COMPARATIVE ASSESSMENT OF IMMUNIZATION COVERAGE TRENDS IN INDIA: A STUDY BASED ON NFHS 3 AND NFHS 4 DATA

Presented By:
Dr Nikita Rao
Roll no.: 788
MBA Hospital and Health Management 23

What is Immunization?

Immunization is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vaccine.(WHO)

What is Vaccination?

Vaccination is one of the most effective ways to prevent diseases. A vaccine helps the body's immune system to recognize and fight pathogens like viruses or bacteria, which then keeps us safe from the diseases they cause.(WHO)

About NFHS

NFHS- The National Family Health Survey is a large scale, multi-round survey conducted in a representative sample of households throughout India.

- The NFHS is a collaborative project of the International Institute for Population Sciences (IIPS), Mumbai, India. GOI designed IIPS as the nodal agency, responsible for providing coordination and technical guidance for the NFHS.
- NFHS was funded by the United States Agency for International Development (USAID) with supplementary support from United Nations Children's Fund (UNICEF).

NFHS1- The first National Family Health Survey was conducted in 1992-93.

- The survey collected extensive information on population, health and nutrition with an emphasis on women and young children.

Contd...

NFHS2- It was conducted in 1998-99 in all 26 states of India with added features on the quality of health and family planning services, domestic violence, reproductive health, anaemia, nutrition of women and the status of women.

NFHS3- It was conducted in 2005-06 and it was the third in the series of the national surveys.

- NFHS-3 was designed to provide estimates of important indicators on family welfare, maternal and child health, and nutrition.
- NFHS-3 also provides information on several new and emerging issues, including family life education, safe injections, perinatal mortality, adolescent reproductive health, high-risk sexual behaviour, tuberculosis, and malaria.
- NFHS-3 interviewed all women age 15-49 and all men age 15- 54. Information on nutritional status, including the prevalence of anaemia, is provided in NFHS3 for women age 15-49, men age 15-54, and young children unlike previous surveys.

Contd…

- A special feature of NFHS-3 is the inclusion of testing of the adult population for HIV.
- NFHS-3 is the first nationwide community-based survey in India to provide an estimate of HIV prevalence in the general population and was carried out in 29 states of India the funding was provided by USAID, The Bill and Melinda Gates foundation, UNICEF, UNFPA.
- The National AIDS control Organisation (NACO) and the National AIDS Research Institute (NARI) are providing technical assistance for the HIV component.

NFHS4

- The 2015-16 National Family Health Survey was the fourth in the NFHS series,
- It provides information on population, health, and nutrition for India and each state and union territory.
- Funding for NFHS-4 was provided by the United States Agency for International Development (USAID), the United Kingdom Department for International Development (DFID), the Bill and Melinda Gates Foundation (BMGF), UNICEF, UNFPA, the MacArthur Foundation, and the Government of India.
- ICF provided technical assistance through the DHS Program, which is funded by USAID.
- Assistance for the HIV component of the survey was provided by the National AIDS Control Organization (NACO) and the National AIDS Research Institute (NARI), Pune.
- NFHS-4 fieldwork was conducted by 14 Field Agencies (FAs), and 7 laboratories conducted the HIV testing.

Introduction

- Vaccination is proven and one of the most cost-effective child survival interventions.
- All countries in the world have an immunization programme to deliver selected vaccines to the targeted beneficiaries, specially focusing on pregnant women, infants and children, who are at a high risk of diseases preventable by vaccines.
- Childhood immunization is one of the most effective activities in health care. Immunization against common childhood diseases has been an integral component of mother and child health services in India since adoption of the primary health care approach in 1978.
- The programme was given the status of a National Technology Mission in 1986(GOI) to provide a feeling of urgency and commitment to achieve the goals within the specified period.
- Universal Immunization Programme (UIP) became a part of the Child Survival and State Motherhood Programme in 1992 and Reproductive and Child Health (RCH) programme in 1997.
- The GOI has been working in collaboration with WHO, UNICEF and other international and national organization to achieve the universal immunization of children.

Contd…

- More than 1.5 million children die and more than a million are disabled every year in India, Due to vaccine-preventable diseases.
- India's high mortality rate among children under the age of five in 48 deaths every 1000 live births. It has missed its Millennium Development Goal of bringing under five mortality down to 42 per 1000 live births.
- The Government's UIP has helped to reduce the mortality figure from 125 in 1990 by focusing on immunization coverage, that is by increasing the number of children getting vaccinated.
- The first new antigen added since the beginning of UIP was hepatitis B vaccine when in the year 2002/2003, it was introduced as a pilot in selected 33 districts and 14 metropolitan areas of India.
- In 2011, HepB vaccine became the 7^{th} antigen to be introduced in the UIP across the country.
- *Haemophilus influenzae* type b (Hib) vaccine has been introduced in Kerala and Tamil Nadu states starting December 2011.
- The timeliness of vaccination is an important factor considering age should be important public health goal. Timely vaccination is defined as administration of vaccine doses at the recommended time or by the maximum recommended age. Timeliness of vaccination was classified as early, on time, delayed or never based on the recommended vaccination schedule.

Contd…

- Vaccination after 32 days from National schedule was considered as delayed.
- Timely vaccination is essential to develop adequate immunity and minimizing susceptibility to vaccine preventable diseases and vaccines given too early or with a shortened interval between doses may also result in a suboptimal immune response, leading to a false sense of protection.
- The first doses of smallpox vaccine lymph in India arrived in May 1802.
- Anna Dusthall, a three year old child from Bombay (now Mumbai) became the first person in India to receive smallpox vaccine on June 14, 1802[6]. From Bombay, through human chain of vaccines, the smallpox vaccine as lymph was sent to Madras, Poona (Pune), Hyderabad and Surat.

Evolution of the Immunization programme

- 1978: Expanded Programme of immunization (EPI)Limited reach - mostly urban
- 1985: Universal Immunization Programme (UIP).
  - For reduction of mortality and morbidity due to 6 VPD's
  - Indigenous vaccine production capacity enhanced
  - Cold chain established
  - Phased implementation - all districts covered by 1989-90
  - Monitoring and evaluation system implemented
- 1986: Technology Mission on Immunization Monitoring under PMO's 20 point programme

Coverage in infants (0 – 12 months) monitored

- 1992: Child Survival and Safe Motherhood (CSSM)
  - Included both UIP and Safe motherhood program
- 1997: Reproductive Child Health (RCH 1)
- 2005: National Rural Health Mission (NRHM)
- 2012: Government of India declared 2012 as "Year of Intensification of Routine Immunization.
- 2013: India, along with other South-East Asia Region, declared
  - commitment towards measles elimination and rubella/congenital rubella
  - syndrome (CRS) control by 2020.
  - 2014: No Wild Polio virus case was reported from the country for the last three years and India had a historic achievement and was certified as "polio free country" along with other South East Asia Region (SEAR) countries of WHO.

Vaccines under UIP

1. BCG (Bacillus Calmette Guerin)
2. DPT (Diphtheria, Pertussis and Tetanus Toxoid)
3. OPV (Oral Polio Vaccine)
4. Measles
5. Hepatitis B
6. TT (Tetanus Toxoid)
7. JE vaccination (in selected high disease burden districts)
8. Hib containing Pentavalent vaccine (DPT+HepB+Hib) (In selected States)

Diseases protected by vaccines under UIP

1. Diphtheria
2. Pertussis
3. Tetanus
4. Polio
5. Tuberculosis
6. Measles
7. Hepatitis B
8. Japanese Encephalitis (commonly known as brain fever)
9. Meningitis and Pneumonia (caused by Haemophilus Influenzae type b)

Literature Review

- According to the NPP (National Population Policy) universal immunization of children against all vaccine preventable diseases should be achieved.
- A NFHS based trend comparison shows that prior to NRHM full immunization coverage in India improved at a sluggish pace from 35.4% in 1992-93 to 42% in 1989-99.
- Review of literature was conducted to understand and explore the country level immunization coverage in India. The literature search for the study also includes reports and articles.

1. In a study conducted by Vandana Gurnani et al in 2018 "Improving vaccination coverage in India: lessons from Intensified Mission Indradhanush, a cross-sectoral systems strengthening strategy" shows that the cross-sectoral participation can increase vaccination rates in children at high risk Strengthening of the system and practice changes could make it more effective.

Contd…

2.In a study conducted by Rajesh Kumar Sood et al (2015) "High Immunization Coverage but Delayed Immunization Reflects Gaps in Health Management Information System (HMIS) in District Kangra, Himachal Pradesh" stated that only 29% children were immunized. Immunization records revealed 68% of the children were at least one immunization delayed over 32 days.

3. In a study conducted by Chintu C. Chaudhary et al in Ahmedabad 2016 the overall immunization coverage in the study was 80.7% which was above the national average. Improvement should focus on bottlenecks by reducing the dropouts from penta 1st dose to penta 3rd dose and improving coverage of measles and Vitamin A.

Research question

- What is Full immunization coverage among the children of age 12-23 months in India as per the report of NFHS3 and NFHS4?

Aim

❖To get the knowledge of Immunization Coverage of India through the report of NFHS3 and NFHS4.

Objectives

❑To compare and find out the gaps of Immunization coverage in India.

❑To find what all vaccines has been included timely as per needs.

❑To study the schemes introduced by government to enhance the immunization.

Research Methodology

Type of Study: Secondary

Study Design: Descriptive

Source of Data: Data is taken from the reports of NFHS3 and NFHS4

Sample: Living children age of 12-23 months

The study design used for NFHS3 and NFHS4-

- **NFHS-3** adopted a two-stage sample design in most rural areas and a three-stage sample design in most urban areas.
- In each state, the rural sample was typically selected in two stages: the first stage involved selection of Primary Sampling Units (PSUs), i.e., villages, with probability proportional to population size (PPS); the second stage involved the systematic selection of households within each PSU.
- Interviews were conducted with 124,385 women age 15-49 and 74,369men age 15-54 from all 29 states throughout India.

NFHS4

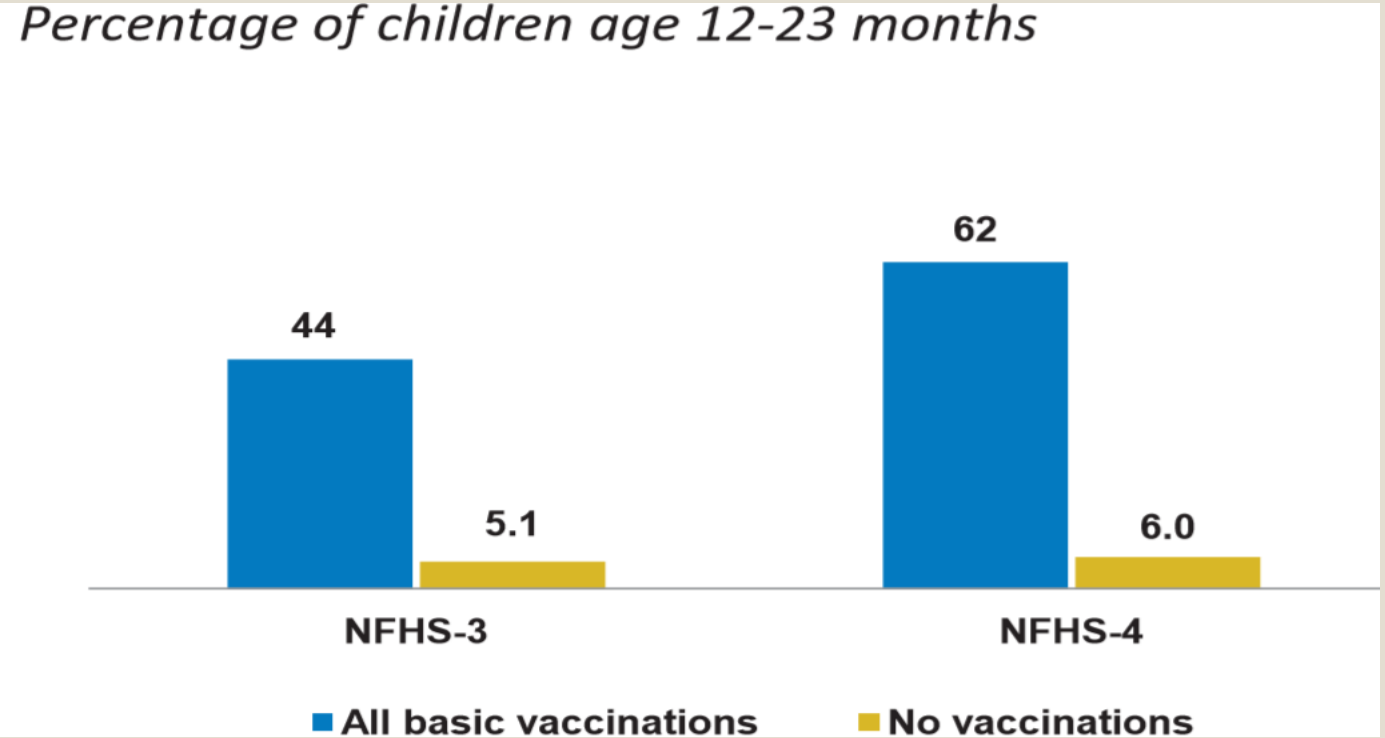
- The NFHS-4 sample is a stratified two-stage sample.
- The 2011 census served as the sampling frame for the selection of PSUs. PSUs were villages in rural areas and Census Enumeration Blocks (CEBs) in urban areas.
- PSUs with fewer than 40 households were linked to the nearest PSU. Within each rural stratum, villages were selected from the sampling frame with probability proportional to size (PPS).
- In each stratum, six approximately equal substrata were created by crossing three substrata, each created based on the estimated number of households in each village, with two substrata, each created based on the percentage of the population belonging to scheduled castes and scheduled tribes (SCs/STs).

Data Analysis

- The data has been taken for the group of 12-23 month of children which shows the immunization coverage of vaccines. Vaccine doses which are included for the comparison are BCG, 3 doses of polio vaccine, 3 doses of DPT vaccine and measles vaccine.
- In NFHS4 three doses of HepB is also included and found to be 62.8% in India.
- The percentage of full immunization has increased in rural area from 39%(NFHS3) to 61%(NFHS4) than in urban areas from 58% (NFHS3) to 64%(NFHS4).
- The percentage of 3 doses of Polio is observed to be slightly low in NFHS4 78% than in NFHS3 73%.
- Most of the vaccines were received in public Health facilities.

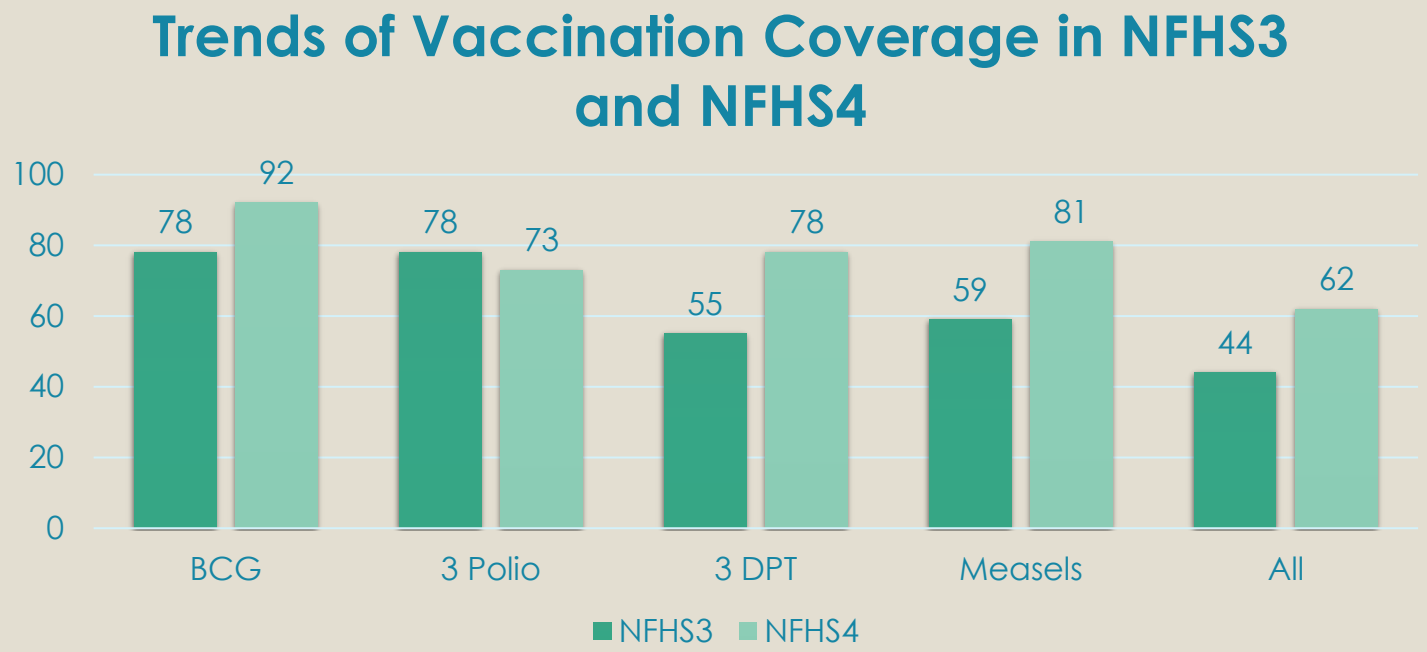
	NFHS3	Urban	Rural	NFHS4	Urban	Rural
Conducted years	2005-06			2015-16		
Immunization status (Fully Immunized)	44%	58%	39%	62%	64%	61%
BCG	78%	87%	75%	92%	94%	91%
three doses of Polio Vaccine	78%	83%	77%	73%	73%	73%
three doses of DPT Vaccine	55%	69%	50%	78%	80%	78%
Measles Vaccine	59%	72%	54%	81%	83%	80%

Percentage of children Received Vaccines in NFHS3 and NFHS4



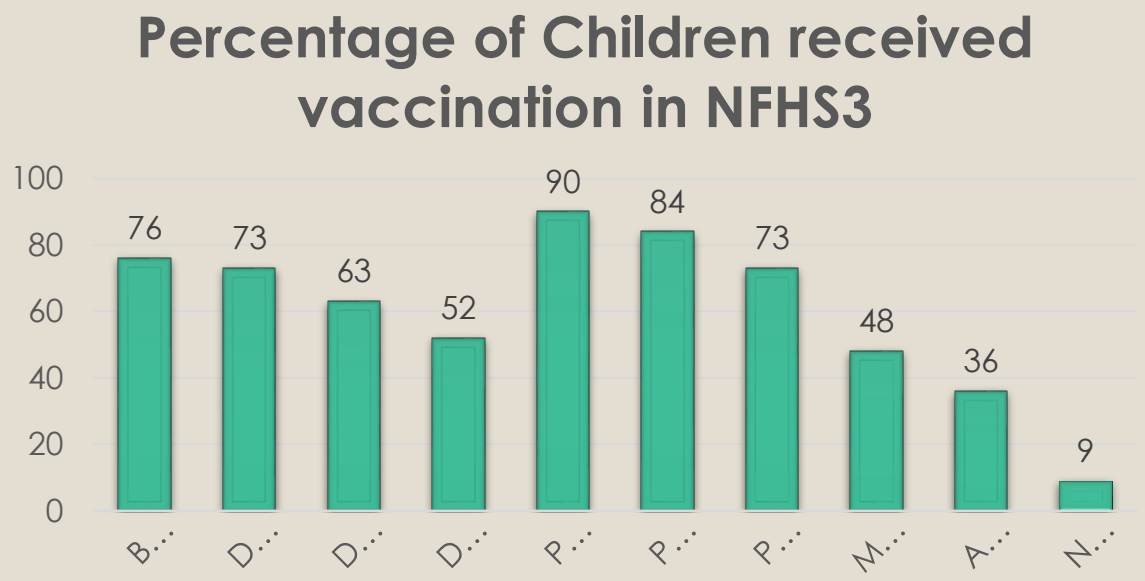
- The percentage of children age 12-23 months who have received all basic vaccinations increased from 44% in 2005-06 to 62% in 2015 and children who didn't receive any vaccine was quite close to 5.1% in NFHS3 and 6% in NFHS4.

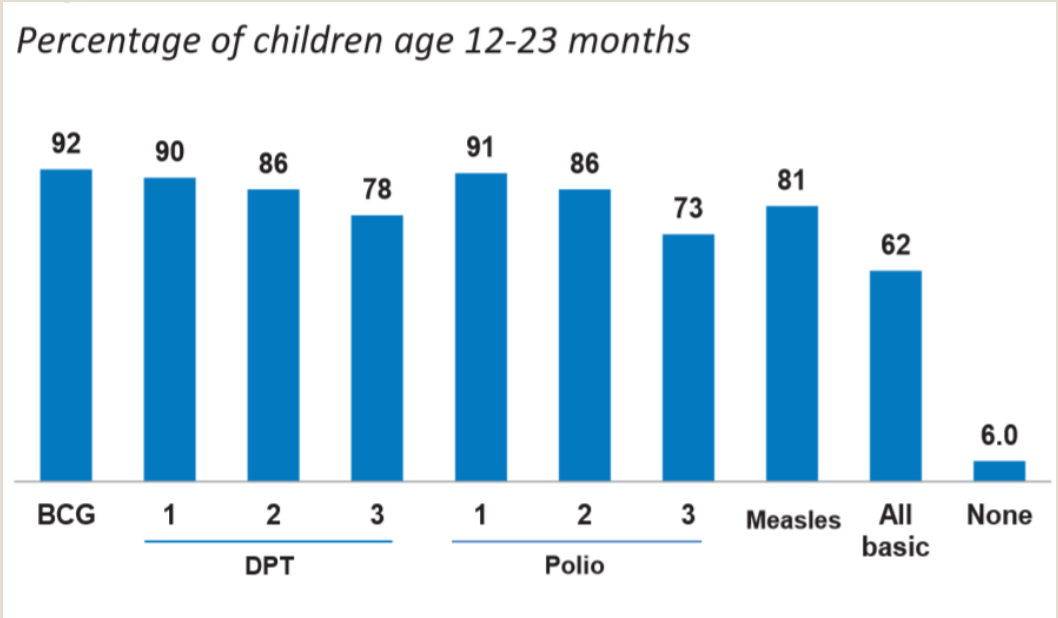
Proportion of Immunization coverage in NFHS3 and NFHS4.



- the Vaccination Coverage is observed to higher in NFHS4 than NFHS3 except for the 3 doses of Polio vaccine. As Shown in the figure BCG 78%, 3 Polio doses 78%, 3DPT doses 55%, Measles 59% and overall coverage is 44% in NFHS3 whereas in NFHS4 it is observed that BCG 92%, 3 Polio doses 73%, 3 DPT doses 78%, Measles 81% and overall immunization coverage is 62%.

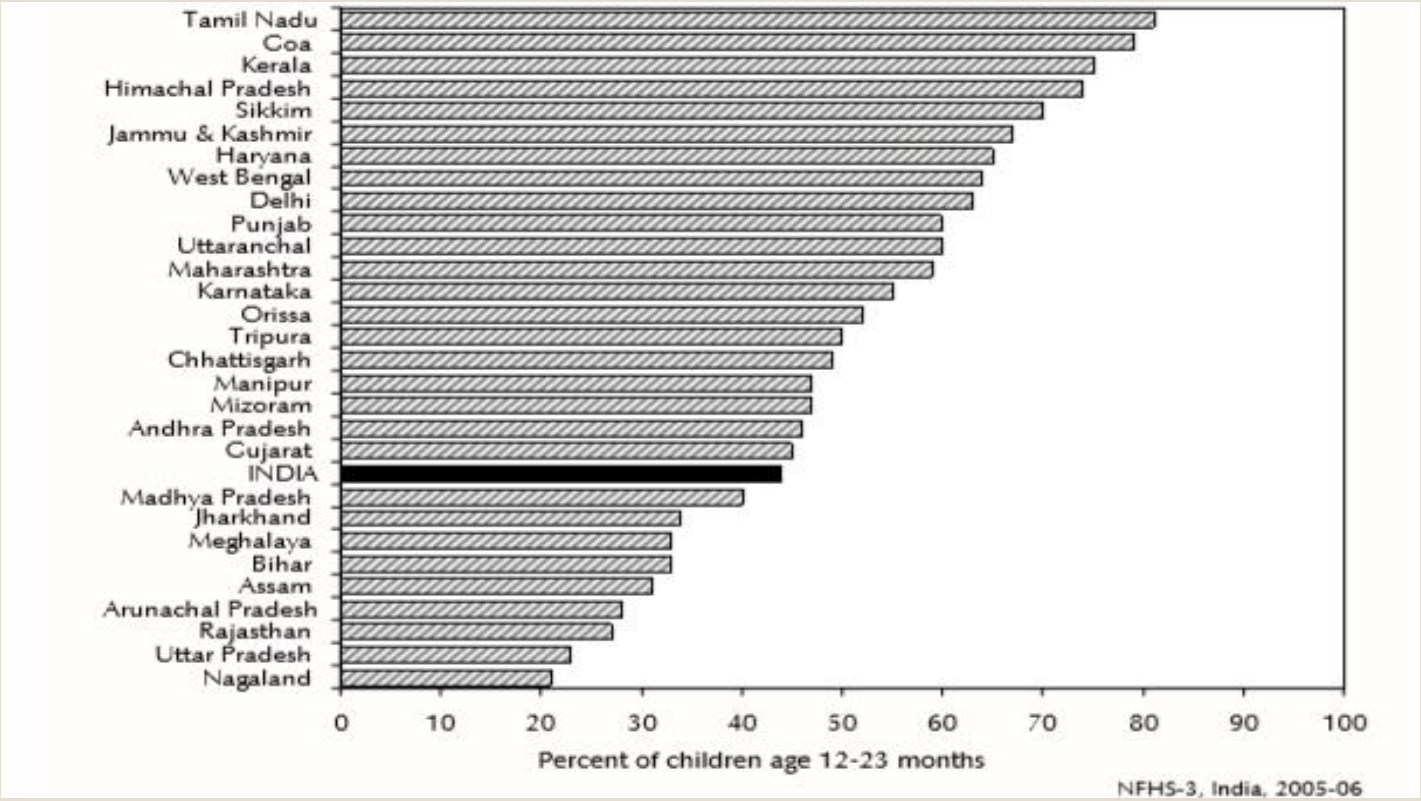
Percentage of children received vaccination in NFHS3 and NFHS4-





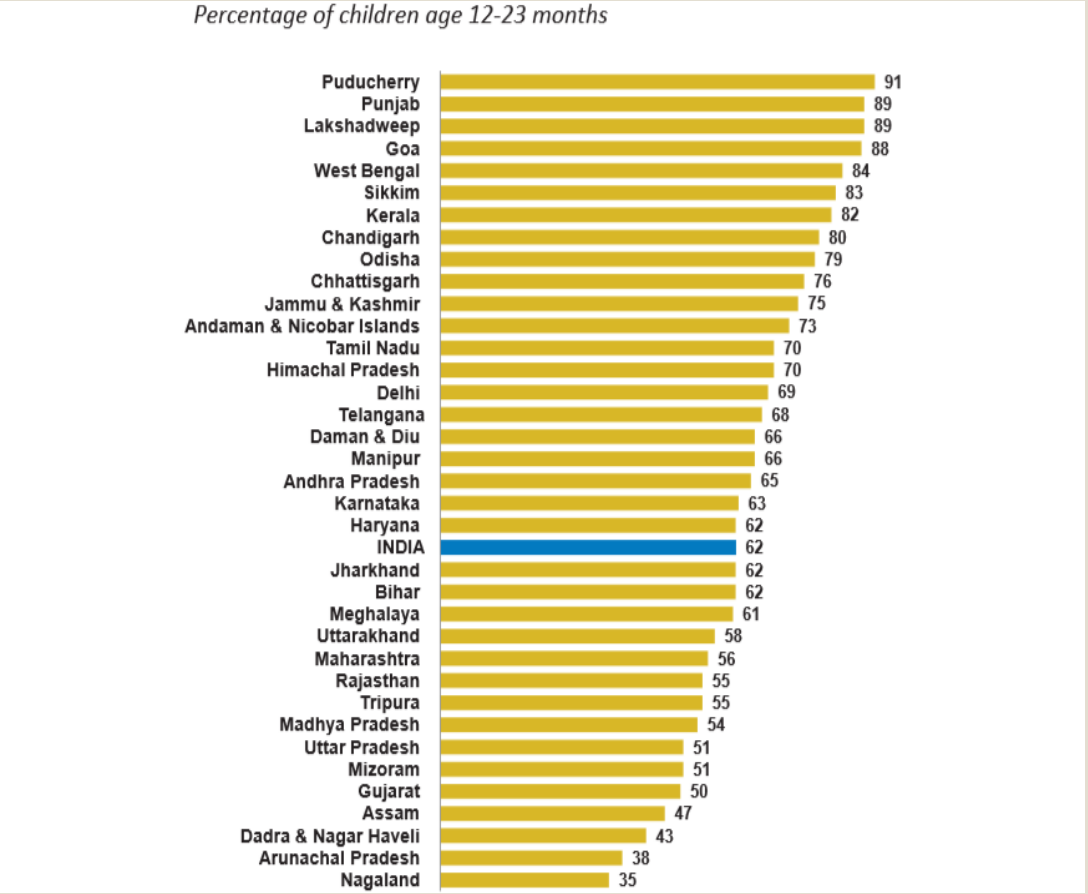
- Coverage was highest for the first dose of Polio vaccine (90%) and lowest for the third dose of DPT vaccine (52%). Although more children received the first doses of the DPT and polio vaccines than the second or third doses, the dropout rates are higher for Measles and DPT than for BCG and Polio.
- Coverage was highest for the BCG vaccine (92%) and lowest for the third dose of polio vaccine (73%). Although more children received the first doses of the DPT and polio vaccines than the second or third doses, the dropout rates are higher for polio than for DPT.

Full immunization coverage by State/UTs in NFHS3-



- The percentage of children who are fully vaccinated ranges from 21% in Nagaland to 81% in Tamil Nadu. 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 the more populous states, Uttar Pradesh 23%, Rajasthan 27%, Assam 31%, Bihar 33%, Jharkhand 34%, and Madhya Pradesh 40% stand out as having a much lower percentage of children fully vaccinated than the national average of 44 percent.

Full immunization coverage of Vaccination in states/UTs in NFHS4-



- The immunization Coverage of all basic vaccinations varies considerably by state and union territory.
- The coverage is highest in Puducherry 91%, Punjab 89%, Lakshadweep 89%, and Goa 88% and lowest in Nagaland 35% and Arunachal Pradesh 38%.

Conclusion

- **NFHS-3** As per the Guideline of WHO BCG should be given at birth or at first clinical contact, DPT and polio require three vaccinations at approximately 4, 8, and 12 weeks of age, and measles should be given at or soon after reaching 9 months of age.
- There is an increase in the proportion of children fully immunized and almost similar in the proportion of children who did not receive any vaccinations between NFHS-3 and NFHS-4.
- In NFHS-3 urban and rural areas show that there is greater improvement in the coverage of full immunization, as well as in most vaccines, in rural areas than in urban areas.
- 44% of children age 12-23 months are fully vaccinated and 5% have not received any vaccinations.
- Coverage for BCG, DPT, and polio (except Polio 0) vaccinations is much higher than for all vaccinations. BCG, the first dose of DPT, and all three doses of polio vaccine have each been received by at least 76% of children.
- 55% of children have received three doses of DPT. Although DPT and polio vaccinations are given at the same time as part of the routine immunization programme, the coverage rates are higher for polio than for DPT (for all three doses), because of the Pulse Polio campaigns.
- 59% of children age 12-23 months have been vaccinated against measles.

NFHS4

- In India 62%of children age 12-23 months received all basic vaccinations at any time before the survey, and 54%received all basic vaccinations by age 12 months.
- Coverage was highest for the BCG vaccine (92%) and lowest for the third dose of polio vaccine (73%). Although more children received the first doses of the DPT and polio vaccines than the second or third doses.
- The dropout rates are higher for polio than for DPT.
- 90% of children age 12-23 months received the first DPT dose and 78%received the last dose. These percentages were 91% and 73% for the polio vaccine.
- 6% of children age 12-23 months received no vaccinations.
- 63% of children received three doses of hepatitis B vaccine.
- The percentage of immunization increased more in rural areas in (from 39%(NFHS3) to 61%(NFHS4)) than in urban areas (from 58%(NFHS3) to 64%(NFHS4)). The proportion of children who received no vaccinations remained low in both surveys (5-6%).

Contd..

- Children age 12-23 months of first birth order are much more likely to receive all basic vaccinations than children of birth order 6 or more (67% versus 43%).
- Vaccination Coverage increases with increasing mother's schooling , 70% 0f children age 12-23 months whose mothers have 12 or more years of schooling have received all basic vaccinations, compared with 52%of children whose mothers have no schooling.
- Sikh children are more likely to have received all basic vaccinations than Muslim or Buddhist/Neo-Buddhist children (89% versus 55-56%).
- Vaccination coverage increases with increasing wealth status; 70% of children age 12-23 months from households in the highest wealth quintile received all basic vaccinations, compared with 53% of children from households in the lowest wealth quintile.

Discussion

Schemes introduced by the GOI to enhance immunization

- **Universal Immunization Programme (UIP)**-Immunization Programme in India was introduced in 1978 as 'Expanded Programme of Immunization' (EPI) by the Ministry of Health and Family Welfare, Government of India.
  - In 1985, the programme was modified as 'Universal Immunization Programme' (UIP) to be implemented in phased manner to cover all districts in the country by 1989-90 with the one of largest health programme in the world.
  - Ministry of Health and Family Welfare, Government of India provides several vaccines to infants, children and pregnant women through the Universal Immunisation Programme.

Vaccines provided under UIP

For Infants				
BCG	At birth or as early as possible till one year of age	0.1ml (0.05ml until 1 month age)	Intra-dermal	Left Upper Arm
Hepatitis B - Birth dose	At birth or as early as possible within 24 hours	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
OPV-0	At birth or as early as possible within the first 15 days	2 drops	Oral	Oral
OPV 1, 2 & 3	At 6 weeks, 10 weeks & 14 weeks (OPV can be given till 5 years of age)	2 drops	Oral	Oral
Pentavalent 1, 2 & 3	At 6 weeks, 10 weeks & 14 weeks (can be given till one year of age)	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
Rotavirus#	At 6 weeks, 10 weeks & 14 weeks (can be given till one year of age)	5 drops	Oral	Oral
IPV	Two fractional dose at 6 and 14 weeks of age	0.1 ml	Intra dermal two fractional dose	Intra-dermal: Right upper arm
Measles /MR 1st Dose$	9 completed months-12 months. (can be given till 5 years of age)	0.5 ml	Sub-cutaneous	Right upper Arm
JE - 1**	9 completed months-12 months.	0.5 ml	Sub-cutaneous	Left upper Arm
Vitamin A (1st dose)	At 9 completed months with measles-Rubella	1 ml (1 lakh IU)	Oral	Oral
For Children				
DPT booster-1	16-24 months	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
Measles/ MR 2nd dose $	16-24 months	0.5 ml	Sub-cutaneous	Right upper Arm
OPV Booster	16-24 months	2 drops	Oral	Oral
JE-2	16-24 months	0.5 ml	Sub-cutaneous	Left Upper Arm
Vitamin A* (2nd to 9th dose)**	16-18 months. Then one dose every 6 months up to the age of 5 years.	2 ml (2 lakh IU)	Oral	Oral
DPT Booster-2	5-6 years	0.5 ml.	Intra-muscular	Upper Arm
TT	10 years & 16 years	0.5 ml	Intra-muscular	Upper Arm

❖ **Mission Indra Dhanush-**

- To strengthen and re-energize the programme and achieve full immunization coverage for all children and pregnant women at a rapid pace, the Government of India launched "**Mission Indradhanush"** in December 2014.
- The ultimate goal of Mission Indradhanush is to ensure full immunization with all available vaccines for children up to two years of age and pregnant women.
- Earlier the increase in full immunization coverage was 1% per year which has increased to 6.7% per year through the first two phases of Mission Indradhanush. Four phases of Mission Indradhanush have been conducted till August 2017 and more than 2.53 crore children and 68 lakh pregnant women have been vaccinated.

❖**Intensified Mission Indradhanush (IMI)-**

- To further intensify the immunization programme, Prime Minister Shri Narendra Modi launched the **Intensified Mission Indradhanush (IMI)** on October 8, 2017. Through this programme, Government of India aims to reach each and every child up to two years of age and all those pregnant women who have been left uncovered under the routine immunisation programme/UIP. The focus of special drive was to improve immunisation coverage in select districts and cities to ensure full immunisation to more than 90% by December 2018.

❖ Intensified Mission Indradhanush (IMI) 2.0-

- To boost the routine immunization coverage in the country, Government of India has introduced Intensified Mission Indradhanush 2.0 to ensure reaching the unreached with all available vaccines and accelerate the coverage of children and pregnant women in the identified districts and blocks from December 2019-March 2020.
- The IMI 2.0 aims to achieve targets of full immunization coverage in 272 districts in 27 States.
- With the launch of Intensified Mission Indradhanush 2.0, India has the opportunity to achieve further reductions in deaths among children under five years of age, and achieve the Sustainable Development Goal of ending
- preventable child deaths by 2030.

The salient features of IMI 2.0 are-

- Conduction of four rounds of immunization activity over 7 working days excluding the RI days, Sundays and holidays.
- Enhanced immunization session with flexible timing, mobile session and mobilization by other departments.
- Enhanced focus on left outs, dropouts, and resistant families and hard to reach areas.
- Focus on urban, underserved population and tribal areas.
- Inter-ministerial and inter-departmental coordination.
- Enhance political, administrative and financial commitment, through advocacy.
- IMI 2.0 drive is being conducted in the selected districts and urban cities between Dec 2019 – March 2020.

References

- Gurnani V, Haldar P, Aggarwal MK, Das MK, Chauhan A, Murray J, Arora NK, Jhalani M, Sudan P. Improving vaccination coverage in India: lessons from Intensified Mission Indradhanush, a cross-sectoral systems strengthening strategy. bmj. 2018 Dec 7;363.https://www.bmj.com/content/bmj/363/bmj.k4782.full.pdf
- Chaudhari CC, Gunjana G, Kelkar VS, Patel DA, Saiyed SM, Thakor N. Immunization status of 12-23 months children in urban slums of Ahmedabad city, Gujarat, India: a cross sectional study. International Journal of Advances in Medicine. 2016 Oct;3(4):816-9.

  https://www.semanticscholar.org/paper/Immunization-status-of-12-23-months-children-in-of-Chaudhari-Gunjana/b028565f236980c13dcea8e64e3eb680a8767067
- Sood RK, Sood A, Bharti OK, Ramachandran V, Phull A. High Immunization Coverage but Delayed Immunization Reflects Gaps in Health Management Information System (HMIS) in District Kangra, Himachal Pradesh, India—An Immunization Evaluation. World Journal of Vaccines. 2015;5(02):69.https://www.scirp.org/html/1-5100137_55741.htm

- https://www.who.int/bulletin/volumes/94/10/15-167593/en/
- https://www.nhp.gov.in/universal-immunisation-programme_pg
- https://www.nhp.gov.in/mission-indradhanush1_pg
- http://rchiips.org/NFHS/NFHS-4Reports/India.pdf
- https://www.scirp.org/html/1-5100137_55741.htm#txtF5

Thank You