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IMMUNIZATION:

THE PULSE OF A RESILIENT PUBLIC HEALTH SYSTEM

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Vaccines have proven to be one of the best contributions of science to mankind[1]. Since the invention of the world's first vaccine for smallpox in 1790s[2], today, they're considered to be among the top 10 public health interventions[3] preventing approximately 6 million deaths annually worldwide[4]. COVID-19 pandemic has heightened the importance of vaccines to handle the biggest health crisis, like never before in the history of mankind. Billions of people from across the globe from all age groups are waiting for their shots of the COVID-19 vaccine while grappling with catastrophe and its ensuing impact on the global economy. Vaccines have the potential to protect individuals from developing a serious disease, protecting the society at-large from the spread of infectious diseases.

However, adult immunisation as a concept is still in its nascent stages in India and many other countries there is a misplaced belief that immunisation programmes are limited to children and new-borns. What is more surprising is that there is a lack of awareness around adult immunization not only among citizens but also among healthcare professionals in India. In a general sense, misguided safety concerns on vaccines have been a major concern. A Medline search using the keywords "vaccine risks" scored approximately five times as compared to searching "vaccine benefits" as keywords[5]. The need of the hour is to raise awareness among the masses regarding the Vaccine-Preventable Diseases [VPDs].

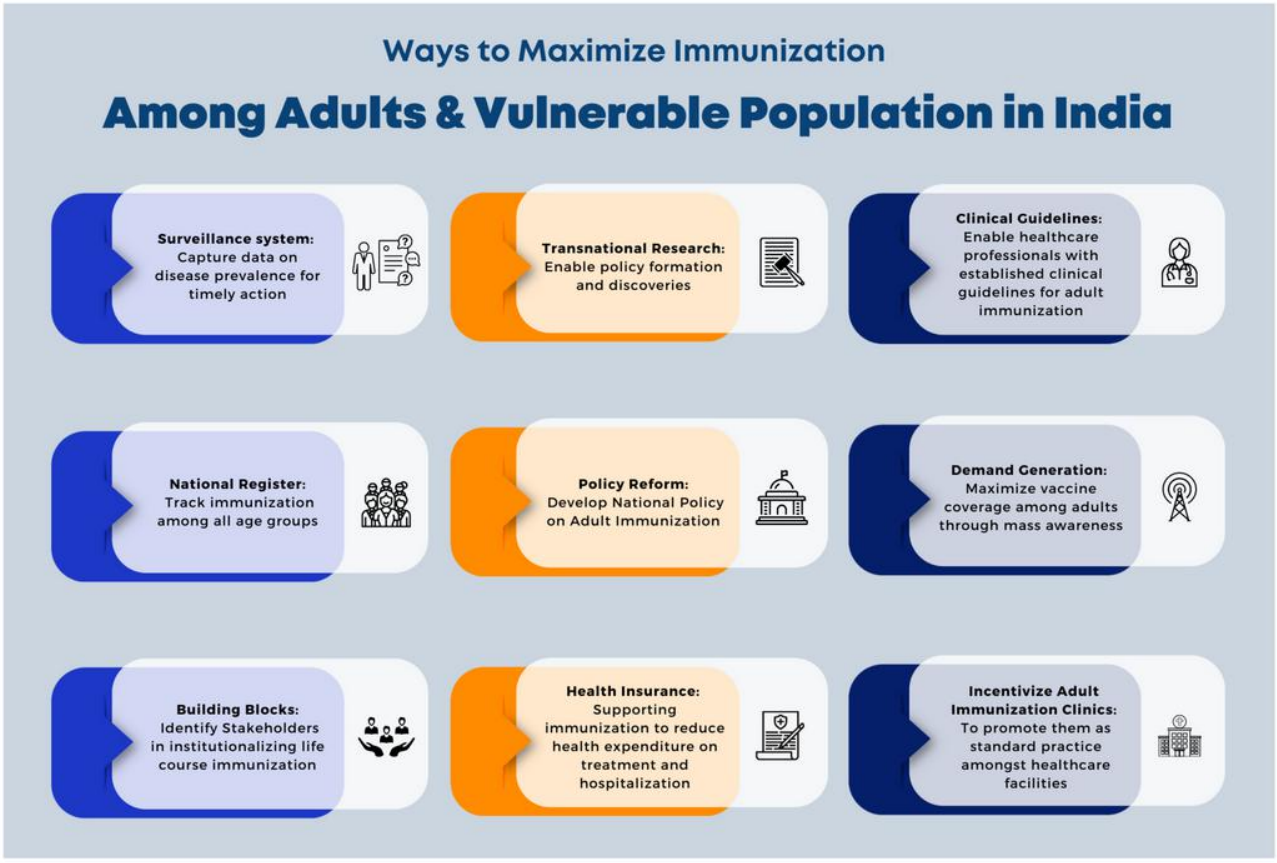

Figure 1: Ways to achieve enhanced coverage of adult immunization in India

1.Ehreth J. The global value of vaccination. Vaccine 2003; 21: 596-600

2.https://www.healthaffairs.org/doi/10.1377/hlthaff.24.3.611#:~:text=We%20begin%20our%20history%20of,performed%20the%20world's%20first%20vaccination.&text=Taking%20pus%20from%20a%20cowpox,%2Dold%20boy%2C%20James%20Phipps.

3.https://sci-hub.se/10.1016/S0264-410X(02)00623-0

4.Ehreth J. The global value of vaccination. Vaccine 2003; 21: 596-600

5.Vaccination greatly reduces disease, disability, death and inequity worldwide. WHO Bulletin, https://www.who.int/bulletin/volumes/86/2/07-040089/en/

Not only do these VPDs increase mortalities in the state, thereby burdening the public health system, but it also adds to the economic vulnerability of the poorer communities. Findings of a study conducted in the US on cervical cancer in India indicated that the introduction of the HPV vaccine to Indian girls would save US$886 per cervical cancer case and up to US$1239 per cervical cancer death[6]. This again shows the economic viability of adult immunisation over other medical treatment which is otherwise expensive. The high risk faced by healthcare workers in the first five months of the pandemic was quite gruesome - approximately 87,000 health workers infected by COVID-19 represented only six states of India and their[7]safety is of utmost importance in this continued fight against the pandemic. To this end, adult immunisation would be instrumental in protecting the healthcare workers as well as India's healthcare systems. Figure 1 displays the various ways in which we can succeed in adult immunisation in India.

NEED FOR ADULT VACCINATION AND LINKAGE WITH VULNERABLE GROUPS

In today's globalised world due to increase in travel, international trade and antibiotic resistance, infectious diseases are no longer contained within a particular geographical location due to the speed at which they travel.

Over the years, infectious diseases have gained significant public health concern. For instance, Malaria - only 20% of the global population was living in areas where malaria was found but today, that number has increased to 40%[8]. For a developing nation such as India, deaths resulting from communicable diseases still surpass deaths due to non-communicable diseases[9]. It has been noted that more than 25% of deaths among adults are caused by infectious diseases[10]. These diseases not only increase the incidence of morbidities in the country but also put the individual under economic strain. For example, insurance claim ratios are one of the highest for Infectious Diseases in India[11]. Additionally, it is also estimated that approximately 63 million Indians are pushed into poverty each year owing to health expenditures.[12]

The elderly population suffers high rates of morbidity and mortality due to vaccine-preventable infectious diseases. To name a few, Influenza, Pneumococcal disease, and Herpes Zoster have their highest mortality rates in older adults[13]. Given below are factors responsible for high rates of morbidity/mortality:

1) Underlying chronic medical conditions[14]

- 1 in 3 suffer from arthritis
- 1 in 3 have hypertension
- 1 in 5 have diabetes
- Cancer is 10 times more common among adults

6. https://www.tandfonline.com/doi/full/10.1080/21645515.2019.1682842

7.https://timesofindia.indiatimes.com/india/over-87k-health-workers-infected-with-covid-19-573-dead/articleshow/77814189.cms

8. http://needtoknow.nas.edu/id/library/82/

9.https://www.researchgate.net/publication/315669564_Vaccine_Preventable_Diseases_in_Indian_Adults-Burden_Prevention

10.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4635930/

11.IIB report 17-18https://www.scribd.com/document/412145382/Health-Insurance-Nonlife-Commercial-Data-Analysis-Report-201617

12.https://cddep.org/blog/posts/63_million_indians_are_pushed_poverty_health_expenses_each_year-and_drugs_are_chief_cause/#:~:text=The%20number%20of%20Indians%20falling,7%25%20of%20the%20nation's%20population.&text=This%20total%20is%20on%20the,15%25%20in%202004%2D5.

13.Abhay BM (2014) Elderly Immunization: A Global Priority and Key Component of Healthy Ageing. J GerontolGeriatr Res 3: 1000E130. doi:10.4172/2167-7182.1000E130

14.Prabha et al, Geriatric health care in India - Unmet needs and the way forward, AMHS Journal, 2017, 5 -1, 112-114

2) As the immune system diminishes function with age, that further leads to a decline in the response to infections (immunosenescence) as well as increases the chances of recurrence & prolonged duration of diseases.

3) Unwillingness among individuals to get vaccinated or take booster injections

4) Waning immunity

5) Reduced immunity in adults due to incomplete or missed childhood vaccination

A study states that the likelihood to contract Invasive Pneumococcal Disease (IPD) of people with various prevailing co-morbidities and habits may differ significantly. People with diabetes are thrice as likely whereas people with chronic heart and lung diseases are six times as likely. Alcoholics are 11 times as likely and surprisingly people with cancer, HIV-AIDs are 23-48 times likely.[15] Similarly, data suggests mortality as a result of influenza rises by 1.5 to 2 times in cases where the patient suffers from cancer/ diabetes or CVDs.[16] Significantly, major co-morbidities have been rising at a phenomenal rate.

Vaccines not only protect the immunised, but they can also reduce the burden of diseases among unimmunized individuals in the community through "indirect effects" or "herd protection". There also remains a plausibility of unvaccinated adults spreading the disease in newly born infants who haven't been immunised yet.[17] Adults also form approximately 60% of India's population and play a significant role in the nation's productivity as they contribute

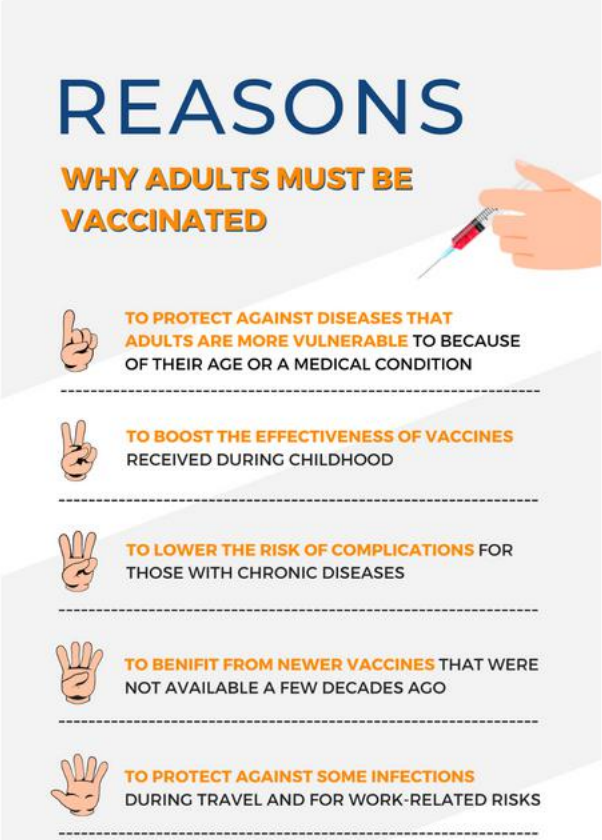

Figure 2: Reasons why adults must be vaccinated

significantly to the nation's economically productive group[18].

Owing to the large population and their basic health needs, the health ecosystem of India is constantly under pressure to provide inclusive and equitable healthcare to all its citizens. Recently, with the introduction of Ayushman Bharat PM-JAY, the flagship scheme of the Government of India, the Indian healthcare system has attempted to translate the burden of healthcare on individuals to themselves. Placing itself as the biggest publicly funded health coverage scheme in the world, it covers pre and post hospitalization costs for approximately 50 crore Indians.

15.Kyaw MH et al JID 2005:192 377-86

16.https://www.hcup-us.ahrq.gov/reports/statbriefs/sb253-Influenza-Hospitalizations-ED-Visits-2006-2016.jsp#supptable1

17.https://www.tandfonline.com/doi/full/10.1080/21645515.2019.1682842

18.https://www.researchgate.net/publication/315669564_Vaccine_Preventable_Diseases_in_Indian_Adults-Burden_Prevention

In such a scenario, VPDs that are considered to cause unnecessary hospitalization, loss of income, morbidities, and mortalities can be easily avoided to relax the burden on individuals as well as the public healthcare system. The ongoing pandemic has further crippled the healthcare system, necessitating the need to adopt measures to optimize the use of depleting resources for preventive healthcare.

One such approach that needs to be considered to reduce the burden on the government as well as individuals, is that of immunisation for all age groups. In India, the term immunisation is synonyms with pediatrics except rabies and tetanus to pregnant women; however, immunisation amongst adults is as important as to reduce the incidence of diseases and the morbidities related to that. In India, the burden of VPDs is not widely known as there is a paucity of data regarding incidence and the resultant mortalities among adults. Yet, certain scattered studies show the heavy burden of VPDs in India.

Figure 3: The most vulnerable groups to vaccine-preventable diseases

VACCINE PREVENTABLE DISEASES IN INDIA: PREVALENCE AND SOCIO ECONOMIC IMPACT

Among VPDs, one of the highest burdens is that of cervical cancer. It has been estimated that in India, around 1,32,000 women are diagnosed with cervical cancer each year and approximately 56% (74,000) of these women succumb to cervical cancer.[19] A matter of concern raised through this research was that 62% of these patients incurred catastrophic health expenditures and 30% people experienced distress financing.

This indicates that the treatment for cervical cancer in India not only adds to the out of pocket (OOP) health expenditures, but it also brings financial hardship to the poor communities.[20]

Congenital Rubella Syndrome (CRS) is another severe matter of concern with nearly 40-45% of women of childbearing age being susceptible to it.[21] In some cases, healthcare workers have also been found to be vulnerable to it due to their increased exposure to infection-prone environments. Rubella infection in mothers has led to approximately two lakh children being born with defects and in some cases, it even causes foetal death.[22]

19.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3385284/

20.http://journal.waocp.org/article_89266_ebaabfa465412f71bcd1996c5749086e.pdf

21.https://www.seruminstitute.com/health_faq_rubella.php

22.https://www.researchgate.net/publication/315669564_Vaccine_Preventable_Diseases_in_Indian_Adults-Burden_Prevention

To this end, Rubella vaccination among women will reduce the health burden among women as well as their offspring.

The high prevalence of hepatitis cases in India is under great distress. Hepatocellular carcinoma also known as primary liver cancer is found to be the fifth leading cause of adult deaths in the world and the third leading cause of cancer deaths in developing countries like India. An estimated 3,00,000 people contract hepatitis and a total of 2,05,286 deaths are recorded in India each year as a result of chronic Hepatitis.[23] Vaccination coverage among these high-risk groups is found to be extremely low. It is important to notes that even healthcare workers who are at the highest risk due to their work profile are not adequately covered through Hepatitis vaccination.

Influenza is one of the most common VPDs.[24] High prevalence of influenza can be especially seen during the peak monsoon period when almost 20% of all hospital admissions are a result of influenza.[25]

Pneumonia, among other VPDs, requires seven days of hospitalisation on an average. USISPF also highlights that claims paid for pneumonia-related hospitalisations are 42% higher than any other insurance claims.[26] This translates into an added economic burden on individuals that can be avoided through adult immunisation. Furthermore, according to US study–out of 12 million people, 20% of those who had been discharged after recovering from pneumonia were re-admitted due to relapse.[27]

Chances of hospitalisations and mortalities are higher among adults above the age of 65 years.[28] Alcohol consumers as well as people with existing comorbidities like cardiovascular, diabetes, etc. are at an even greater risk of contracting these IPDs. "Life-course immunization" has been adopted in many countries, as adult vaccination is an important contributor to healthy ageing. The recent update in Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines which list the CDC recommendations for Tdap (Tetanus, diphtheria, and acellular pertussis) in Chronic Obstructive Pulmonary Disease (COPD) in addition to flu and pneumococcal vaccination, has also emphasised the need to immunize adults – particularly those with chronic conditions which otherwise make them vulnerable to infections and increases the risk of complications.

Japanese Encephalitis (JE) and Dengue, are viral diseases spreading through the bite of an infected mosquito. While JE mostly affects children below 15 years of age, adults residing in areas with a high concentration of the spread of JE are also susceptible.[29] From global perspective, India has shown a disproportionately high incidence of JE. In 2017, out of the total cases worldwide, 44% of the cases were reported from India alone.[30] Similarly, Dengue also has a high prevalence in India with approximately 290 million people running a risk of contracting dengue. Apart from the individual burden of the disease, the annual burden of dengue on the Indian health system is approximately US$5.7 bn annually.[31]

23.https://www.researchgate.net/publication/315669564_Vaccine_Preventable_Diseases_in_Indian_Adults-Burden_Prevention

24.https://ncdc.gov.in/WriteReadData/linkimages/February_Final_020862513827.pdf

25. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0055918

26.IRDA 2014

27.IRDA 2014

28.https://ncdc.gov.in/WriteReadData/linkimages/February_Final_020862513827.pdf

29.Pfizer Limited Annual Report 2011

30.https://www.tandfonline.com/doi/full/10.1080/21645515.2019.1682842

31.https://www.ijidonline.com/article/S1201-9712(19)30021-9/fulltext

Owing to its cascading effects on new-borns and infants, maternal immunisation cannot be ignored from the adult immunization aspect. In 2019, India reported 7,62,000[32] neonatal deaths which were suspected to be caused by infections and perinatal health. Neonates and infants can be protected from various infectious diseases through antibodies transmitted from the mother to the new-born.[33] It has been found that sufficiently high amount of antibodies in the mother during pregnancy can protect new-borns against infectious diseases in their initial months. Immunisation of pregnant women becomes indispensable in safeguarding not only the health of the mother but also her offspring. Vaccines for Diphtheria, Pertussis, and Tetanus (DPT) as well as influenza have been recommended by healthcare organisations such as The American College of Obstetricians and Gynecologists' (ACOG) & The Federation of Obstetric and Gynaecological Societies of India (FOGSI) for effective maternal immunisation.[34]

The above data underscores heavy burden of VPDs in India. It is critical to note (See Figure 4) that Universal Immunization Programme mainly covers child immunisation and immunisation for pregnant women. On the flip side, there is an absolute dearth of coverage for adults who form a large percentage of the vulnerable population including Healthcare Workers.[35]

India has nearly 36.1 lac Healthcare workers and studies show that rates of healthcare workers contracting influenza infection range from 23%[36] in a regular season as opposed to 47.5%[37] during outbreaks. India also has <5% Vaccine Coverage Rate (VCR) compared to the neighboring countries like S Korea and Malaysia with VCR for their healthcare workers sat 60.5% and 50%, respectively.[38]

INDIA INITIATIVES AND PREPAREDNESS ON LIFE COURSE IMMUNIZATION

There is sufficient scope for the government to expand coverage through interventions in the future. Some initiatives are already in place which will go a long way in expanding adult immunisation in India. Initiation of a typhoid disease surveillance system by THSTI and CMC Vellore under the guidance of Indian Council of Medical Research (ICMR)[39] and recently launched initiative of Government, National Digital Health Mission, will serve a pivotal role in future to record actual burden of VPDs and real-time surveillance for swift actions. The recently published Vision 2035: “Public Health Surveillance in India” by the NITI Aayog has also laid down a data sharing mechanism between the centre & the states for better disease detection, prevention & control.[40]

32. World Health Organization. WHO vaccine-preventable diseases: monitoring system. 2020 global summary; [Cited 30 July 2020]. Available from: https://apps.who.int/immunization_monitoring/globalsummary

33. Edwards KM. Maternal immunisation in pregnancy to protect new-born infants. 2019; 104 (4):316-9

34. FOGSI-Good Clinical Practice Recommendations on PRECONCEPTION CARE: : https://www.fogsi.org/gcpr-preconception-care/ (accessed Oct 2020) 4. ACOG COMMITTEE OPINION. Influenza Vaccination During Pregnancy. Obstetrics and Gynaecology. Vol. 131, No. 4, April 2018 (Accessed Oct 2020).

35. https://www.who.int/hrh/resources/16058health_workforce_India.pdf

36. Elder AG, O'Donnell B, McCruden EA et al. Incidence and recall of influenza in a cohort of Glasgow healthcare workers during the 1993-4 epidemic: results of serum testing and questionnaire. BMJ. 1996 Nov 16; 313(7067):1241-2

37. Ruel N, Odelin MF, Jolly J et al. [Outbreaks due to respiratory syncytial virus and influenza virus A/H3N in institutionalized aged. Role of immunological status to influenza vaccine and possible implication of caregivers in the transmission.] Presse Med. 2002 March 2; 31(8):349-55

38. K.W. To et.al, Increasing the coverage of influenza vaccination in healthcare workers: review of challenges and solutions, Journal of Hospital Infection 94 (2016) 133-142. https://sci-hub.se/https://doi.org/10.1016/j.jhin.2016.07.003

39. https://www.nitag-resource.org/sites/default/files/19078a2f67280e66a39a3d530078d8d19d74dbf8_1.pdf

40. https://niti.gov.in/sites/default/files/2020-12/PHS_13_dec_web.pdf

Moreover, through the understanding of the disease burden of VPDs, many healthcare societies in India have published recommendations for vaccination against many diseases in certain at-risk adult populations. These associations include: -

- ASSOCIATION OF PHYSICIANS OF INDIA (API).
- INDIAN ASSOCIATION OF OCCUPATIONAL HEALTH (IAOH)
- RESEARCH SOCIETY FOR THE STUDY OF DIABETES IN INDIA (RSSDI)
- INDIAN MEDICAL ASSOCIATION (IMA)
- GERIATRIC SOCIETY OF INDIA (GSI)
- NATIONAL KIDNEY FOUNDATION (NKF)
- INDIAN SOCIETY OF NEPHROLOGY (ISN)

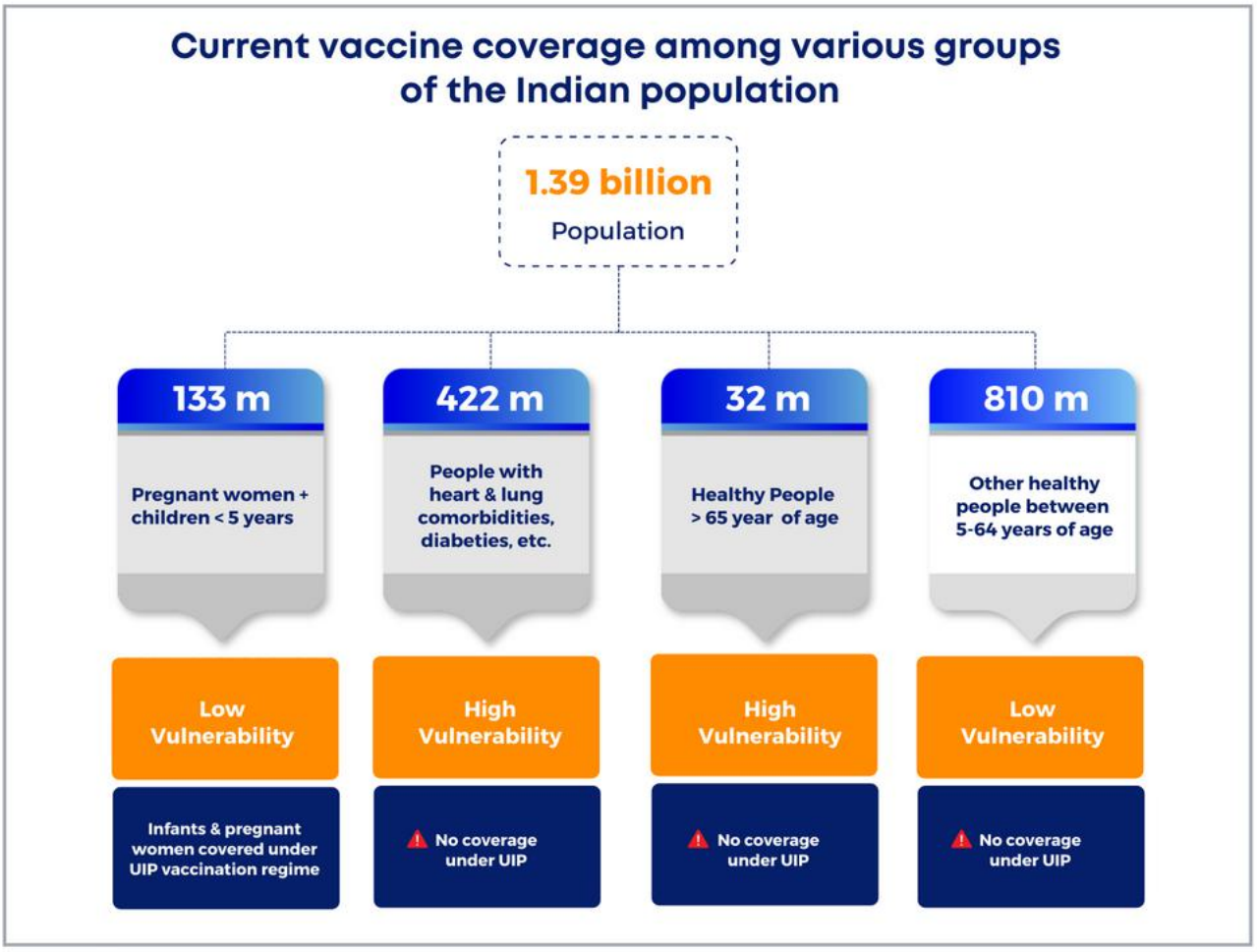

Figure 4: Current vaccine coverage among various groups of the Indian population
Source: U N D P, GB D database(extrapolated), NSSO 2014

To add to the above initiatives, a few Indian states have taken steps towards adult immunisation programmes, but the success has been limited due to lack of awareness and promotion. For example, when the Government of India offered JE vaccination to adults, only 50% of the targeted population turned up.[41] Similarly, in 2018, AIIMS Jodhpur had set up an adult vaccination centre but however, they were hardly close to meeting the expected success rate.[42] A study conducted in North India stated that the majority of the population (67.25%) were not fully aware of pneumococcal infection and its complication, despite several initiatives by the GOI to spread awareness about its incidence and vaccination.[43]

Another survey conducted among 2,002 adults across six metro cities in India found that over 42% of adults ranked staying in good physical health as the primary priority in life whereas the rest informed about various vaccinations is typically less important compared to other ways of staying healthy. Interestingly, around 34% believe vaccinations are required only for travel purposes, 38% believe vaccinations are for children and/or babies only and 26% believe vaccinations are not required if one is fit and healthy.[44]

Learnings from various perceptions around vaccines and global initiatives including the ongoing drive for COVID-19 vaccination to all age groups lay down a strong foundation of future endeavors on adult immunization for a stronger public health system of preventive care in India. Apart from vaccination resulting in fewer medical visits, diagnostic tests, treatments, and hospitalisations, causing substantial savings in healthcare costs, vaccines can also contribute to the sustainability of healthcare systems through reduced and more efficient use of healthcare resources.[45]

WAY FORWARD AND USISPF RECOMMENDATION

- India's prior expertise and existing infrastructure from child vaccination and successful eradication of few deadly infections like Polio and smallpox would be paramount to set up new targets and achieving success towards reducing the burden of various VPDs in India. Mass Awareness and sensitization were the key drivers of the success of these initiatives. On similar lines, permitting companies to expand their outreach by enabling provisions under the Drugs & Magic Remedies Act on VPDs building faith among the target population on advances made in science and R&D would bring significant changes in the prevalence of VPDs.

- Appropriate measures such as government-led awareness initiatives, establishment of dedicated Adult immunisation centres and impact-based partnerships, allocation of funds among other initiatives will play a key role in reducing the incidence of various illnesses in India.

- A significant step towards adult immunisation can also be achieved through introducing a dedicated package under the existing Ayushman Bharat

41.https://www.livemint.com/Science/wj3m99LunJthogOMRnw5yH/Why-governments-adult-immunisation-policy-is-not-taking-off.html

42.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7482772/

43.Sharma Y, Jaswal D, Shriwal H, Verma H, Shah J. Awareness, attitude, and knowledge about pneumococcal infection and vaccination: A survey across North Delhi. Int J Health Allied Sci 2019; 9:51-6.

44.http://macid.manipal.edu/Docs/10th%20August%202019/Dr%20Swati%20Rajagopal_%20ADULT%20VACCINATION.pdf

45.Largeron, Nathalie et al. "Role of vaccination in the sustainability of healthcare systems." Journal of market access & health policy vol. 3 10.3402/jmahp.v3.27043. 12 Aug. 2015, doi:10.3402/jmahp.v3.27043

scheme. Introduction of an adult immunisation package will not only leverage the existing infrastructure, but it will also facilitate preventive immunisation thus reducing the repeated visits to the hospital & reducing cost of treatment.[46]

With that background, we strongly believe that it is a suitable time to engage with the key stakeholders to identify appropriate measures to encourage the practice of immunization among adults.

Focus Areas of
USISPF's Adult Immunization Initiative

46.https://static.investindia.gov.in/2020-12/Invest%20India%20Adult%20Immunization%20Report.pdf

AUTHORS & CONTRIBUTORS

Nivedita Mehra
Managing Director

Chitra Gupta
Director Healthcare

Prutha Pandharkame
Student Intern

Anushka Shah
Associate

Nisha Rajan
Senior Policy Coordinator

Abhinav Dixit
Associate

Shruti Nagpal
Director-Operations

Sukanya Sen
Director of Communications & Marketing

Partners

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For more information on the
US-India Strategic Partnership Forum
please contact:

2550 M Street, NW
Washington, DC 20037
USA

1270 Avenue of the Americas
7th Floor, New York,
NY 10020
USA

12, Hailey Rd, Hamdard Nagar
Vakil Lane, Mandi House
New Delhi 110001
India

usispf@usispf.org
www.usispf.org

@USISPForum

/USISPForum

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