likely then children in rural areas (76 per cent) to have their birth registered. Birth registration is lowest in Uttar Pradesh (60 per cent) and Bihar (61 per cent). Birth registration among children under age five years doubled over the considered decade (from 41 per cent to 80 per cent). The percentage of births that were registered increased by more than 50 percentage points over the decade in Jharkhand, Bihar, Uttar Pradesh, Madhya Pradesh, and Rajasthan.

Table 2: Percentage of Children under age 5 years whose birth was registered across State in India. 2005-06 and 2015-16

States	NFHS-4 (2015-16)			NFHS-3 (2005-06)
	Urban	Rural	Total	Total
Andhra Pradesh	90.1	79.9	82.7	41.3
Arunachal Pradesh	80.0	58.3	62.9	32.4
Assam	97.4	93.8	94.2	43
Bihar	64.5	60.3	60.7	5.8
Chhattisgarh	92.6	84.4	86.1	73
Goa	98.9	99	98.9	94.7
Gujarat	97.2	94.8	95.8	85.6
Haryana	94.0	94.3	94.2	71.7
Himachal Pradesh	97.7	95.1	95.3	89
Jammu & Kashmir	90.5	73.3	77.4	35.8
Jharkhand	77.7	61.9	65	9.1
Karnataka	95.0	94.9	94.9	58.3
Kerala	97.3	98.1	97.7	88.6
Madhya Pradesh	92.2	78.4	81.9	29.7
Maharashtra	95.8	94.6	95.1	80
Manipur	74.8	59.7	64.8	30.4
Meghalaya	89.2	78.4	79.8	43.3
Mizoram	97.8	98	97.9	93.3
Nagaland	80.2	63.8	68.3	36.9
Odisha	90.0	80.7	82.1	57
Punjab	97.3	99	98.3	76.8
Rajasthan	81.5	62.5	66.6	16.4
Sikkim	98.6	98.4	98.5	85.7
Tamil Nadu	98.5	98.2	98.3	85.8
Tripura	96.8	89.9	91.6	74.4
Uttarakhand	81.8	74.2	76.7	38.4
Uttar Pradesh	67.9	58.1	60.2	7.1
West Bengal	97.3	96.7	96.9	75.8
India	88.8	76.1	79.7	41.2
Mean	90.4	77.5	85.3	58.3
SD	8.70	35.1	12.7	27.4

Sources: *NFHS (2005-06) and (2015-16).*

Sex ratio at birth for children born in the last five years

Sex ratio at birth for children represents the sex ratio at birth of female for every thousand males born within the last five years. Sex ratio at birth is less than 1000 in most of the states i.e. more male child has been born than female child. Kerala and Meghalaya are only in exception. That is the serious concern of the society. As many as 14 states have showed a decline in the sex ratio at birth. North-Eastern part of India is in crucial stage. Manipur, Mizoram and Sikkim have shown a tremendous fall in female sex ratio at birth per thousand males. In India, Sex ratio at birth for children born in the last five years (females per 1,000 males) has been shown in Table 3.

It was increased from 914 (in 2005-06) to 919 (in 2015-16) in India. Across the states, this ratio varies between 734 to 1091in 2005-06 and 809 to 1047 in 2015-16, the top five states in terms of under

children born in the last five years sex ratio were Jharkhand, Arunachal Pradesh, Andhra Pradesh, Assam, Mizoram. And the bottom five position in 2015-16 namely Punjab, Haryana, Delhi, Rajasthan, Maharashtra in 2005-06. Among them four states retained in the bottom five position in 2015-16 namely Delhi, Haryana, Punjab, Rajasthan and Sikkim.

Table 3: Sex ratio at birth for children born in the last five years (females per 1,000 males) across State in India, 2005-06 and 2015-16

State	NFHS-4 (2015-16)			NFHS-3 (2005-06)
	Urban	Rural	Total	Total
Andhra Pradesh	1,010	880	914	1035
Arunachal Pradesh	848	941	920	1,071
Assam	794	945	929	1,033
Bihar	942	933	934	893
Chhattisgarh	922	992	977	972
Goa	894	1,109	966	921
Gujarat	835	960	907	906
Haryana	785	867	836	762
Himachal Pradesh	1,151	920	936	913
Jammu & Kashmir	902	928	922	902
Jharkhand	893	926	919	1,091
Karnataka	875	935	910	922
Kerala	1,062	1,032	1,047	925
Madhya Pradesh	899	937	927	960
Maharashtra	920	927	924	867
Manipur	962	962	962	1,014
Meghalaya	891	1,030	1,009	907
Mizoram	926	970	946	1,025
Nagaland	1,014	935	956	984
Odisha	966	927	933	963
Punjab	792	909	860	734
Rajasthan	845	899	887	847
Sikkim	632	911	809	984
Tamil Nadu	972	939	954	896
Tripura	1,100	925	966	959
Uttarakhand	817	924	888	912
Uttar Pradesh	896	905	903	922
West Bengal	902	984	960	976
India	899	927	919	914
Mean	905	943.3	923.8	932.6
SD	104.2	182.3	52.3	82.2

Sources: *NFHS (2005-06) and (2015-16).*

COVERAGE OF VACCINATION ACROSS STATES IN INDIA

The coverage BCG vaccine among children age 12-23 months is shown in Table 4. The percentage of children age 12-23 months who have received BCG vaccination increased from 78.2 per cent in 2005-06 to 91.9 per cent in 2015-16. Across the state, this percentage varies between 77.2 per cent 98.9 per cent in urban areas, 65 per cent and 100 per cent in rural areas**.** The top five states are Goa, Jharkhand, Jammu & Kashmir, Kerala, Sikkim, and bottom five states are Nagaland, Mizoram, Arunachal Pradesh, Himachal Pradesh, Uttar Pradesh in urban areas Among them three states were retained in the bottom five position in rural areas namely Nagaland, Arunachal Pradesh and Mizoram. The other two states were Tripura, Assam. The percentage of children who received BCG vaccine have increased in all states from 2005-06 to 2015-16 but it increased the most in Assam, Madhya Pradesh, Jharkhand, Bihar, Uttar Pradesh where as it increased the least in Goa, Mizoram, Gujarat, Kerala, Himachal Pradesh.

Table 4: Percentage Children (12-23 months) have received BCG vaccine across State in India, 2005-06 and 2015-16

States	NFHS-4 (2015-16)			NFHS-3 (2005-06)
	Urban	Rural	Total	Total
Andhra Pradesh	97.7	97.1	97.3	93
Arunachal Pradesh	80.4	68	70.9	57.7
Assam	94.3	81	82.3	62.4
Bihar	91.5	91.7	91.7	64.7
Chhattisgarh	97.1	98.7	98.4	84.6
Goa	100	100	100	96.8
Gujarat	90.6	85.9	87.9	86.4
Haryana	93.8	92.3	92.8	84.9
Himachal Pradesh	88.1	95.3	94.8	97.2
Jammu & Kashmir	98.5	94.7	95.6	90.9
Jharkhand	98.7	95.1	95.8	72.7
Karnataka	89.2	95.2	92.5	87.8
Kerala	98.3	97.9	98.1	96.3
Madhya Pradesh	95	90.3	91.6	80.5
Maharashtra	90.3	89.8	90	95.3
Manipur	95.5	89.1	91.2	80
Meghalaya	96.2	84.4	86	65.9
Mizoram	79.2	71.4	75.3	86.4

Nagaland	77.2	65	68.4	46.3
Odisha	93.3	94.2	94.1	83.6
Punjab	97.7	98.5	98.2	88
Rajasthan	95.3	87	88.8	68.5
Sikkim	98.2	99.2	98.9	95.9
Tamil Nadu	96.2	93.9	94.9	99.5
Tripura	89.5	80	82.4	81.1
Uttarakhand	90.4	94	92.9	83.5
Uttar Pradesh	88.3	87.4	87.6	61
West Bengal	95.1	98.5	97.5	90.1
India	93.2	91.4	91.9	78.2
Mean	73.0	82.7	90.7	81.7
SD	58.5	39.4	8.1	13.7

Sources: NFHS-3 (2005-06) and NFHS-4 (2015-16).

The coverage for each of the basic vaccination among children age 12-23 months is shown for the year 2005-06 and 2015-16 in Table 5. Coverage was least for the third dose of polio vaccine (73 per cent). Although, more children received the first doses of the DPT and polio vaccines than the second or third doses, the dropout rates were higher for polio. The percentage of children age 12-23 months who have received 3 doses of polio vaccination decreased from 78.2 per cent in 2005-06 to 72.8 per cent in 2015-16. Across the state, this percentage varies between 93.7 per cent and 92 per cent in urban areas, 59.1 per cent and 94.8 per cent in rural areas**.** The top five states are Manipur, Punjab, Jammu & Kashmir, Chhattisgarh, Kerala and bottom states are Goa, Sikkim, Himachal Pradesh, Gujarat, Nagaland, in urban areas. Among them two states which retained in the bottom five position in rural areas were Goa, Nagaland. The percentage of children who received 3 doses of polio vaccine have increases for some states namely Madhya Pradesh, Kerala, West Bengal, Maharashtra, and Andhra Pradesh in 2015-16.

Table 5: Percentage of Children (12-23 months) who received 3 doses of polio vaccine across State in India, 2005-06 and 2015-16

States	NFHS-4 (2015-16)			NFHS-3 (2005-06)
	Urban	Rural	Total	Total
Andhra Pradesh	64.9	75.2	72.3	79
Arunachal Pradesh	62.8	51.0	53.7	55.8
Assam	76.4	53.7	56.0	59
Bihar	71.6	73	72.9	82.4
Chhattisgarh	87.5	80.2	81.7	85.1
Goa	93.7	91.4	92.9	87.2
Gujarat	61.5	63	62.3	65.3
Haryana	72.1	77	75.3	82.8
Himachal Pradesh	67.3	83.6	82.4	88.6
Jammu & Kashmir	85.9	83.1	83.8	82.2
Jharkhand	79.9	72.4	73.8	79.3
Karnataka	70.0	78.2	74.6	73.8
Kerala	89.6	87.6	88.5	83.1
Madhya Pradesh	69.5	61.5	63.6	75.6
Maharashtra	64.4	69.1	67	73.4
Manipur	84.7	72.7	76.6	77.5
Meghalaya	84.2	69	71.0	56.6
Mizoram	64.2	59.1	61.7	63.5
Nagaland	58.8	50.1	52.5	46.2
Odisha	79.9	83.3	82.8	65.1
Punjab	92.0	94.8	93.7	75.9
Rajasthan	68.5	64.5	65.4	65.2
Sikkim	87.1	88	87.7	85.6
Tamil Nadu	84.4	80.7	82.3	87.8
Tripura	78.9	67.2	70.1	65.3
Uttarakhand	67.2	68.4	68	80.3
Uttar Pradesh	69.8	67.8	68.3	87.6
West Bengal	82.5	90.1	87.9	80.8
India	73.4	72.6	72.8	78.2
Mean	58.6	66.9	74.0	74.8
SD	49.8	34.8	11.2	11.2

Sources: NFHS-3 (2005-06) and NFHS-4 (2015-16).

The percentage of children age 12-23 months who have received 3 doses of DPT vaccine increases from 55.3 per cent in 2005-06 to 78.4 per cent in 2015-16. Across the state, this percentage varies from 58 per cent to 94 per cent in urban areas while 49.7 per cent to 95.7 per cent in rural areas**.** The top five states were Goa, Chhattisgarh, Punjab, Jammu & Kashmir, Kerala and bottom states are Nagaland, Arunachal Pradesh, Mizoram, Uttar Pradesh, Haryana in urban areas Among them four states retained in the bottom five position in case of rural areas namely Nagaland, Arunachal Pradesh, Mizoram, Uttar Pradesh. The percentage of children who received 3 doses of DPT vaccine was highest in Manipur, Nagaland, Tripura, Tamil Nadu, Uttarakhand whereas the least was in Bihar, Himachal Pradesh, Goa, Haryana and Chhattisgarh (Table 6).

The percentage of children age 12-23 months who have received measles vaccine increases from 58.8 per cent in 2005-06 to 81.1 per cent in 2015-16.

Across the state, this percentage varies from 58 per cent to 94 per cent in urban areas whereas from 49.7 per cent to 95.7 per cent in rural areas**.**

Table 6: Percentage of Children (12-23 months) received 3 doses of DPT vaccine across State in India, 2005-06 and 2015-16

States	NFHS-4 (2015-16)			NFHS-3 (2005-06)
	Urban	Rural	Total	Total
Andhra Pradesh	84.9	90.6	89	61
Arunachal Pradesh	60	49.9	52.3	39.3
Assam	82.8	64.6	66.5	44.9
Bihar	79.3	80.2	80.2	46.1
Chhattisgarh	93.2	91	91.4	62.8
Goa	94	94.7	94.2	87.5
Gujarat	77.6	69.1	72.7	61.4
Haryana	71.6	79.2	76.5	74.2
Himachal Pradesh	74.8	85.8	85	85.1
Jammu & Kashmir	92.4	86.7	88.1	84.5
Jharkhand	87.1	81.3	82.4	40.3
Karnataka	72.7	82.1	77.9	74
Kerala	90.5	90.3	90.4	84
Madhya Pradesh	80.8	70.7	73.4	49.8
Maharashtra	75	74.8	74.9	76.1
Manipur	84.9	74.3	77.8	61.2
Meghalaya	88.1	71.8	74	47.3
Mizoram	63	60.4	61.7	66.8
Nagaland	58	49.7	52	28.7
Odisha	87.4	89.6	89.2	67.9
Punjab	92.6	95.7	94.5	70.5
Rajasthan	78.4	69.8	71.6	38.7
Sikkim	88.4	95	93	84.3
Tamil Nadu	86.3	83.1	84.5	95.7
Tripura	77.4	68.9	71.1	60.2
Uttarakhand	81	79.6	80	67.1
Uttar Pradesh	68.8	65.9	66.5	30
West Bengal	87.8	94.7	92.7	71.5
India	80.2	77.7	78.4	55.3

Sources: NFHS-3 (2005-06) and NFHS-4 (2015-16).

The top five states were Goa, Chhattisgarh, Punjab, Jammu & Kashmir, Kerala and the bottom states were Nagaland, Arunachal Pradesh, Mizoram, Uttar Pradesh and Haryana in urban areas. Among them, four states who retained in the bottom five position in rural areas were Nagaland, Arunachal Pradesh, Mizoram and Uttar Pradesh. The states with highest percentage of children who received measles vaccine were Tripura, Sikkim, Rajasthan, Odisha, Tamil Nadu whereas the percentage was least in Chhattisgarh, Bihar, Goa, Assam, and Gujarat (Table 7).

Table 7: Percentage of Children (12-23 months) received Measles Vaccination across State in India, 2005-06 and 2015-16

States	NFHS-4 (2015-16)			NFHS-3 (2005-06)
	Urban	Rural	Total	Total
Andhra Pradesh	92	88.4	89.4	69
Arunachal Pradesh	63.4	51.9	54.6	38.3
Assam	86.1	69.7	71.4	37.4
Bihar	77.3	79.6	79.4	40.4
Chhattisgarh	96.3	93.3	93.9	62.5
Goa	95.6	-98.2	96.5	91.2
Gujarat	76.7	73.7	75	65.7
Haryana	78.8	79.1	79	75.5
Himachal Pradesh	89.2	87.4	87.5	86.3
Jammu & Kashmir	92.1	84.2	86.2	78.3
Jharkhand	85.4	82	82.6	47.6
Karnataka	80.7	83.8	82.4	72
Kerala	90.3	88.6	89.4	82.1
Madhya Pradesh	85.1	77.7	79.6	61.4
Maharashtra	82.6	82.9	82.8	84.7
Manipur	81.8	70.4	74.2	52.9
Meghalaya	86.6	69.7	71.9	43.8
Mizoram	60.4	61.9	61.1	69.5
Nagaland	57	47.8	50.4	27.3
Odisha	84.7	88.5	87.9	66.5
Punjab	92.7	93.3	93.1	78
Rajasthan	86.5	75.8	78.1	42.7
Sikkim	90	94.8	93.3	83.1
Tamil Nadu	85.9	84.4	85.1	92.5
Tripura	76.9	67.3	69.7	59.9
Uttarakhand	77.7	81.8	80.6	71.6
Uttar Pradesh	70.8	70.8	70.8	37.7
West Bengal	88.4	94.5	92.8	74.7
India	83.2	80.3	81.1	58.8
Mean	63.9	72.3	80.3	64.5
SD	54.6	37.3	11.6	18.4

Sources: NFHS-3 (2005-06) and NFHS-4 (2015-16).

The percentage of children age 12-23 who were fully immunized increases from 43.5 per cent in 2005-06 to 62 per cent in 2015-16. Across the

state, this percentage varies from 41.6 per cent to 88.7 per cent in urban areas and from 33.4 per cent to 90.1 per cent in rural areas. The top five states were Punjab, Goa, Chhattisgarh, Kerala and Jammu & Kashmir whereas the bottom states were Nagaland, Arunachal Pradesh, Mizoram, Gujarat, Uttar Pradesh in urban areas Among them three states which retained in the bottom five position in rural areas were Nagaland, Arunachal Pradesh and Gujarat. The other two states were Madhya Pradesh, Assam. The states with the highest percentage of children who were fully immunized were Gujarat, Assam, Punjab, West Bengal and Mizoram whereas the least percentage was in Manipur Arunachal Pradesh, Chhattisgarh, Meghalaya, and Maharashtra (Table 8).

Table 8: Percentage of Children (12-23 months) fully immunized (BCG, measles, and 3 doses each of polio and DPT) Across State in India, 2005-06 and 2015-16

State	NFHS-4 (2015-16)			NFHS-3 (2005-06)
	Urban	Rural	Total	Total
Andhra Pradesh	60.4	67.2	65.3	46
Arunachal Pradesh	44.2	36.4	38.2	28.4
Assam	70.9	44.4	47.1	31.4
Bihar	59.7	61.9	61.7	32.8
Chhattisgarh	84.9	74.3	76.4	48.7
Goa	87.7	90.1	88.4	78.6
Gujarat	50.4	50.4	50.4	45.2
Haryana	57	65.1	62.2	65.3
Himachal Pradesh	NA	NA	69.5	74.2
Jammu & Kashmir	81.6	72.9	75.1	66.7
Jharkhand	67	60.7	61.9	34.2
Karnataka	59.8	64.8	62.6	55
Kerala	82.2	82	82.1	75.3
Madhya Pradesh	63	50.2	53.6	40.3
Maharashtra	55.8	56.7	56.3	58.8
Manipur	74.3	61.7	65.9	46.8
Meghalaya	81.4	58.5	61.5	32.9
Mizoram	49.8	51.3	50.5	46.5
Nagaland	41.6	33.4	35.7	21
Odisha	75	79.2	78.6	51.8
Punjab	88.7	89.3	89.1	60.1
Rajasthan	60.9	53.1	54.8	26.5
Sikkim	81.4	83.7	83	69.6
Tamil Nadu	73.3	66.8	69.7	80.9
Tripura	64.2	51.2	54.5	49.7
Uttarakhand	56.5	58.2	57.7	60
Uttar Pradesh	53.6	50.4	51.1	23
West Bengal	77.7	87.1	84.4	64.3
India	63.9	61.3	62	43.5
Mean	54.7	56.3	63.9	50.9
SD	41.2	33.8	14.1	17.4

Sources: NFHS-3 (2005-06) and NFHS-4 (2015-16).

COVERAGE OF VITAMIN- A SUPPLEMENTATION ACROSS STATES IN INDIA

The percentage of children age 9-59 months who received Vitamin A dose in last 6 months increases from 16.5 per cent in 2005-06 to 60.2 per cent in 2015-16. Across the state, this percentage varied from 36.4 per cent to 88.3 per cent in urban areas whereas from 22.9 per cent and 91.7 per cent in rural areas. The top five states in this regard were Goa, Sikkim, Mizoram, Karnataka, Odisha and bottom states were Rajasthan, Manipur, Nagaland, Uttarakhand, and Uttar Pradesh in urban areas. Among them the three states who retained in the bottom five position in rural areas were Nagaland, Manipur, Uttarakhand, Rajasthan.

Table 9: Percentage of Children (9-59 months) who received Vitamin A dose in last 6 months across State in India, 2005-06 and 2015-16

States	NFHS-4 (2015-16)			(2005-06)
	Urban	Rural	Total	Total
Andhra Pradesh	73.5	71.6	72.1	21.1
Arunachal Pradesh	49	36.8	39.4	15.8
Assam	58.5	50.5	51.3	12.2
Bihar	58.6	62.7	62.3	25.1
Chhattisgarh	73.3	69.4	70.2	8.9
Goa	88.3	91.7	89.5	31
Gujarat	69.9	72.2	71.2	12.8
Haryana	65.7	67.3	66.7	10.5
Himachal Pradesh	51	65.4	64.3	26.7
Jammu & Kashmir	68.1	63.6	64.7	12.6
Jharkhand	48.8	53.8	52.9	18
Karnataka	75.1	81.3	78.7	13.6
Kerala	74.3	74.5	74.4	31.5
Madhya Pradesh	65.6	58.6	60.4	12.5
Maharashtra	72.2	69.2	70.5	23.3
Manipur	39.1	28.4	32.1	11.2
Meghalaya	63.7	52.9	54.4	14.9
Mizoram	75.2	61.1	68.6	40.2
Nagaland	37.9	22.9	27.1	6.6

Odisha	74.8	68.1	69.1	20.4
Punjab	69.3	71.5	70.6	14.6
Rajasthan	47.3	37.5	39.6	8.6
Sikkim	80.5	86.2	84.3	18
Tamil Nadu	65.9	70.5	68.3	33.1
Tripura	69.1	60.7	62.8	28.3
Uttarakhand	36.9	36.9	36.9	12.8
Uttar Pradesh	36.4	40.4	39.5	5.6
West Bengal	65.7	69.6	68.4	31.7
India	62.9	59.1	60.2	16.5
Mean	62.3	55.9	60.8	18.4
SD	14	30.2	15.6	9.1

Sources: NFHS-3 (2005-06) and NFHS-4 (2015-16).

The state where there was the highest increase in the percentage of children who received Vitamin-A were Manipur, Odisha, Jharkhand, Uttarakhand, and Punjab. Whereas the least increment was in Chhattisgarh, Bihar, Assam, Arunachal Pradesh and Andhra Pradesh (Table 9).

CHILD VACCINATIONS THROUGH PUBLIC HEALTH SECTOR ACROSS STATES IN INDIA

The percentage of children age 12-23 months who received most of the vaccinations in public health facility increased from 82 per cent in 2005-06 to 90.7 per cent in 2015-16. Across the state, this percentage varied from 72.6 per cent to 94.7 per cent in urban areas, and from 81.7 per cent to 99.2 per cent in rural areas over the decade.

Table 10: Percentage of Children (12-23 months) received most of the vaccinations through public health facility across State in India, 2005-06 and 2015-16

States	NFHS-4 (2015-16)			(2005-06)
	Urban	Rural	Total	Total
Andhra Pradesh	83.4	94.9	91.6	43.4
Arunachal Pradesh	90.3	95.1	93.9	95.4
Assam	77.3	95.3	93.3	87
Bihar	87	96.4	95.5	73.2
Chhattisgarh	87.6	98.6	96.4	93.8
Goa	72.7	86.4	77.2	83.2
Gujarat	78.2	93.9	87.1	82.2
Haryana	91.4	96.6	94.8	92.6
Himachal Pradesh	94.7	98.1	97.9	96.3
Jammu & Kashmir	93.9	98.8	97.5	91.5
Jharkhand	81.5	98.3	95.3	83
Karnataka	77.8	96.1	88.2	74.8
Kerala	72.6	81.7	77.6	66
Madhya Pradesh	88.9	98.3	95.7	86.7
Maharashtra	78.5	92.3	86.2	79.6
Manipur	92.8	92.9	92.9	92.7
Meghalaya	81.1	94.3	92.4	87
Mizoram	86.8	98.3	92.2	93.7
Nagaland	84.6	94.7	91.7	93.1
Odisha	93.2	99.2	98.3	86.4
Punjab	80.4	94.3	89	85.5
Rajasthan	88.8	96	94.4	87.2
Sikkim	91.9	95.1	94.1	98.6
Tamil Nadu	78.7	91.9	86.1	75
Tripura	92.6	99.2	97.4	87.2
Uttarakhand	87.6	92.4	91	81.7
Uttar Pradesh	77.5	86.4	84.5	80.5
West Bengal	90.4	99	96.6	92.5
India	82.1	94.2	90.7	82
Mean	67.4	88.6	91.8	84.4
SD	53.6	37.7	5.5	11.1

***Sources**: NFHS-3 (2005-06) and NFHS-4 (2015-16).*

The top five states were Himachal Pradesh, Jammu & Kashmir, Tripura, Manipur and Odisha while the bottom states were Kerala, Goa, Assam, Uttar Pradesh and Karnataka in urban areas. Among them the three states which retained in the bottom five position in rural areas were Kerala, Goa, Uttar Pradesh, Maharashtra, and Tamil Nadu. The states showing highest increase in the percentage of children who received most of the vaccinations in public health facility were Andhra Pradesh, Arunachal Pradesh, Bihar, Assam, and Chhattisgarh whereas the least occurred in West Bengal, Uttar Pradesh Odisha, Tamil Nadu and Uttarakhand (Table 10).

CONCLUSION

Percentage of population below 15 years of age has experienced reduction over the decade. In case of all the indicators considered to analyze child immunization it was observed that all the them namely birth registration among children under the age of five years, sex ratio at birth for the children born, percentage of children who received BCG vaccine, percentage of children who received 3

doses of polio vaccine, coverage of DPT vaccine and measles vaccine, percentage of children who received Vitamin-A and the percentage of children who received most of the vaccinations by the public health facility has shown an improvement over the considered period i.e. from 2005-06 to 2015-16. Jharkhand, Bihar, Uttar Pradesh, Madhya Pradesh, and Rajasthan showed highest increment in case of birth registration. Assam, Madhya Pradesh, Jharkhand, Bihar, Uttar Pradesh showed the highest increment in the percentage of children who received BCG vaccine. Madhya Pradesh, Kerala, West Bengal, Maharashtra, and Andhra Pradesh showed the highest increase in the percentage of children who received 3 doses of polio vaccine. Coverage of DPT vaccine was highest in Manipur, Nagaland, Tripura, Tamil Nadu and Uttarakhand and the states showing highest increment in coverage for measles vaccine for children were Tripura, Sikkim, Rajasthan, Odisha and Tamil Nadu whereas the increment in the percentage of children who received most of the vaccinations by the public health facility over the decade has also increased in case of all the states.

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