International Journal of Multidisciplinary Research and Growth Evaluation.

Immunization in Rural Areas of The United States of America: Challenges and Strategies to Improve

Manaswi Chigurupati
RPh, PharmD, MPH, Independent Researcher, USA

* Corresponding Author: **Manaswi Chigurupati**

Article Info

ISSN (online): 2582-7138
Volume: 05
Issue: 01
January-February 2024
Received: 19-12-2023
Accepted: 14-01-2024
Page No: 1582-1585

Abstract
Vaccination holds the key to eliminating or minimizing the potentially life-threatening infectious diseases. Globally, over the years, immunization has led to the eradication of fatal infectious diseases like smallpox. Thus, timely compliance with the vaccination schedule right from the time of birth ensures protection from various infectious diseases. The United States of America has one of the most successful vaccination programs, with immunization rates crossing 90% or more. However, this span of immunization rate has not been uniformly distributed. Vaccination in rural areas is significantly lower than in urban areas. This non-uniform immunization rate can be attributed to various factors, viz., lack of well-established infrastructure, socio-economic status of the population, literacy rate, and availability of well-trained healthcare providers, etc. This review will throw light on these barriers to successful vaccination programs in rural areas, along with certain recommendations that can help to improve the immunization rate.

DOI: https://doi.org/10.54660/.IJMRGE.2024.5.1.1582-1585

Keywords: Vaccination, Vaccine, Vaccine-hesitancy, COVID-19 vaccine, Immune program

Introduction

The immunization programme is primarily aimed at minimizing or completely eradicating infectious diseases, thus significantly reducing the mortality as well as burden on the health care system [1]. In fact, early childhood immunization programs have been able to achieve immense success in keeping infectious diseases at bay and reducing hospitalizations and mortality significantly. According to the immunization program by the Center for Disease Control and Prevention (CDC), a child should be administered at least ten vaccines till the age of 18 months viz., rotavirus, diphtheria-tetanus-acellular pertussis (DTaP), pneumococcal conjugate vaccine (PCV), varicella (VAR), hepatitis A (HepA) and B (HepB), measles-mumps-rubella (MMR), Haemophilus influenza type b (Hib), inactivated poliovirus, and influenza [2]. Annually, the CDC allocates more than 75 million vaccine doses for administering these vaccines to children of suitable age across the United States of America through health departments and private health providers [3]. Historically, the measles outbreak in the United States in 1989-91 significantly accelerated the state immunization program for preschool kids. Simultaneously, till 1999, vaccination for diphtheria tetanus-pertussis, polio, *Haemophilus influenzae* type b and measles increased to 78.4% [4]. Recent studies, however, indicate that almost 50% of children below 2 years of age haven't received the vaccines [5, 6]. Over the years, the vaccination levels at national levels have significantly improved to almost 90%, especially for polio, diphtheria, tetanus-pertussis, measles and hepatitis B. Still, significant discrepancy in immunization at community levels as compared to national as well as state levels has been observed [7, 8]. As per the National Immunization Survey-Child (NIS-Child) carried out by the CDC, the children who were born in 2017-2018 and living in non-metropolitan areas were found to have lower immunization as compared to children in metropolitan areas during the first two years of their lives. The highest immunization was observed for polio, varicella, hepatitis, and measles, mumps, and rubella vaccine, while the lowest was for influenza vaccine [9]. Financial status, ethnicity or race, and health insurance coverage are some of the few reasons for the discrepancy observed in the immunization status. It is important to note that this disparity exists even when immunization of children up to the age of 18 years, both insured as well as uninsured, are covered under state-run

immunization programs or Vaccines for Children [10]. Further discrepancy in vaccination status is observed in uninsured subjects, especially for the rotavirus vaccine and influenza vaccine [9]. A lot of discrepancy was observed for the COVID-19 vaccine, especially for vaccination in children. There was significant concern regarding the associated side effects and safety of the COVID-19 vaccine. This vaccine hesitancy for the COVID-19 vaccine was especially high in rural areas [11, 12]. From December 2020 to January 2022, the COVID-19 vaccine was found to be lower in rural areas (~58.5%) as compared to urban areas (75.4%) [13]. Thus, hesitancy to vaccines is a multifaceted challenge that limits the coverage of immunization programs.

In this review, we will try to decipher the challenges and factors contributing to the discrepancy in the vaccination, especially in rural areas of the United States of America.

Challenges to immunization coverage

Globally, vaccine hesitancy is an established hurdle to the success of the immunization program. Vaccine hesitancy has been, in fact, labelled as one of the top ten threats to global health by the World Health Organization (WHO) [14]. WHO defines vaccine hesitancy as delay or lack of immunization even when the supply of vaccines is available [15, 16]. Parental hesitancy to vaccines is primarily driven by the lack of awareness of the safety and associated side effects of the vaccine, and also by the school of thought that vaccines are not necessary for children. [17, 18]. The absence of information regarding immunization schemes and plans, vaccine anxiety pertaining to its adverse effects, a perception that vaccine-preventable diseases are low-risk diseases, and apathy towards childhood vaccination [19]. Recent reports suggest that across the United States, there is an increase in vaccine hesitancy along with reduced vaccination of children. More than 75% of the health providers raised apprehensions concerning the immunization of children. More significantly, almost 12% of healthcare providers denied administering at least one of the recommended vaccines. [20, 21]. Lack of efforts from caregivers to compensate for the missed opportunity, misapprehension regarding the administration of multiple vaccines, and vaccine-associated contraindications and restraint paid by the caregivers regarding adherence to the timeline of the vaccination schedule, results in poor compliance with the vaccination schedule. Poor compliance with the vaccination schedule is also fueled by the unavailability of healthcare services, deficiency or fragmentation of healthcare infrastructure, and lack of availability of child immunization status. [19]. Geographically inaccessibility of health care, i.e., the availability of health care services at a far-off place, especially in rural areas, makes it difficult for parents to vaccinate their child [9]. Socio-economic conditions, and ethnic and religious beliefs also strongly influence childhood immunization as well as healthcare outcomes. [22]. The key determinants of a successful immunization program are diagrammatically shown in Figure 1.

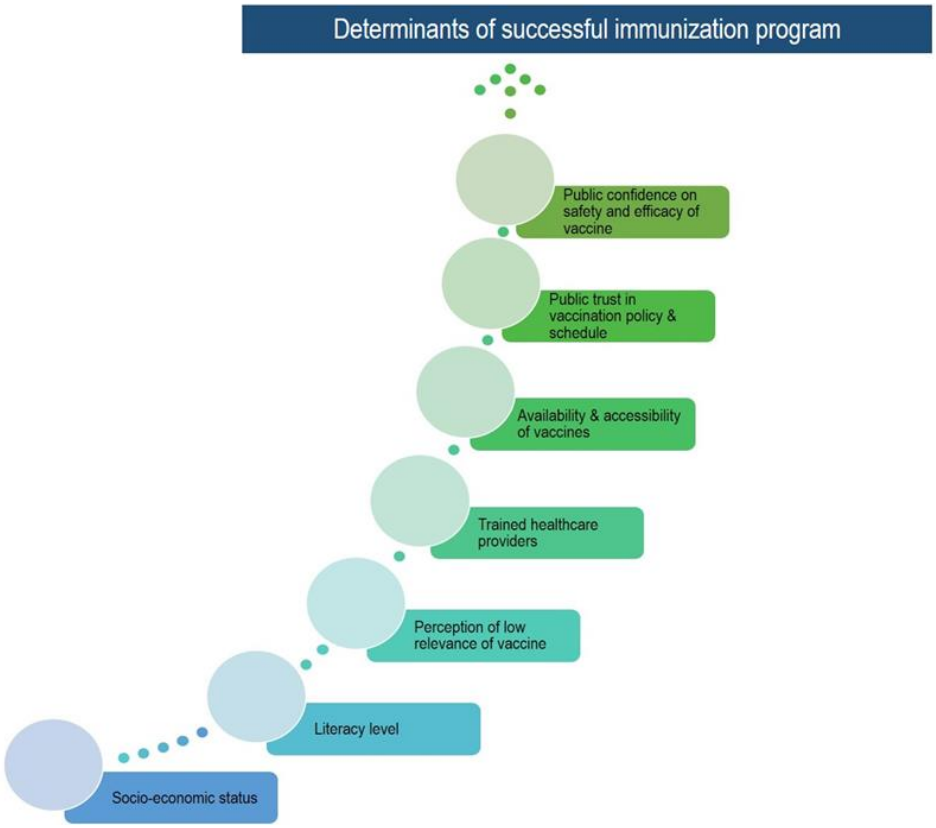

Fig 1: The key determinants that can significantly affect the success of an immunization program

It is well established that rural communities in the United States of America have poor childhood health outcomes like higher rates of obesity, reduced rates of healthcare service usage, reduced rates as well as untimely immunization and mortality due to unknown or inadvertent injury [23, 24]. One of the key factors that specifically contribute to low rates of immunization in rural setups is that in the majority of the cases, healthcare providers in rural setups refer children for vaccination to public facilities. This may be attributed to a lack of infrastructure to store and stock up the vaccines in appropriate storage conditions, along with a lack of staff in health care facilities. This pattern of referral for vaccination can either result in parental hesitancy to reach the public facility due to distance, or it can result in a delay in the

vaccination of children. In either case, the vaccination is missed or delayed. Further, referring children for vaccination also results in spreading out the vaccination information, which may be difficult to gather and keep systematic vaccination records, thus making it tough for the healthcare providers to keep track of the vaccination schedule of the child [4, 25-27].

Approaches to improve immunization rate

One of the approaches adopted during the COVID-19 pandemic vaccination was to authorize the pharmacies to carry out vaccination. This helped to improve the coverage of vaccination programs as licensed pharmacists, technicians, and interns were authorised to administer vaccines in their local community pharmacies. Due to ease of accessibility, the span of the immunization program widened and was successful in implementing COVID-19 vaccination. This approach can be useful in improving the immunization program. This would be especially useful in rural areas as these areas can lack healthcare infrastructure, accessible transportation, along with limited awareness and knowledge about vaccines. Pharmacists can help to bridge this gap to improve the health outcomes of immunization programs in rural areas [28, 29]. Further consolidating the vaccination records of children as well as adults in a central data system will strengthen the immunization program. This will enable healthcare providers to keep track of the vaccination status of people in their area and connect with them to facilitate timely immunization [30]. Integrating technology with the immunization program will also help to send timely reminders to subjects so that they don't miss their vaccines [31]. Employing healthcare providers that specialize in logistics for vaccine facilities, maintaining vaccination data, communicating with the public, and educating them about the benefits of timely vaccination, will strengthen immunization programs [30]. A timely review of the immunization program will also help to address key areas of concern in a particular area or geographical territory, healthcare facility upliftment, staff requirements, etc. This will also help to keep the facility ready to handle any kind of medical emergency, like a pandemic [30].

Conclusion

A well-established immunization program ensures minimal existence of infectious diseases that can be prevented by vaccines. Timely compliance with the vaccination schedule is the key parameter that ensures a successful vaccination program. However, multiple factors are detrimental to the successful immunization program. Factors like socio-economic status, age of subjects, religious beliefs, accessibility to the healthcare infrastructure, and infrastructure facility, play a crucial role in immunization programs, especially in a rural setup. The vaccination rate in rural areas lags behind the immunization rate in urban areas, which exposes a significant population to infectious diseases. Thus, taking corrective steps, like the inclusion of community pharmacies, employing healthcare providers to communicate the benefits of vaccines, integrating technology with the vaccination program to set up timely reminders for vaccination, and maintaining a central database of the vaccination status of the population, can significantly positively impact the vaccination rate. This will also help to keep the healthcare facility ready to tackle any kind of medical emergency.

References

1. Hosangadi D, Shearer MP, Warmbrod KL, Kan L, Cantu M, Nuzzo JB. Current state of mass vaccination preparedness and operational challenges in the United States, 2018–2019. Health Security. 2020;18:473–82.
2. Centers for Disease Control and Prevention. Child and adolescent immunization schedule. Centers for Disease Control and Prevention.
3. Centers for Disease Control and Prevention. Pandemic vaccine program distribution, tracking, and monitoring. In: Centers for Disease Control and Prevention.
4. Stokley S, Smith PJ, Klevens RM, Battaglia MP. Vaccination status of children living in rural areas in the United States: Are they protected? American Journal of Preventive Medicine. 2001;20:55–60.
5. Freeman RE, Thaker J, Daley MF, Glanz JM, Newcomer SR. Vaccine timeliness and prevalence of undervaccination patterns in children ages 0–19 months, US, National Immunization Survey-Child 2017. Vaccine. 2022;40:765–73.
6. Kurosky SK, Davis KL, Krishnarajah G. Completion and compliance of childhood vaccinations in the United States. Vaccine. 2016;34:387–94.
7. Zucker JR, Rosen JB, Iwamoto M, Arciuolo RJ, Langdon-Embry M, Vora NM, *et al*. Consequences of undervaccination—measles outbreak, New York City, 2018–2019. New England Journal of Medicine. 2020;382:1009–17.
8. Gahr P, DeVries AS, Wallace G, Miller C, Kenyon C, Sweet K, *et al*. An outbreak of measles in an undervaccinated community. Pediatrics. 2014;134:e220–8.
9. Hill HA. Vaccination coverage by age 24 months among children born in 2017 and 2018—National Immunization Survey-Child, United States, 2018–2020. MMWR. Morbidity and Mortality Weekly Report. 2021;70.
10. Schwartz JL, Colgrove J. The vaccines for children program at 25—access, affordability, and sustainability. New England Journal of Medicine. 2020;382:2277–9.
11. Ruggiero KM, Wong J, Sweeney CF, Avola A, Auger A, Macaluso M, *et al*. Parents' intentions to vaccinate their children against COVID-19. Journal of Pediatric Health Care. 2021;35:509–17.
12. Szilagyi PG, Shah MD, Delgado JR, Thomas K, Vizueta N, Cui Y, *et al*. Parents' intentions and perceptions about COVID-19 vaccination for their children: Results from a national survey. Pediatrics. 2021;148.
13. Saelee R. Disparities in COVID-19 vaccination coverage between urban and rural counties—United States, December 14, 2020–January 31, 2022. MMWR. Morbidity and Mortality Weekly Report. 2022;71.
14. Scheres J, Kuszewski K. The ten threats to global health in 2018 and 2019. A welcome and informative communication of WHO to everybody. Zdrowie Publiczne i Zarządzanie. 2019;17:2–8.
15. MacDonald NE. Vaccine hesitancy: Definition, scope and determinants. Vaccine. 2015;33:4161–4.
16. World Health Organization. Report of the SAGE working group on vaccine hesitancy. In: World Health Organization.
17. Mical R, Martin-Velez J, Blackstone T, Derouin A. Vaccine hesitancy in rural pediatric primary care. Journal of Pediatric Health Care. 2021;35:16–22.

18. Taylor JA, Darden PM, Brooks DA, Hendricks J, Wasserman RC, Bocian AB. Association between parents' preferences and perceptions of barriers to vaccination and the immunization status of their children: A study from Pediatric Research in Office Settings and the National Medical Association. Pediatrics. 2002;110:1110–6.
19. Gore P, Madhavan S, Curry D, McClung G, Castiglia M, Rosenbluth SA, *et al*. Predictors of childhood immunization completion in a rural population. Social Science & Medicine. 1999;48:1011–27.
20. Opel DJ, Mangione-Smith R, Taylor JA, Korfiatis C, Wiese C, Catz S, *et al*. Development of a survey to identify vaccine-hesitant parents: The parent attitudes about childhood vaccines survey. Human Vaccines. 2011;7:419–25.
21. Salmon DA, Dudley MZ, Glanz JM, Omer SB. Vaccine hesitancy: Causes, consequences, and a call to action. Vaccine. 2015;33:D66–71.
22. Bennett KJ, Borders TF, Holmes GM, Kozhimannil KB, Ziller E. What is rural? Challenges and implications of definitions that inadequately encompass rural people and places. Health Affairs. 2019;38:1985–92.
23. Probst JC, Barker JC, Enders A, Gardiner P. Current state of child health in rural America: How context shapes children's health. The Journal of Rural Health. 2018;34:S3–12.
24. Zhai Y, Santibanez TA, Kahn KE, Srivastav A, Walker TY, Singleton JA. Rural, urban, and suburban differences in influenza vaccination coverage among children. Vaccine. 2020;38:7596–602.
25. Fagnan LJ, Shipman SA, Gaudino JA, Mahler J, Sussman AL, Holub J. To give or not to give: Approaches to early childhood immunization delivery in Oregon rural primary care practices. The Journal of Rural Health. 2011;27:385–93.
26. Deutchman M, Brayden R, Siegel CD, Beaty B, Crane L. Childhood immunization in rural family and general practices: Current practices, perceived barriers, and strategies for improvement. Ambulatory Child Health. 2000;6:181–9.
27. Kempe A, Steiner JF, Renfrew BL, Lowery E, Haas K, Berman S. How much does a regional immunization registry increase documented immunization rates at primary care sites in rural Colorado? Ambulatory Pediatrics. 2001;1:213–6.
28. AlMahasis SO, Fox B, Ha D, Qian J, Wang C-H, Westrick SC. Pharmacy-based immunization in rural USA during the COVID-19 pandemic: A survey of community pharmacists from five southeastern states. Vaccine. 2023;41:2503–13.
29. Burson RC, Buttenheim AM, Armstrong A, Feemster KA. Community pharmacies as sites of adult vaccination: A systematic review. Human Vaccines & Immunotherapeutics. 2016;12:3146–59.
30. Shen AK, Sobczyk EA, Coyle R, Tirmal A, Hannan C. How ready was the US vaccination infrastructure and network of immunization information systems for COVID-19 vaccination campaigns: Recommendations to strengthen the routine vaccination program and prepare for the next pandemic. Human Vaccines & Immunotherapeutics. 2022;18:2088010.
31. Stockwell MS, Fiks AG. Utilizing health information technology to improve vaccine communication and coverage. Human Vaccines & Immunotherapeutics. 2013;9:1802–11.