VACCINE DELIVERY RESEARCH DIGEST

UNIVERSITY OF WASHINGTON STRATEGIC ANALYSIS, RESEARCH & TRAINING (START) CENTER

REPORT TO THE GATES FOUNDATION

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{Abstract & START Commentary} {Full Article}

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2 Geospatial inequalities in zero-dose vaccination and structural determinants: Insights from sub-Saharan Africa (2015-2023).

{Abstract & START Commentary} {Full Article}

- Local burden of zero-dose prevalence varies substantially within countries.

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{Abstract & START Commentary} {Full Article}

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{Abstract & START Commentary} {Full Article}

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{Abstract & START Commentary} {Full Article}

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{Abstract & START Commentary} {Full Article}

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- Lower-dose schedules may lend themselves to increased vaccine coverage, completion, and compliance.

Additional Articles of Interest

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Details of Articles

1. Spatial clustering of zero dose children aged 12 to 59 months across 33 countries in sub-Saharan Africa: A multiscale geographically weighted regression analysis.

Ozigbu C, Li Z, Olatosi B, Hardin J, Hair N.

PLoS One. 2025 Dec 10;20(12):e0338568.
PubMed ID: 41370297

ABSTRACT

While prior studies have identified sociodemographic correlates of zero-dose status within populations in sub-Saharan Africa (SSA), few have applied spatial regression techniques to explore geographic variability in these relationships. We aimed to address this gap using data from Demographic and Health Surveys conducted in SSA between 2010 and 2020. Our sample comprised children aged 12-59 months in 33 countries and 329 survey regions. Data were aggregated to the first-level administrative unit prior to analysis. First, using ordinary least squares regression, we documented global relationships between theoretically important sociodemographic characteristics and zero-dose prevalence. Next, we identified patterns, i.e., geographic clustering, of zero-dose prevalence. Finally, using multiscale geographically weighted regression, we described spatial variability in relationships between sociodemographic characteristics and zero-dose prevalence. We detected 27 regions with higher than expected concentrations of zero-dose children. All but one of these hot spots were observed in 7 Western and Central African countries; only 1 was located in an Eastern African country. Regions with higher proportions of mothers with no antenatal care visits were consistently found to have higher rates of zero-dose children. In contrast, relationships between zero-dose prevalence and indicators of religious affiliation, delivery site, maternal age, maternal education, and maternal employment were found to vary locally in terms of their strength and/or direction. Study findings underscore spatial disparities in zero-dose prevalence within SSA and, further, highlight the importance of geographically informed strategies to effectively address immunization gaps. Implementing targeted interventions based on regional sociodemographic dynamics is crucial for achieving comprehensive vaccination coverage in SSA.

WEB: 10.1371/journal.pone.0338568
IMPACT FACTOR: 2.6
CITED HALF-LIFE: 8.5

START COMMENTARY

This study maps the prevalence of zero-dose children and examines spatial variability in zero-dose populations across sub-Saharan Africa (SSA) using spatial regression techniques and DHS data from 2010–2020 **(Figure 1)**. The authors also assess how sociodemographic characteristics relate to zero-dose prevalence across subnational regions. Clusters of high zero-dose prevalence were concentrated in West and Central Africa, particularly in Angola, Cameroon, Chad, Mali, Niger, and Nigeria, with Ethiopia identified as the only East African country containing a high-prevalence cluster. Regression analyses found zero-dose prevalence to be significantly associated with higher proportions of adolescent mothers, mothers with no media access, women with no antenatal care (ANC) visits, and children living in rural areas. Across all countries in the analysis, regions with higher proportions of mothers with no ANC visits consistently had the highest rates of zero-dose children. In contrast, most other relationships varied substantially in strength and direction across regions. For example, in West, Central, and Southern Africa, higher proportions of mothers with no education were associated with greater zero-dose prevalence, while in parts of East Africa this relationship was reversed. Authors state that these findings contrast with previous evidence and warrant further investigation. Similarly, maternal employment showed substantial spatial variability, and existing research on this association remains limited, with mixed and often weak effects. A strength of this study is its use of advanced spatial regression methods and nationally representative data from a large set of countries, strengthening generalizability. However, its ecological design limits inference. Findings support implementing policies to promote ANC utilization and underscore the need for context-specific, data-driven interventions tailored to localized drivers of zero-dose status.

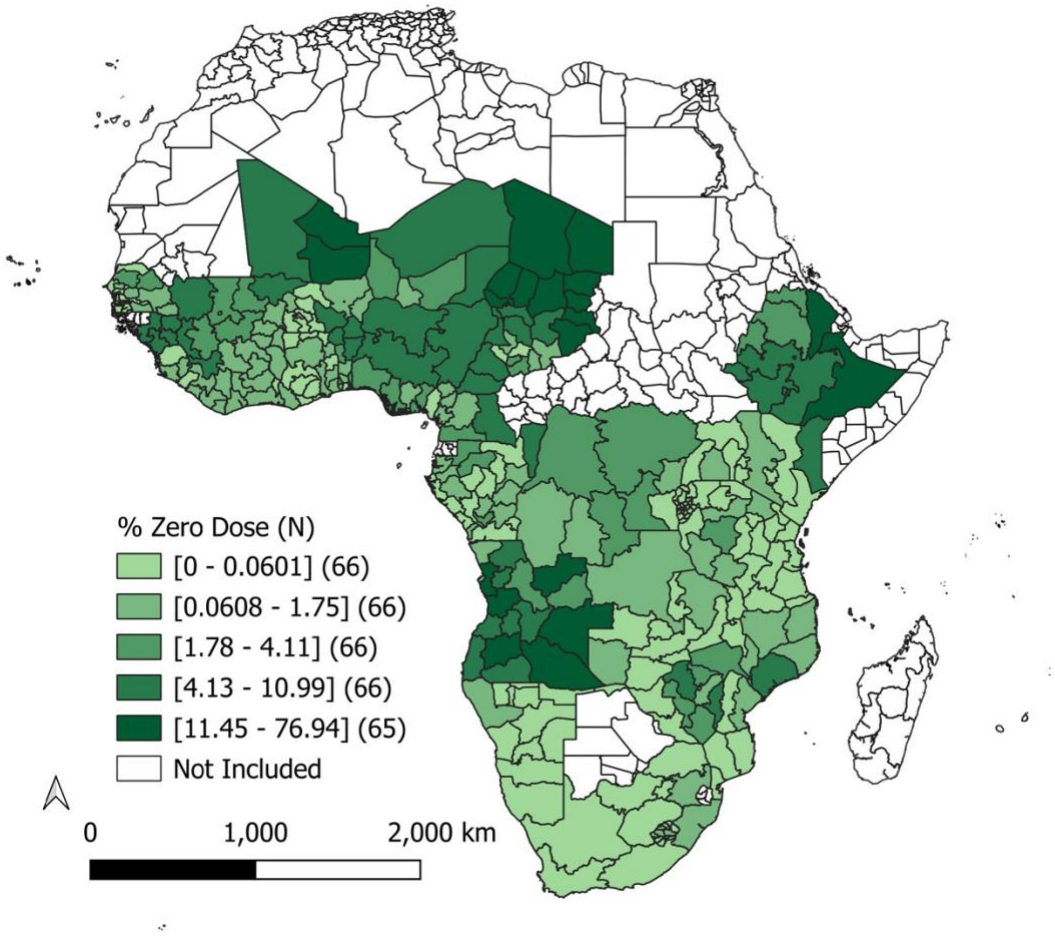

Figure 1: Prevalence of zero-dose children across SSA

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2. Geospatial inequalities in zero-dose vaccination and structural determinants: Insights from sub-Saharan Africa (2015-2023).

Wand H, Naidoo S, Moodley J, Govender V.

Vaccine. 2025 Dec 26;71:128062.
PubMed ID: 41349446

ABSTRACT

BACKGROUND: Zero-dose children-those who receive no routine vaccines-signal missed prevention and deep inequities. Sub-Saharan Africa (SSA) carries the largest zero-dose burden, yet pan-regional, subnational evidence on where these children live and which structural factors matter most remains limited.

METHODS: We analysed Demographic and Health Surveys (DHS) from SSA (2015-2023). The primary outcome was "vaccine-never" (0-59 months) and antigen-specific zero-dose. Country-specific spatial heterogeneity was assessed using generalized additive models via the smooth's estimated degrees of freedom. Multivariable models (survey-weighted) quantified the associations between zero-dose vaccine and sociodemographic characteristics and their population-attributable risk percentages (PAR%) were estimated in multifactorial setting.

RESULTS: We included 179,971 children (0-59 months). Pooled zero-dose prevalence was 26 %; antigen-specific zero-dose was 43 % measles, 13 % BCG (bacille Calmette-Guérin), 18 % polio, 19 % DTP (Diphtheria-toxoid), 21 % tetanus. National zero-dose varied widely (~10-11 % in Kenya/Zambia to ~34-45 % in Angola/Madagascar), with marked within-country ranges (Angola 7-63 %). Most countries showed significant spatial heterogeneity, revealing localised "hotspots". In pooled models, rural residence, lowest wealth, lack of maternal schooling/literacy, and limited information access were strongly associated with zero-dose. Service-contact gradients were steep: home delivery and no/low antenatal care (ANC) showed large increases in odds, consistent with missed early contact. At population level, geolocation and deprivation/information blocks explained substantial burden (PAR%: 30-40 % for location/socioeconomic status (SES); 30-60 % for literacy/information, varying by country).

CONCLUSIONS: Zero-dose in SSA is highly clustered sub-nationally and tightly linked to structural disadvantage and weak early contact with the health system. By integrating individual, household, and spatial perspectives, this work aims to inform strategies for reducing inequities in immunisation and accelerating progress toward Immunisation Agenda (IA) 2030 targets.

WEB: 10.1016/j.vaccine.2025.128062
IMPACT FACTOR: 3.5
CITED HALF-LIFE: 8.2

START COMMENTARY

This study characterizes subnational geospatial patterns and structural determinants of zero-dose in sub-Saharan Africa using DHS data from 2015-2023 from 21 countries. Findings show substantial heterogeneity in zero-dose within countries, including those with comparatively low national prevalence, demonstrating that national estimates may obscure localized pockets of higher burden. For example, Ghana's national zero-dose prevalence was approximately 16%, yet district-level estimates ranged from 4% to 43%, while Kenya had the lowest national prevalence (~10%) but still showed wide subnational variation (2%–54%). High-burden countries such as Angola, Cameroon, and Madagascar displayed similarly pronounced subnational disparities **(Figure 2)**. Additionally, structural determinants were broadly consistent across countries, particularly poverty, information isolation, and limited antenatal care (ANC), though the strength of their population-level impact differed by setting. For instance, missed ANC and weak health-facility contact appeared to have the greatest population-level influence in Cameroon and Mozambique, whereas financial and distance barriers were more impactful in Nigeria and Senegal. Strengths of this study include its multi-country design and use of standardized DHS data. However, findings are limited by self-reported measures of access barriers and the cross-sectional design of the data, limiting causality. Programmatically, findings call for intensifying outreach in rural communities, strengthening facility-based delivery and ANC contact, and bundling immunization and maternal health services to reach zero-dose children earlier in the care continuum.

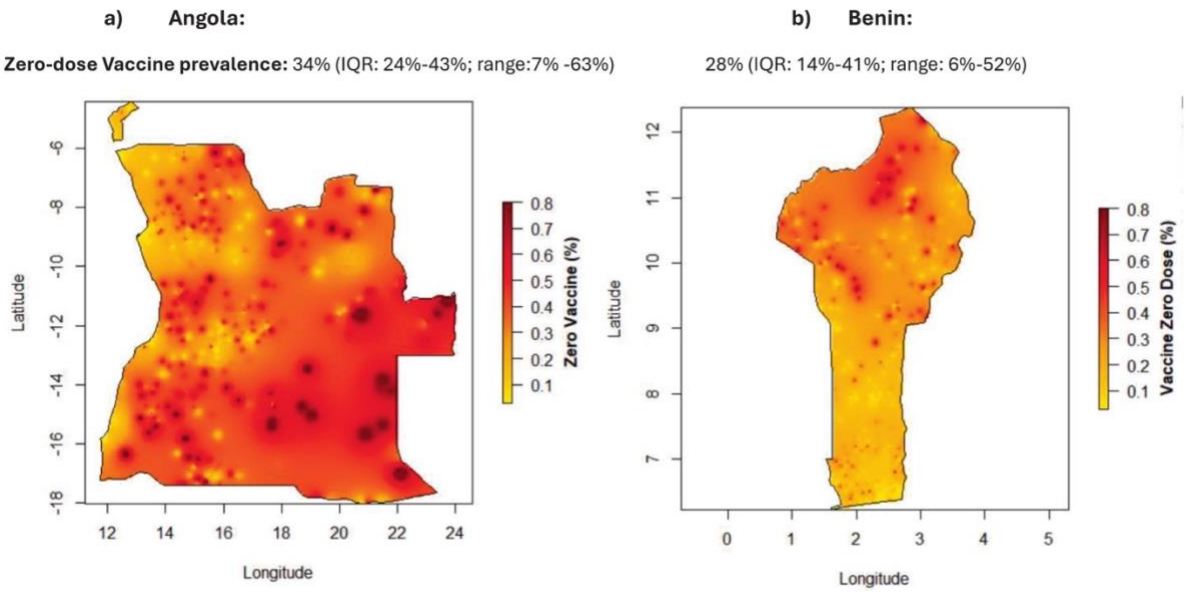

Figure 2: Zero-dose vaccine prevalence within Angola and Benin

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3. Barriers to HPV vaccine introduction and revitalization in sub-Saharan francophone African countries - A qualitative descriptive study.

Waheed D, Bolio A, Burdier R, Guillaume D, Biey J, Ndiaye C, et al.

Vaccine. 2025 Dec 11;70:128030.
PubMed ID: 41313895

ABSTRACT

The pace of progress of HPV vaccine introduction in Sub-Saharan francophone African countries has been limited, particularly in conflict-affected countries. To better understand the barriers affecting the introduction and sustainability of the HPV vaccine, we conducted a qualitative study from January - April 2024 informed by insights from a multi-country HPV symposium. Our study explored perspectives from stakeholders across six countries through key-informant interviews: four in the pre-introduction phase (Chad, Central African Republic, Gabon, Republic of Congo) and two seeking to sustain HPV vaccination program (Senegal and Côte d'Ivoire), alongside regional and global partners. We identified shared and context-specific barriers using semi-structured interviews and abductive thematic analysis, which included weak health system capacity, competing vaccine priorities, human resource constraints, political and conflict instability, and logistical challenges that limited countries' ability to introduce the HPV vaccine. For countries with existing programs, challenges included coordination between Ministries of Health and Education, insufficient funding for communication, misinformation, and gaps in teacher engagement. Despite policy commitment, financial sustainability, including co-financing and transition from Gavi support, remains a core concern. The study findings emphasize the importance of strengthening health systems, promoting cross-sectoral coordination, allocating finance for communication plan, and planning for sustainable financing to support both the introduction and long-term sustainability of HPV programs in low-resource settings.

WEB: 10.1016/j.vaccine.2025.128030
IMPACT FACTOR: 3.5
CITED HALF-LIFE: 8.2

START COMMENTARY

This qualitative descriptive study used semi-structured interviews with stakeholders to identify challenges affecting the introduction and sustainability of HPV vaccination programs in francophone sub-Saharan African countries. Participants included members of national immunization programs (EPI), Ministries of Health, and development partners.

In countries that had not yet introduced the HPV vaccine (Chad, Central African Republic, and Gabon), challenges related to vaccine delivery and health system capacity emerged as major barriers. Frequent government turnover in these settings disrupts continuity, even for routine services. Because HPV vaccination targets an adolescent age group not routinely served by many national immunization platforms, few established delivery mechanisms were available, further straining fragile systems. Stakeholders described constraints in storage and cold chain capacity that contributed to wastage, alongside major logistical challenges in reaching widely dispersed populations across large geographies. The investments required to expand cold chain infrastructure at scale were described as prohibitive for many countries. While partners such as Gavi can provide support, stakeholders noted that available resources may still be insufficient to fully address these gaps.

In countries with existing HPV programs seeking to revitalize and sustain coverage (Senegal and Côte d'Ivoire), cross-sectoral collaboration, especially the role of the Ministry of Education (MoE), was a prominent theme. MoE stakeholders emphasized that clearer definitions of teachers' roles and stronger coordination between the Ministries of Health and Education could improve implementation. Teachers were described as important for mobilizing students, supporting parental consent, and potentially integrating health education into lessons. Stakeholders suggested educators could help build trust and strengthen community understanding and acceptance of HPV vaccination.

Although the sample size was small, the study included regional and national stakeholders well positioned to describe real-world constraints and practical strategies to improve coverage. Findings highlight the importance of sustainable financing, particularly for countries transitioning from Gavi support or facing difficulties mobilizing domestic resources, and suggest that options such as pooled procurement and public–private partnerships should be explored. Strengthening coordination and communication between collaborating ministries also emerged as a key lever for both introduction and long-term program sustainability.

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4. Community-level determinants of RTS,S/AS01 vaccine acceptance in a hyperendemic Ghanaian Region: A Bayesian multilevel analysis from Kpando Municipality, Ghana.

Kwadzokpui P, Ablordey K.

PLOS Glob Public Health. 2025 Nov 21;5(11):e0005436.
PubMed ID: 41270097

ABSTRACT

The successful scale-up of Ghana's RTS,S/AS01 malaria vaccine depends on understanding community-level variation in caregiver acceptance. This study investigates vaccine acceptance and its predictors in a hyperendemic municipality bordering Volta Lake, where geographic and contextual disparities may hinder equitable implementation. A weighted, community-based cross-sectional survey was conducted from November 2023 to January 2024 among 452 caregivers of children aged 6-59 months in Kpando Municipality. Data were collected via structured digital interviews and analyzed using Bayesian multilevel logistic regression to identify individual and contextual determinants, with spatial mapping to visualize geographic disparities. Overall vaccine acceptance was 89.9% (95% CI: 89.2-90.7), with sub-district variation from 41.1% in Agbenorhoe to 100% in several island and rural communities. Among children initiating vaccination, 6.0% received one dose, 17.6% two doses, 10.4% three doses, and 66.0% completed four doses. Booster completion (66.0%) significantly exceeded primary series completion (34.0%, $p < 2 \times 10^{-16}$). For initial acceptance, bush-surrounded households had higher odds (aOR = 2.69) while vaccine risk concern reduced acceptance (aOR = 0.32). For booster completion, higher household income (1500-1900 GHC: aOR = 3.19; 2000-2400 GHC: aOR = 2.75), older child age (1 year: aOR = 2.27; 2 years: aOR = 2.14), family/peer influence (aOR = 2.09), and perceived convenience (aOR = 1.58) were positive predictors, while bush-surrounded residence reduced odds (aOR = 0.26). Sub-district-level factors explained 85% of variance (ICC = 0.85). Despite high acceptance, sharp spatial disparities and uneven dose completion persist. To ensure equitable coverage as Ghana scales up RTS,S/AS01, interventions must both address initial hesitancy in low-acceptance areas and improve primary series retention by reducing economic barriers and enhancing service convenience in rural communities.

WEB: 10.1371/journal.pgph.0005436
IMPACT FACTOR: 2.5
CITED HALF-LIFE: 1.9

START COMMENTARY

This study examines geospatial disparities alongside sociodemographic and environmental determinants of RTS,S malaria vaccine acceptance among caregivers in Kpando Municipality,

Ghana, using a community-based cross-sectional design. Findings show spatial heterogeneity in vaccine acceptance and demonstrate that households located near environmental sources of malaria exposure, like dense vegetation and standing water, were significantly more likely to accept the RTS,S vaccine, suggesting that heightened perceived malaria risk as associated with higher vaccine acceptance. However, ownership of insecticide-treated bed nets (ITNs) was associated with substantially lower acceptance of the malaria vaccine. The authors suggest that this inverse relationship may stem from the distinct delivery channels and perceived roles of these interventions. In Ghana, bed nets are primarily distributed through mass campaigns and antenatal care services, whereas RTS,S is delivered via routine childhood immunization platforms. This separation may inadvertently foster the perception that these malaria prevention strategies are substitutes rather than complementary tools. These findings underscore the need for integrated service delivery and harmonized health communication strategies that clearly emphasize the synergistic benefits of combining vaccination with existing malaria prevention measures. However, the study's cross-sectional design limits causal inference, and the exclusion of 18 hard-to-reach communities lowers generalizability. Looking forward, successful scale-up of RTS,S and future novel vaccines will require hyperlocal, community-specific interventions in low-acceptance sub-districts, reframed messaging that reinforces complementarity across malaria control tools, and strategic engagement of healthcare workers as trusted sources of vaccine information.

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5. Geographically weighted regression analysis of incomplete basic childhood vaccination in Sub-Saharan Africa: Evidence from DHS, 2019-2024.

Tsegaw T, Alemu E, Arage F, Tadese Z, Taye E, Abate T.

PLoS One. 2025 Nov 21;20(11):e0336498.

PubMed ID: 41270083

ABSTRACT

BACKGROUND: Immunization is the safest way to protect against disease. Currently, vaccination saves more than 4 million lives annually. By 2030, 90% of people worldwide are expected to have received the basic immunizations, according to the Immunization Agenda 2030 (IA2030). However, in sub-Saharan Africa (SSA), only 54.1% of children receive the complete set of basic childhood vaccinations. Therefore, this study aims to assess the spatial variation of incomplete basic childhood vaccination and its determinants in SSA by using DHS data from 2019-2024.

METHOD: For our study, we utilized a total of 28,045 weighted children from 16 selected SSA countries. The vaccination status was determined through both maternal recall and the use of vaccination cards. Spatial autocorrelations, hotspot analysis, spatial interpolation, and SaTScan analysis were conducted to explore the spatial distribution. Ordinary Least Squares (OLS) and Geographical Weighted Regression (GWR) were performed to identify the associated factors of partial immunization.

RESULTS: The pooled prevalence of partial immunization in SSA was 35.5% [95% CI: 28.49%, 42.51%]. Mauritania, Gabon, Côte d'Ivoire, central Tanzania, Liberia, and northeast Mozambique are among the hotspot regions that have been identified. Higher maternal education, female-headed households, maternal age between 15 and 24 years, absence of antenatal care, and urban residency were all found to be significant predictors with GWR analysis.

CONCLUSION: In SSA, partial immunization shows a clustered spatial pattern with different hotspot areas. The use of maternal health services and socio-demographic factors has an impact on incomplete immunization. Improving vaccination coverage requires focused programs that address awareness creation and service utilization.

WEB: 10.1371/journal.pone.0336498

IMPACT FACTOR: 2.6

CITED HALF-LIFE: 8.5

START COMMENTARY

This analysis used DHS data from 2019–2024 across 16 countries to assess the spatial variation and determinants of incomplete basic childhood vaccination in sub-Saharan Africa. The findings demonstrate mixed relationships between urban residency and incomplete vaccination. An inverse association was observed in eastern Ethiopia, Gabon, and Mozambique, which the authors suggest may reflect stronger healthcare infrastructure and easier access to vaccine delivery in some urban settings. However, a positive association between urban residence and incomplete vaccination was observed in Tanzania, Burkina Faso, Rwanda, Ghana, Côte d'Ivoire, and Liberia. This discrepancy may be explained by heterogeneity within urban areas since capital cities and wealthier neighborhoods often have higher coverage, while urban slums and peri-urban communities may face barriers such as limited access to healthcare, overcrowding, and social inequality. As a result, urban residency does not uniformly predict higher vaccination coverage, underscoring the importance of addressing local context and intra-urban disparities. Female-headed households were also associated with higher rates of partial immunization, possibly because female caregivers may face disproportionate economic constraints, time pressures, and household management responsibilities. However, this association was not uniform across settings, highlighting the context-specific nature of these relationships. Strengths of the study include its use of a large, nationally representative dataset and its ability to examine how predictor effects vary geographically. Limitations include the cross-sectional design and the absence of consistently available measures across countries, such as employment, media exposure, and distance to health facilities. To improve vaccination coverage, context-specific interventions, such as strengthening maternal health service utilization, addressing intra-urban inequalities, and expanding community-based education, may help reduce gaps in immunization.

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6. Recommendations to mitigate barriers to uptake and delivery of a four-dose malaria vaccine schedule: insights from the MVIP's qualitative evidence.

Price J, Collymore Y, Bawa J, Mkisi R, Buell C, Jalang'o R, et al.

Malar J. 2025 Nov 19;24(1):408.

PubMed ID: 41254759

ABSTRACT

BACKGROUND: Malaria vaccination was piloted in selected areas of three countries to produce evidence that would inform global recommendations on the public health use of the RTS,S/AS01E (RTS,S) malaria vaccine and to inform guidance for countries planning to introduce the vaccine into childhood immunization systems. This paper focuses on challenges to the uptake and delivery of a four-dose RTS,S schedule, presents actionable insights into qualitative data from the 2019-2023 Malaria Vaccine Pilot Evaluation in Ghana, Kenya, and Malawi, and presents recommendations to address barriers to vaccine uptake.

METHODS: This paper draws on published qualitative data from the three pilot countries and unpublished expert analysis. It draws on findings previously reported in publications from a qualitative longitudinal study, the Healthcare Utilization Study (HUS), conducted in a subsample of communities where RTS,S was introduced during the pilots. The study elicited perceptions from caregivers of eligible children about the vaccine alongside other relevant topics, such as their use of vaccination services. Interviews with health workers focused on their evolving perceptions about the vaccine and experiences integrating its delivery into routine immunization. Technical experts involved in the vaccine pilot and implementation managers from the pilot countries provided insights from their experiences. This feedback helped validate both the findings and the potential practicality of recommendations for scaling up delivery.

RESULTS: Despite good acceptance of the vaccine, many children missed some or all doses due to overlapping challenges to acceptance and delivery of the four-dose schedule. Highlighting the barriers to uptake, the paper discusses guidance, tools, and materials that may help programme staff develop strategies, plans, and materials, including strategies to address the complexity of the schedule and to track four doses for individual children.

CONCLUSIONS: Adding a four-dose vaccine to a crowded routine immunization schedule presents challenges, as seen during the pilots. The malaria vaccine experience and several studies have provided guidance and tools to support malaria vaccine expansion in the three countries and introduction of the vaccine elsewhere. The observations and recommendations in this paper are intended as a complement to the wide range of materials, guidance and tools already available.

WEB: 10.1186/s12936-025-05611-3
IMPACT FACTOR: 3.0
CITED HALF-LIFE: 7.3

START COMMENTARY

This paper examines seven reasons children missed doses of the malaria vaccine across the three MVIP pilot countries and proposes programmatic strategies to address these barriers, drawing on qualitative evidence from caregivers and health workers. The primary reported barriers were communication gaps, schedule complexity, difficulties tracking doses for individual children, fourth-dose complacency, challenges associated with subnational implementation, new vaccine hesitancy, and service interruptions.

To address communication barriers, the authors recommend adopting a systematic vaccination communication approach that anticipates information needs, alongside high-visibility vaccine introduction events. To mitigate schedule complexity, they suggest adapting existing tools to local contexts, strengthening health worker training on eligibility and interpersonal communication, and simplifying caregiver-facing eligibility messaging (including that late doses can still be given). For dose-tracking challenges, the authors suggest using user-informed record-keeping tools, designing systems that can accommodate future vaccine introductions, and teaching caregivers to use the child health book to track doses. To improve fourth-dose uptake, they recommend aligning dose four with other high-uptake second-year vaccines like the measles vaccine to reduce the burden of additional visits. For subnational rollouts, clear guidance and coordinated procedures for both vaccinating and non-vaccinating sites, especially adjacent sites, are highlighted to manage cross-area care seeking and migration. To address hesitancy, the authors recommend comprehensive risk communication planning to reduce refusals and defaulting. Finally, they propose strengthening supply systems through routine audits and improved subnational stock management to minimize service interruptions.

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7. Awareness, acceptability, and willingness to pay for the R21/Matrix-M malaria vaccine: a cross-sectional study among pregnant women and nursing mothers in Enugu State, Nigeria.

Dim O, Chima U, Iloabuchi F, Anene-Okeke C, Nwachuya C, Onyehalu J, et al.

BMC Public Health. 2025 Nov 23;25(1):4011.
PubMed ID: 41254572

ABSTRACT

BACKGROUND: The R21/Matrix-M vaccine has significantly reduced incident malaria in children aged 3–36 months, but awareness, acceptance, and affordability of the vaccine are key to its successful rollout. The objective of this study was to assess the awareness, acceptability, and willingness to pay (WTP) for the R21/Matrix-M malaria vaccine among pregnant women and nursing mothers in Enugu State, Nigeria.

METHODS: A descriptive cross-sectional study was carried out in the selected locations via a 30-item, 4-section questionnaire. Descriptive statistics (frequency, percentage, mean and median) and inferential statistics (chi-square test and binary logistic regression) were used to analyze the data, with the significance level set at $p \leq 0.05$.

RESULTS: Of the 310 participants, most were aged 22–33 years, 232 (75.0%) and had at least one child aged 3 years and younger, 180 (58.1%). Additionally, the majority were not aware of the R21/Matrix-M malaria vaccine, 262 (84.5%); agreed to vaccinate their child, 292 (94.2%); and declared a WTP, 247 (79.7%). The mean and median maximum WTP values were US $0.82 ± 1.41 (₦639.27 ± 1097) and US $0.38 (₦300) [Official USD ($) rate; (1 USD = ₦780) as of June–July 2023], respectively. Age ($p = 0.005$) and health insurance ($p = 0.021$) were significantly associated with the respondents' WTP. Health insurance (OR: 0.417, 95% CI: 0.19–0.92) also predicted a lower WTP.

CONCLUSION: Despite limited awareness of the R21/Matrix-M malaria vaccine, participants demonstrated high acceptance and a strong WTP, suggesting that increased awareness could lead to high vaccine coverage.

SUPPLEMENTARY INFORMATION: The online version contains supplementary material available at 10.1186/s12889-025-25405-1.

WEB: 10.1186/s12889-025-25405-1
IMPACT FACTOR: 3.6
CITED HALF-LIFE: 5.4

START COMMENTARY

Vaccine hesitancy in Nigeria poses a challenge to measles elimination. Hesitancy toward malaria vaccination may be driven in part by affordability constraints in this low- and middle-income country (LMIC) context. This study examines the financial viability of introducing the R21 malaria vaccine in Nigeria to inform equitable and sustainable implementation strategies, using a cross-sectional questionnaire among pregnant women and nursing mothers in Enugu State. Most respondents reported willingness to pay (WTP) for their child to be vaccinated. Age, occupation, and health insurance were significantly associated with WTP with respondents aged 18–21 being most likely to report WTP, and employed respondents being more likely than unemployed respondents. Respondents without health insurance were more likely to pay than those with insurance. Unexpectedly, family income was not a significant predictor of WTP, contrary to findings from other studies. Interpretation is limited by the cross-sectional design, which captures participant attitudes at a single point in time, and by potential response bias because participants were aware of the study's purpose and no blinding was applied. Further stated WTP may not align with actual behavior. The authors recommend government funding to subsidize vaccine costs, investment in public health campaigns to increase awareness, and integration of malaria vaccination into existing healthcare structures. Policies that reduce financial burdens on nursing mothers, such as free or low-cost vaccination, are also emphasized.

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8. Acceptance, hesitancy, and ethical challenges of the COVID-19 vaccine in sub-Saharan Africa: a systematic review and meta-analysis.

Ilboudo D, Simpore A, Sawadogo J, Ouattara A, Ouedraogo A, Zongo L, et al.

Vaccine. 2025 Dec 12;69:127966.
PubMed ID: 41253021

ABSTRACT

BACKGROUND: In light of the public health emergency brought about by the novel coronavirus, health authorities actively promoted vaccination against SARS-CoV-2. The COVID-19 pandemic has brought to the forefront critical questions concerning individual freedoms and the right to consent or decline vaccination. To better anticipate and manage future epidemics, it is essential to engage in thoughtful philosophical and ethical reflection-particularly regarding the legitimacy and implications of vaccine passport policies.

OBJECTIVES: This study aimed to assess COVID-19 vaccine acceptance and hesitancy in Sub-Saharan Africa, identify reasons for refusal, and examine the ethical legitimacy of imposing a “green pass” for vaccination for foreign travel.

METHODS: A meta-analysis was conducted from January 2021 to April 2025 in sub-Saharan African countries, in five databases (PubMed, Science Direct, Google Scholar, African Journal Online, and HINARI) to identify studies related to acceptance and hesitancy toward COVID-19 vaccines in the general population and among healthcare professionals. This study was registered under the PROSPERO database (CRD420251060375) and used the PRISMA guidelines. The “proportional effect size” of acceptance and hesitancy was calculated using a random-effects meta-analysis with STATA 17 software. Funnel plots and Egger’s tests were used to assess publication bias.

RESULTS: A total of 40 studies involving 107,478 participants across 23 African countries were included. The pooled rates of vaccine acceptance and hesitancy were, respectively: 54.73 [95 % CI: 50.54 %-58.89 %], and 34.96 % [95 % CI: 27.95 %-42.30 %]. Eastern Africa had the highest acceptance rate (60.44 %), and lower rate observed in West Africa (52.22 %). Reasons for hesitancy included misinformation, distrust of new vaccines, fear of side effects, suspicion of authorities, and opposition to mandatory vaccination certificates.

CONCLUSION: The pandemic has brought to the fore fundamental issues relating to the right to accept or refuse vaccination. To prepare for the management of future epidemics, it is necessary to reflect on the ethics of requiring a vaccine passport.

WEB: 10.1016/j.vaccine.2025.127966
IMPACT FACTOR: 3.5
CITED HALF-LIFE: 8.2

START COMMENTARY

This systematic review and meta-analysis synthesized 40 studies from 23 countries in sub-Saharan Africa (SSA) to estimate COVID-19 vaccine acceptance and hesitancy and to examine ethical debates about vaccine “green pass” policies—certificates required for travel or participation in social events. Across studies, a recurring theme was the changing public perception of COVID-19 severity since the acute phases of the pandemic. In many SSA settings, COVID-19 is now viewed as a milder, seasonal illness, contributing to increased vaccine hesitancy. Green pass policies were frequently interpreted as violations of bodily autonomy and government overreach, generating resentment and, in some cases, reinforcing vaccine hesitancy. These findings underscore the importance of careful ethical consideration when implementing vaccine mandates during public health emergencies. The authors argue that vaccine passport policies should be treated as exceptional measures paired with transparent communication and trust-building to avoid exacerbating resentment. Interpretation is limited by high heterogeneity, suggesting substantial contextual differences across settings. A key strength of this study is its integration of ethical reflection on mandatory vaccination and vaccine passports, enhancing its relevance for future pandemic preparedness, particularly in balancing public health goals with individual autonomy and privacy.

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9. Ranking the most efficient human papillomavirus vaccination strategies in low-income and lower-middle income countries: a mathematical modelling analysis.

Bénard &, Drolet M, Gingras G, Laprise J, Sabourin A, Bloem P, et al.

Lancet Glob Health. 2025 Nov 15;13(12):e2153-e2164.
PubMed ID: 41240953

ABSTRACT

BACKGROUND: One-dose vaccination and increased vaccine supply provide the opportunity for low-income countries (LICs) and lower-middle-income countries (LMICs) to extend human papillomavirus (HPV) vaccination to populations other than girls aged 9-14 years targeted by routine vaccination. The aim of our study was to use mathematical modelling to identify and rank HPV vaccination strategies according to their efficiency at reducing cervical cancer in LICs and LMICs.

METHODS: In this mathematical modelling analysis, we used HPV-ADVISE to model the efficiency of 162 vaccination strategies in 67 LICs and LMICs varying the following parameters: targeted populations (girls and women or gender neutral); age cohorts (routine vaccination at age 9 years or multi-age cohorts up to age 14 years, 20 years, 25 years, 30 years, and 35 years); number of doses (one or two); and vaccination coverage (40-90%), under different one-dose vaccine efficacy and duration assumptions. We measured efficiency using the number of doses needed to prevent one cervical cancer (ie, number needed to vaccinate [NNV]), obtained by dividing the incremental number of doses given by the incremental number of cervical cancers averted over 100 years. We ranked, incrementally, all strategies from most to least efficient.

FINDINGS: Globally, under our base-case assumptions (80% vaccination coverage, non-inferior one-dose vaccine, and unfeasibility of increasing vaccination coverage), the model projects that, following routine vaccination of girls aged 9 years with one dose, the most efficient strategies (efficiency frontier) would be, in order: multi-age cohort vaccination of girls aged 10-14 years with one dose (NNV 48); multi-age cohort vaccination of girls aged 15-20 years with one dose (NNV 64); multi-age cohort vaccination of women aged 21-25 years with two doses (NNV 369); routine and multi-age cohort vaccination of boys aged 9-20 years with one dose (NNV 512); multi-age cohort vaccination of women aged 26-30 years (NNV 640) and 31-35 years (NNV 771) with two doses. Under all scenarios investigated (varying vaccination coverage, one-dose vaccine assumptions, and country characteristics), the model projects that the most efficient strategies would be to vaccinate girls up to age 20 years with one dose. The next most efficient strategies depend on the vaccination coverage that can be achieved and the cervical cancer incidence in a given country.

INTERPRETATION: Our study suggests that the most efficient vaccination strategy to prevent cervical cancer in LICs and LMICs is to vaccinate girls aged up to 20 years with a single-dose

vaccine with high vaccination coverage, before adding boys or providing a second dose to girls. The choice of additional populations to vaccinate will depend on the characteristics and prioritisation goals of a country.

FUNDING: WHO, Canadian Institute of Health Research, and the Gates Foundation.

WEB: 10.1016/S2214-109X(25)00376-6
IMPACT FACTOR: 18.0
CITED HALF-LIFE: 4.8

START COMMENTARY

Since 2022, WHO guidance has supported a single-dose HPV schedule as an alternative to the traditional two-dose regimen, creating an opportunity to expand HPV vaccination coverage in LMICs. This modelling study used HPV-ADVISE LMIC, a transmission-dynamic model of HPV infection and cervical cancer, to evaluate and rank vaccination strategies across LICs and LMICs by dose-efficiency. Across scenarios, the most efficient strategy after routine vaccination of girls at age 9 was one-dose catch-up vaccination of girls through age 20, which far outperformed strategies adding boys or older women. These results show the importance of vaccination coverage when considering strategy efficiency. When coverage among girls is below the 90% elimination target, the model generally indicates it is most efficient to increase coverage in girls up to age 20 before expanding to other groups. The authors note, however, that increasing coverage may be logistically and financially challenging in some settings due to delivery costs, outreach demands, and the need to build vaccine confidence. Strengths include the breadth of scenarios and use of a widely peer-reviewed model that has informed policy. A key limitation is the focus on cervical cancer alone. Including non-cervical HPV-related cancers, particularly in men, would likely improve the efficiency of vaccinating boys and men. Overall, the findings provide a practical prioritization framework for LMIC decision makers, while underscoring the need for country-level adaptation that reflects local epidemiology, feasibility, and program goals.

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10. Rotavirus vaccine coverage, completion, and compliance: A systematic literature review.

Tahrat H, Munir A, Marchetti F.

Hum Vaccin Immunother. 2025 Jan 03;21(1):2442780.
PubMed ID: 39751000

ABSTRACT

Rotavirus, a leading cause of severe acute gastroenteritis in children, is largely preventable through immunization with two internationally licensed oral rotavirus vaccines (RVVs) included in national programs across over 100 countries. These RVVs are administered in either two (Rotarix™; 2D-RV) or three (RotaTeq®; 3D-RV) doses. We aimed to assess the global coverage, completion, and compliance of 2D-RV and 3D-RV in various settings, and to identify factors influencing vaccine coverage. We conducted a systematic review of PubMed and Embase for articles published between 2006 and 2021. We included 74 publications across 31 countries. RVV coverage rates and the factors associated with coverage varied widely among countries based on income level, RVV used, and the year of vaccination. Due to market bias and insufficient studies, valid RVVs coverage comparisons couldn't be made. However, 2D-RV had better completion/compliance rates than 3D-RV in Italy, Mexico, and the US.

WEB: 10.1080/21645515.2024.2442780
IMPACT FACTOR: 3.5
CITED HALF-LIFE: 4.8

START COMMENTARY

This systematic review assessed coverage, completion, and compliance of two-dose Rotarix (2D-RV) and three-dose RotaTeq (3D-RV) across 31 countries where either vaccine was included in the national immunization program. Uptake metrics varied widely by country income level, vaccine used, year of vaccination, and program context. Although results were reported separately for 2D-RV and 3D-RV, direct comparisons between vaccines are not valid because of market share bias, methodological heterogeneity, country-specific factors, and a lack of head-to-head studies. However, descriptively reported data showed higher observed coverage for 2D-RV in several settings. For example, when Mexico switched from 2D-RV to 3D-RV, full coverage declined from approximately 76% to 61%. In Australia, full coverage was consistently higher in regions using 2D-RV than in those using 3D-RV across study periods. Strengths of this review include its long study period and inclusion of multiple utilization metrics beyond coverage alone. Limitations include heterogeneous definitions of compliance and exclusion of DHS data. Findings from this study suggest that lower-

dose schedules may improve real-world vaccination coverage, completion, and compliance.

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Additional Articles of Interest

1 Integration Models for Delivering COVID-19 Vaccines Through HIV Services in Low-and Middle-Income Countries: A Scoping Review. {Full Article}
2 Association between the continuum of maternal healthcare services and child immunisation in East Africa: a propensity score matching analysis. {Full Article}
3 Tetanus toxoid immunization coverage and its determinants among pregnant women in Somalia: A cross-sectional analysis of the 2020 Demographic and Health Survey. {Full Article}
4 Navigating stigma, faith, and fear: understanding HPV vaccine acceptance among adolescent girls in rural parts of Central Ethiopia. {Full Article}
5 Coverage and determinants of hepatitis B virus vaccine uptake among children aged 12-36 months in Ethiopia: an analysis of the 2016 Ethiopian Demographic and Health Survey. {Full Article}
6 A qualitative exploration of deterrents to COVID-19 vaccination uptake among adults in post-war Tigray, Northern Ethiopia. {Full Article}
7 Awareness and acceptance of the malaria vaccine among caregivers attending primary health care centres in Sudan: a mixed-methods study. {Full Article}
8 Strategies to promote COVID-19 vaccination in Northern Ghana: a qualitative study of stakeholders' perspectives. {Full Article}
9 Decomposition of socioeconomic inequalities in zero-dose children aged 12-23 months in India. {Full Article}
10 Targeted assessment of prevalence of zero-dose and under-immunised children in Bangladesh {Full Article}
11 Behavioural and social drivers of immunisation among zero dose children in pastoralist communities of Ethiopia: a qualitative study. {Full Article}
12 Economic evaluation of the one-dose HPV vaccination program in Nigeria. {Full Article}
13 A qualitative analysis exploring barriers and enablers to distribution, delivery, and access to COVID-19 vaccines in Botswana. {Full Article}
14 Human papillomavirus awareness and vaccination willingness among adults in Madagascar: a cross-sectional study. {Full Article}
15 An impact and cost-effectiveness analysis of rotavirus vaccine introduction in Egypt. {Full Article}
16 Zero-Dose Vaccination Among Children Aged 12-35 Months in Ethiopia. {Full Article}
17 Cultural tailoring of vaccination messages: leveraging culturally adapted audio messaging in the promotion of maternal and infant vaccination uptake in rural communities in Nigeria. {Full Article}
18 Geographic disparities in hepatitis B vaccine coverage across Africa: Implications for targeted interventions and 2030 goals. {Full Article}

19 Key players and determinants improving human papillomavirus vaccination coverage in Cameroon: a cross-sectional nationwide health workers survey. {Full Article}

20 Safety and coverage of Pneumosil pneumococcal polysaccharide conjugate vaccine (10-valent PCV) in a camp for internally displaced persons in Somaliland. {Full Article}

21 Identifying context-specific drivers of routine childhood immunisation dropout in Mozambique and Malawi: a secondary thematic analysis of qualitative community-based participatory research data. {Full Article}

22 Assessment of hepatitis B knowledge, attitudes, and practices among healthcare workers in Herat, Afghanistan: a cross-sectional study. {Full Article}

23 Child vaccine communication practice in promoting child immunization in the Amhara region of Ethiopia. {Full Article}

24 Recommendations to mitigate barriers to uptake and delivery of a four-dose malaria vaccine schedule: insights from the MVIP's qualitative evidence. {Full Article}

Appendix

The literature search for the August 2025 Vaccine Delivery Research Digest was conducted on December 28, 2025. We searched English language articles indexed by the US National Library of Medicine and published between November 15, 2025 and December 14, 2025. The search resulted in 832 items.

SEARCH TERMS

((((“vaccine”[tiab] OR “vaccines”[tiab] OR “vaccination”[tiab] OR “immunization”[tiab] OR “immunisation”[tiab] OR “vaccines”[MeSH Terms] OR (“vaccination”[MeSH Terms] OR “immunization”[MeSH Terms])) AND (“logistics”[tiab] OR “supply”[tiab] OR “supply chain”[tiab] OR “implementation”[tiab] OR “expenditures”[tiab] OR “financing”[tiab] OR “economics”[tiab] OR “Cost effectiveness”[tiab] OR “coverage”[tiab] OR “attitudes”[tiab] OR “belief”[tiab] OR “beliefs”[tiab] OR “refusal”[tiab] OR “Procurement”[tiab] OR “timeliness”[tiab] OR “systems”[tiab])) OR “vaccine delivery”[tiab] OR “vaccination refusal”[MeSH Terms] OR “immunization programs”[MeSH Terms] OR “zero dose”[tiab] OR “unvaccinated children”[tiab] OR “gavi”[tiab]) NOT (“in vitro”[tiab] OR “immune response”[tiab] OR “gene”[tiab] OR “chemistry”[tiab] OR “genotox*”[tiab] OR “sequencing”[tiab] OR “nanoparticle*”[tiab] OR “bacteriophage”[tiab] OR “exome”[tiab] OR “exogenous”[tiab] OR “electropor*“[tiab] OR”systems biology”[tiab] OR “animal model”[tiab] OR “cattle”[tiab] OR “sheep”[tiab] OR “goat”[tiab] OR “rat”[tiab] OR “pig”[tiab] OR “mice”[tiab] OR “mouse”[tiab] OR “murine”[tiab] OR “porcine”[tiab] OR “ovine”[tiab] OR “rodent”[tiab] OR “fish”[tiab])) AND “English”[Language] AND 2025/11/15:2025/12/14[Date - Publication]