

Bridging Gaps in Childhood Immunization Timeliness: Global Evidence from JRF Data with a Spotlight on Nigeria

¹Morufu Olalekan Raimi, ²Elemuwa Uchenna Geraldine, ³Sarah Samson Jatau

¹Niger-Delta Institute for Emerging and Re-Emerging Infectious Diseases (NDIERID), Federal University Otuoke, Bayelsa State. Nigeria

²National Agency for Food and Drug Administration and Control, NAFDAC, Nigeria.

³Department of Public Health, Faculty of Health Sciences, Plateau State University, Bokkos.

INTRODUCTION & AIM

Childhood vaccination remains one of the most effective public health interventions, yet delays and missed opportunities undermine herd immunity and equity. The WHO/UNICEF Joint Reporting Form (JRF) provides a global platform to monitor vaccination timeliness and catch-up doses, offering critical insights into zero-dose populations and equity gaps. Nigeria, as one of the countries with the highest burden of zero-dose children, presents a compelling case for contextual analysis. This study assessed global progress in monitoring timely and catch-up vaccination using JRF data, while highlighting Nigeria as a case study to explore practical barriers and policy solutions for reducing immunity gaps.

METHOD

A secondary analysis of JRF data from 2016 to 2022 was conducted across WHO member states, focusing on reported indicators of delayed measles-containing vaccine (MCV1) and other antigens. Global patterns in timeliness, reporting completeness, and cohort-based coverage estimates were compared. Nigeria's JRF data were triangulated with administrative records, UNICEF country briefs, and published estimates of zero-dose children. To contextualize implementation challenges and policy enablers, stakeholder interviews and relevant literature were reviewed. We calculated the completeness of reporting to WHO/UNICEF over the seven years. Proportions are presented by WHO Region (Figure 1), World Bank Income Classification (2023 revision), and Gavi-eligibility status in 2023. Additionally, we examined the effect of population size on delayed dose proportions by excluding countries with small populations defined arbitrarily as fewer than 10,000, and using the 16,862 figure corresponding to the last quartile of the surviving infant population distribution, based on United Nations 2022 estimates.

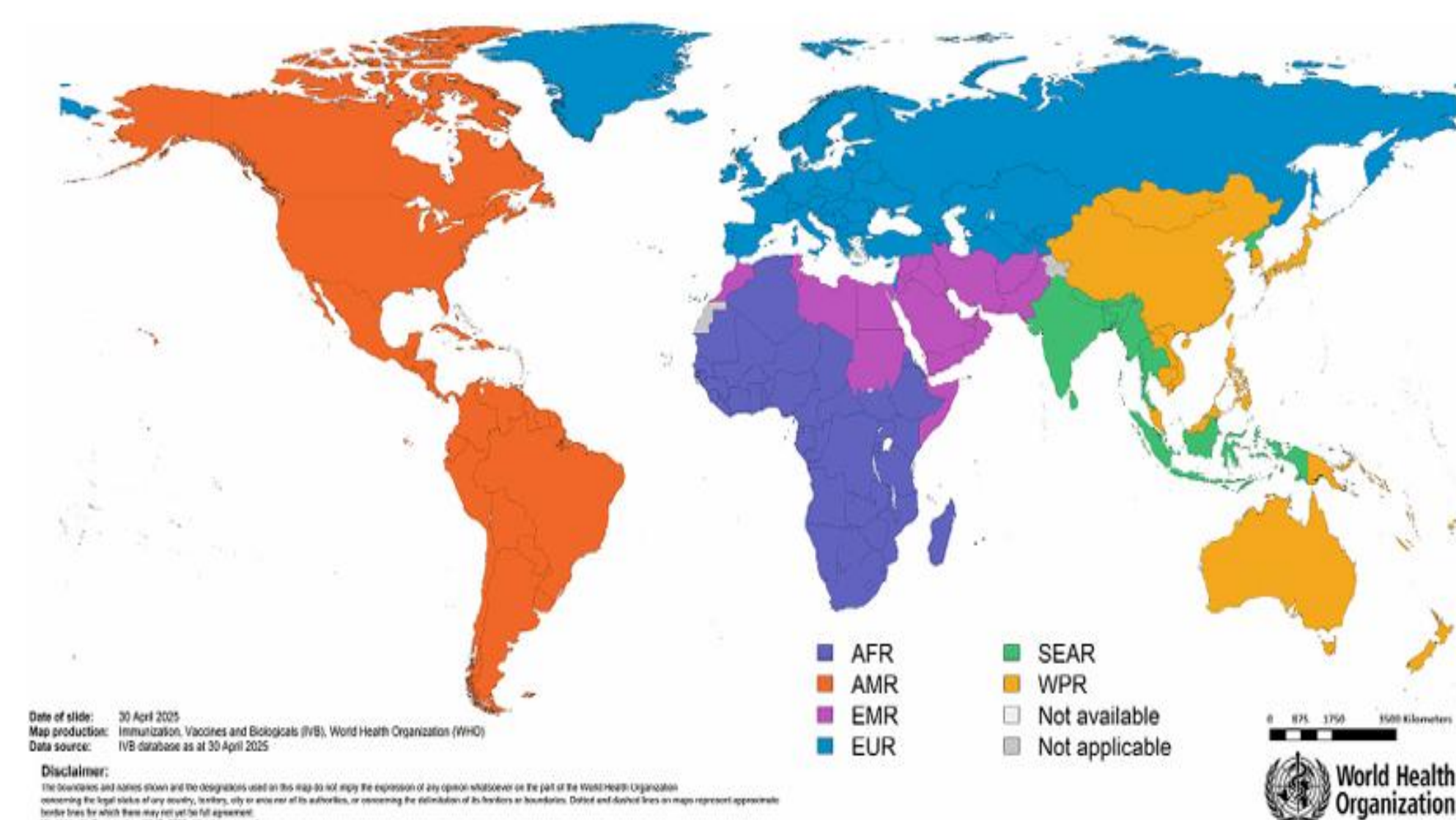


Figure 1: Regions of the World Health Organization, 2023.

RESULTS & DISCUSSION

Globally, reporting of delayed vaccination indicators remains inconsistent, with less than half of countries providing full data between 2016 and 2022. Including delayed doses raised cohort coverage estimates by 3-8% in several countries. In Nigeria, approximately 2.1 million under-one-year-old children (24% of the cohort) were classified as zero-dose in 2023, and an estimated 6.2 million children missed at least one routine vaccine between 2019 and 2022 due to service disruptions. Incorporating catch-up doses into cohort analysis raised Nigeria's estimated measles-containing vaccine coverage by nearly 6 percentage points, with state-level heterogeneity reflecting inequities in service delivery. Thus, timely vaccination is essential because it minimizes the period during which children remain unnecessarily vulnerable to vaccine-preventable diseases (VPDs) (Raimi *et al.*, 2022; Raimi, 2025a-c; WHO, 2025). Survey data reveal considerable variation in the proportion of children vaccinated after their first year of life (WHO/UNICEF, 2024; Okechukwu *et al.*, 2024; Promise *et al.*, 2024; 2025; Oginifolunnia *et al.*, 2025). Notably, children living in rural areas and those from disadvantaged socioeconomic backgrounds experience more prolonged vaccination delays (Raimi *et al.*, 2019; WHO, 2024; Yusuf *et al.*, 2025; Olaniyi and Morufu, 2025; Henry and Morufu, 2025). Such delays have been linked to incomplete vaccination schedules, even in high-income countries (Elemuwa *et al.*, 2024; Uchenna *et al.*, 2024; Kakwi *et al.*, 2025; Ibrahim *et al.*, 2025). Despite this, receiving a vaccine late is preferable to not being vaccinated at all (Christopher *et al.*, 2024). Catch-up vaccination has gained prominence in global immunization efforts following the declines in coverage and subsequent VPD outbreaks during the COVID-19 pandemic (Raimi and Raimi, 2020; Samson *et al.*, 2020; Morufu *et al.*, 2021).

CONCLUSION

Monitoring vaccination timeliness and catch-up through JRF offers a more accurate picture of cohort protection than annual coverage alone. Nigeria's case demonstrates both the potential and the gaps in delayed-dose monitoring, highlighting the importance of institutionalizing age-disaggregated reporting and cohort-based analysis in high-burden countries. Strengthen global and national reporting standards to improve the timeliness and completeness of catch-up vaccination data within the Joint Reporting Form (JRF), while institutionalizing cohort monitoring in Nigeria's national immunization system through digital registers and state-level analytics. Additionally, scale up catch-up vaccination strategies by deploying community engagement toolkits and conducting local outreach campaigns, and promote cross-country learning to adapt JRF data for actionable, equity-focused interventions. Global application of JRF timeliness and catch-up monitoring, combined with targeted action in high-burden countries such as Nigeria, can reduce zero-dose inequities, enhance outbreak preparedness, and accelerate progress toward SDG 3 (health), SDG 10 (reduced inequalities), and SDG 16 (inclusive institutions).

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