VACCINE DELIVERY RESEARCH DIGEST

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

REPORT TO THE BILL & MELINDA GATES FOUNDATION

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List of Articles

1 Attitudes and behaviors of maternal Tdap vaccination in Panama, Peru, and Colombia: An international cross-sectional study.

{Abstract & START Commentary} {Full Article}

- Surveyed women with children under 12 months of age to gain insight into behavioral and social drivers of Tdap vaccine uptake during pregnancy

2 Repurposing rapid diagnostic tests to detect falsified vaccines in supply chains.

{Abstract & START Commentary} {Full Article}

- Provides evidence from a pilot study for the use of rapid diagnostic tests to detect falsified vaccines

3 The public health impact and cost-effectiveness of the R21/Matrix-M malaria vaccine: a mathematical modelling study.

{Abstract & START Commentary} {Full Article}

- Provides estimates of malaria cases, deaths, disability-adjusted life-years averted and cost-effectiveness across a range of transmission settings in sub-Saharan Africa under three vaccination scenarios based on vaccine efficacy data from 3 years of follow-up in the phase 2b trial of R21/Matrix-M malaria vaccine

4 When a Toolkit Is Not Enough: A Review on What Is Needed to Promote the Use and Uptake of Immunization-Related Resources.

{Abstract & START Commentary} {Full Article}

- Identified factors that support the uptake and use of immunization-related resources such as toolkits, guidance materials, and capacity building materials

5 Deployment of vaccine cold chain equipment in resource-limited settings: lessons from the Gavi Cold Chain Optimization Platform in Cameroon.

{Abstract & START Commentary} {Full Article}

- Reported on timeline for cold chain equipment installation and quality and functioning of equipment after it was installed at selected health facilities in Cameroon

6 Resurgent rotavirus diarrhoea outbreak five years after introduction of rotavirus vaccine in Botswana, 2018.

{Abstract & START Commentary} {Full Article}

- Described a 2018 rotavirus outbreak and analyzed trends in diarrheal disease among children < 5 years prior to and after the introduction of rotavirus vaccine in Botswana

7 Safety and efficacy of malaria vaccine candidate R21/Matrix-M in African children: a multicentre, double-blind, randomised, phase 3 trial.

{Abstract & START Commentary} {Full Article}

- Provides safety and efficacy results from the phase 3 R21/Matrix-M malaria vaccine of more than 3000 vaccinated children who were followed for up to 18 months post-vaccination

8 Using community-based, participatory qualitative research to identify determinants of routine vaccination drop-out for children under 2 in Lilongwe and Mzimba North Districts, Malawi.

{Abstract & START Commentary} {Full Article}

- Identified and described determinants of vaccination drop-out in Malawi from the perspective of caregivers and health workers

9 HPV vaccination in Africa in the COVID-19 era: a cross-sectional survey of healthcare providers' knowledge, training, and recommendation practices.

{Abstract & START Commentary} {Full Article}

- Provides evidence to support the need for training to increase healthcare provider's knowledge about HPV vaccination

10 Impact of the 'Health on Wheels' (HoW) strategy on COVID-19 vaccination coverage in hard-to-reach communities in Alta Verapaz, Guatemala, 2022.

{Abstract & START Commentary} {Full Article}

- Evaluated COVID-19 vaccine uptake in communities in Guatemala with low COVID-19 vaccination uptake and high levels of COVID-19 vaccine hesitancy after deploying mobile brigades with dedicated teams of health workers and culturally sensitive health promotion plans

11 Supporting National Immunization Technical Advisory Groups (NITAGs) in development of evidence-based vaccine recommendations and NITAG assessments - New tools and approaches.

{Abstract & START Commentary} {Full Article}

- Described facilitated training developed by the U.S. Centers for Disease Control and Prevention and Task Force for Global Health to support NITAGs in using evidence-informed decision making

12 Factors impacting sustained coverage in the context of donor transitions: experience from Sri Lanka.

{Abstract & START Commentary} {Full Article}

- Evaluated transition experiences of the expanded programme on immunization (EPI) that received Gavi funding to expand the vaccine portfolio and the Anti-Malaria Campaign (AMC) that received funding from the Global Fund for AIDS, Tuberculosis and Malaria to scale-up interventions to target and achieve malaria elimination and assessed if these programs were able to sustain coverage of previously donor-funded interventions post-transition

13 A Holistic Strategy of Mother and Child Health Care to Improve the Coverage of Routine and Polio Immunization in Pakistan: Results from a Demonstration Project.

{Abstract & START Commentary} {Full Article}

- Assessed the impact of an integrated strategy which involved setting up health camps and actively engaging and mobilizing the local community on immunization coverage in Pakistan's high-risk union councils of polio-endemic districts

14 Effectiveness of one dose of killed oral cholera vaccine in an endemic community in the Democratic Republic of the Congo: a matched case-control study.

{Abstract & START Commentary} {Full Article}

- Examined the effectiveness of a single-dose of the oral cholera vaccine Euvichol-Plus in Uvira, an endemic urban setting in eastern Democratic Republic of the Congo where a mass vaccination campaign was conducted in 2020, resulting in largely single-dose coverage

15 Evaluating the potential impact of rubella-containing vaccine introduction on congenital rubella syndrome in Afghanistan, Dem. Republic of Congo, Ethiopia, Nigeria, and Pakistan: A mathematical modeling study.

{Abstract & START Commentary} {Full Article}

- Used a mathematical model to simulate rubella-containing vaccine introduction scenarios over 30 years and found that introducing rubella-containing vaccine in Afghanistan,

Democratic Republic of Congo, Ethiopia, Nigeria, and Pakistan could avert between 86,000 and 535,000 congenital rubella syndrome births, preventing 2.5 to 15.8 million disability-adjusted life years

16 Equity in vaccine coverage in Uganda from 2000 to 2016: revealing the multifaceted nature of inequity.

{Abstract & START Commentary} {Full Article}

- Utilized the Vaccine Economics Research for Sustainability and Equity (VERSE) Equity Toolkit to provide a multivariate assessment of immunization coverage and equity among children under five years of age in Uganda based on the 2016 Uganda Demographic and Health Survey dataset by ranking the population with a composite direct unfairness index, generating quantitative measure of efficiency (coverage) and equity, and decomposing inequity into its contributing factors

Appendix

Details of Articles

1. Attitudes and behaviors of maternal Tdap vaccination in Panama, Peru, and Colombia: An international cross-sectional study.

McDermid P, Blazek K, Mougin N, Thomson A, Seale H.

Vaccine. 2024 Feb 14.

PubMed ID: 38355320

ABSTRACT

INTRODUCTION: Despite a recommendation by PAHO for Tdap vaccination in pregnant women since 2019, uptake remains suboptimal across Latin America. This study evaluated the knowledge and attitudes of women towards maternal Tdap vaccination in Colombia, Peru, and Panama to identify the critical behavioral and social drivers of Tdap vaccine uptake during pregnancy.

METHODS: A cross-sectional online survey was undertaken between December 8, 2022, and January 11, 2023, targeting women in Colombia, Peru, or Panama with a child 12 months or under. We collected data on respondents' demographics, social and behavioral determinants of vaccine acceptance, determinants of vaccine uptake (using the validated 5As taxonomy), and previous vaccination experience.

RESULTS: In the 938 respondents who completed the survey (Panama, n = 325; Peru, n = 305; Colombia, n = 308), 73-80 % had received the influenza vaccine, whereas only 30-39 % had received a Tdap vaccine. Significant correlates of Tdap vaccine uptake common to all three countries included a health professional recommendation, knowledge of the vaccine and location of vaccination, perceived vulnerability to pertussis infection, perceived importance of immunization, and receipt of a reminder. In specific countries, nonvaccinated women were more likely to cite issues with ease of access (Panama, Colombia), affordability (opportunity costs; Peru, Colombia), and understanding the rationale for vaccination in pregnancy (Panama, Colombia).

CONCLUSION: To increase maternal Tdap vaccine uptake, health professionals should be encouraged to recommend vaccination consistently, and pregnant women should receive reminders explaining why and where to be vaccinated.

WEB: 10.1016/j.vaccine.2024.01.106

IMPACT FACTOR: 5.5

CITED HALF-LIFE: 7.2

START COMMENTARY

More than 84% of study respondents in each country (Colombia, Peru, Panama) reported receiving a vaccination during their last pregnancy. In all three countries, 80% of respondents reported that health care professionals had recommended the tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine, and >80% reported understanding of the importance of Tdap vaccination. Given low vaccine uptake despite positive attitudes toward the Tdap vaccine, McDermid et al. recommended integrating maternal immunization with other health services such as prenatal visits. Of note, the survey completion rate was only 35.5% with over 1700 responses excluded due to ineligibility or incomplete responses. Important demographic data such as race/ethnicity were not collected, limiting the generalizability of these results.

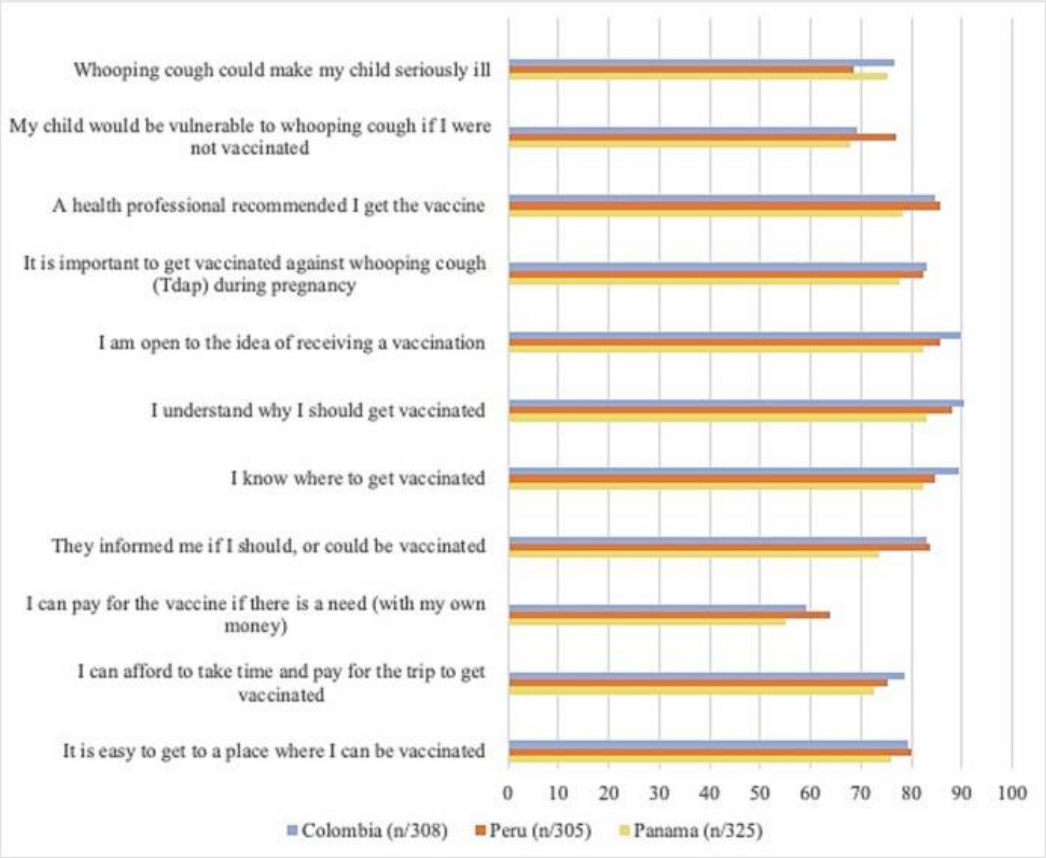

Figure 1. *Determinants of vaccination in Colombia, Peru, and Panama (Percentage of participants who agree/strongly agree).*

Return to List of Articles

2. Repurposing rapid diagnostic tests to detect falsified vaccines in supply chains.

Bharucha T, Gangadharan B, Clarke R, Fernandez L, Arman B, Walsby-Tickle J, et al.
Vaccine. 2024 Feb 14.
PubMed ID: 38355318

ABSTRACT

Substandard (including degraded) and falsified (SF) vaccines are a relatively neglected issue with serious global implications for public health. This has been highlighted during the rapid and widespread rollout of COVID-19 vaccines. There has been increasing interest in devices to screen for SF non-vaccine medicines including tablets and capsules to empower inspectors and standardise surveillance. However, there has been very limited published research focussed on repurposing or developing new devices for screening for SF vaccines. To our knowledge, rapid diagnostic tests (RDTs) have not been used for this purpose but have important potential for detecting falsified vaccines. We performed a proof-in-principle study to investigate their diagnostic accuracy using a diverse range of RDT-vaccine/falsified vaccine surrogate pairs. In an initial assessment, we demonstrated the utility of four RDTs in detecting seven vaccines. Subsequently, the four RDTs were evaluated by three blinded assessors with seven vaccines and four falsified vaccines surrogates. The results provide preliminary data that RDTs could be used by multiple international organisations, national medicines regulators and vaccine manufacturers/distributors to screen for falsified vaccines in supply chains, aligned with the WHO global 'Prevent, Detect and Respond' strategy.

WEB: 10.1016/j.vaccine.2024.01.019
IMPACT FACTOR: 5.5
CITED HALF-LIFE: 7.2

START COMMENTARY

Vaccines and rapid diagnostic tests (RDTs) included in this study by Bharucha et al. are listed in Table 1. RDTs were chosen for corresponding vaccines – a lateral flow test for hepatitis B was used to test hepatitis B vaccines, an RDT that detects the presence of streptococcus pneumoniae antigen was used with the two pneumococcal conjugate vaccines, etc. All seven vaccines were correctly detected by their corresponding RDT. In the blinded follow-up study described in the abstract, the RDTs enabled successful identification of genuine vaccine samples in 10 out of 11 samples tested. Advantages of RDT include affordability, high specificity and sensitivity, ease of use, and ability to provide quick results. Currently, RDTs would not be able to detect substandard vaccines or those with reduced potency, and development of quantitative RDTs is suggested to meet that need. In

addition, not all vaccines or vaccine formulas would be detected by current RDTs. Authors note that this is a small proof of concept study and further studies are needed.

Return to List of Articles

3. The public health impact and cost-effectiveness of the R21/Matrix-M malaria vaccine: a mathematical modelling study.

Schmit N, Topazian H, Natama H, Bellamy D, Traoré O, Somé M, et al.

Lancet Infect Dis. 2024 Feb 11.

PubMed ID: 38342107

ABSTRACT

BACKGROUND: The R21/Matrix-M vaccine has demonstrated high efficacy against Plasmodium falciparum clinical malaria in children in sub-Saharan Africa. Using trial data, we aimed to estimate the public health impact and cost-effectiveness of vaccine introduction across sub-Saharan Africa.

METHODS: We fitted a semi-mechanistic model of the relationship between anti-circumsporozoite protein antibody titres and vaccine efficacy to data from 3 years of follow-up in the phase 2b trial of R21/Matrix-M in Nanoro, Burkina Faso. We validated the model by comparing predicted vaccine efficacy to that observed over 12-18 months in the phase 3 trial. Integrating this framework within a mathematical transmission model, we estimated the cases, malaria deaths, and disability-adjusted life-years (DALYs) averted and cost-effectiveness over a 15-year time horizon across a range of transmission settings in sub-Saharan Africa. Cost-effectiveness was estimated incorporating the cost of vaccine introduction (dose, consumables, and delivery) relative to existing interventions at baseline. We report estimates at a median of 20% parasite prevalence in children aged 2-10 years (PfPR2-10) and ranges from 3% to 65% PfPR2-10.

FINDINGS: Anti-circumsporozoite protein antibody titres were found to satisfy the criteria for a surrogate of protection for vaccine efficacy against clinical malaria. Age-based implementation of a four-dose regimen of R21/Matrix-M vaccine was estimated to avert 181 825 (range 38 815-333 491) clinical cases per 100 000 fully vaccinated children in perennial settings and 202 017 (29 868-405 702) clinical cases per 100 000 fully vaccinated children in seasonal settings. Similar estimates were obtained for seasonal or hybrid implementation. Under an assumed vaccine dose price of US$3, the incremental cost per clinical case averted was $7 (range 4-48) in perennial settings and $6 (3-63) in seasonal settings and the incremental cost per DALY averted was $34 (29-139) in perennial settings and $30 (22-172) in seasonal settings, with lower cost-effectiveness ratios in settings with higher PfPR2-10.

INTERPRETATION: Introduction of the R21/Matrix-M malaria vaccine could have a substantial public health benefit across sub-Saharan Africa.

FUNDING: The Wellcome Trust, the Bill & Melinda Gates Foundation, the UK Medical Research Council, the European and Developing Countries Clinical Trials Partnership 2 and 3, the NIHR Oxford Biomedical Research Centre, and the Serum Institute of India, Open Philanthropy.

WEB: 10.1016/S1473-3099(23)00816-2
IMPACT FACTOR: 56.3
CITED HALF-LIFE: 3.7

START COMMENTARY

In this study, authors modeled 3 malaria vaccination scenarios: 1) age-based, 2) seasonal, and 3) a hybrid of age-based and seasonal. They evaluated the malaria cases and deaths averted across scenarios. The age-based vaccination scenario was based on the WHO guidelines and Malaria Vaccine Implementation Programme with three doses at 6, 7, and 8 months and a booster dose 12 months after dose three, with an optional second booster. In the seasonal vaccination scenario doses were administered to children aged 5-17 months and timed relative to the peak in clinical incidence, with doses administered 5.5, 4.5, and 3.5 months before the seasonal peak. The hybrid approach combined age-based and seasonal timing, with the first three doses administered using the age-based regimen, the first booster dose given 3.5 months before the seasonal peak and a minimum gap of 6 months between dose 3 and the first booster; children with shorter gaps received the first booster the following year (Appendix 1). Table 2 includes public health impact, cost, and cost-effectiveness estimates by implementation method and number of booster doses.

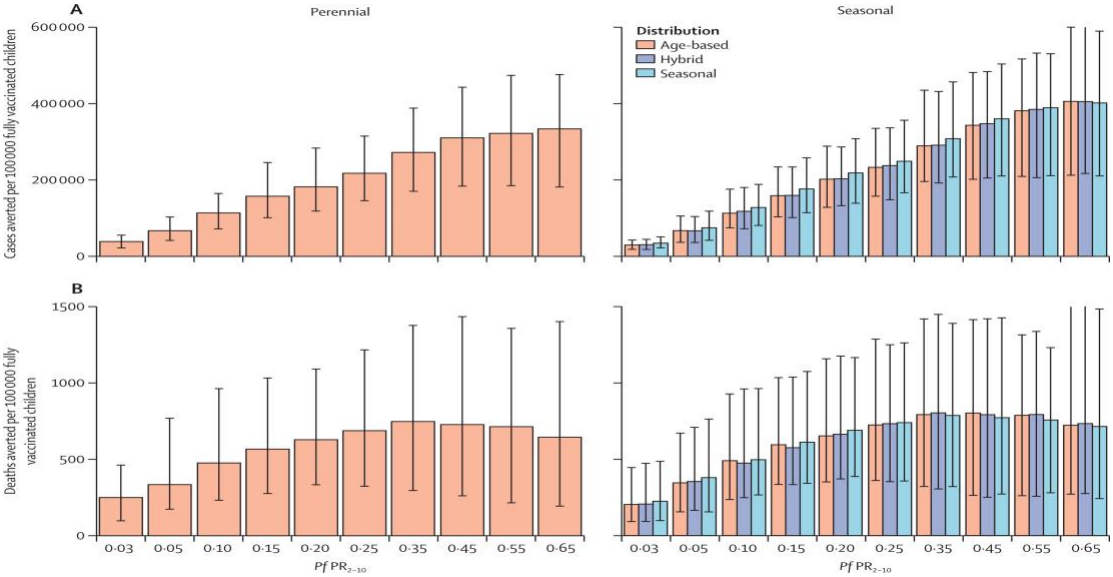

Figure 3. *Cases averted per 100,000 fully vaccinated children (A) and malaria deaths averted per 100,000 fully vaccinated children (B), stratified by Plasmodium Falciparum parasite prevalence ($PfPR_{2-10}$) in children aged 2-5 years, seasonality, and implementation method (age-based, hybrid, or seasonal).*
Error bars represent the 2.5 and 97.5 percentiles around the median estimate.

Return to List of Articles

4. When a Toolkit Is Not Enough: A Review on What Is Needed to Promote the Use and Uptake of Immunization-Related Resources.

Jaffe S, Meghani A, Shearer J, Karlage A, Ivankovich M, Hirschhorn L, et al.

Glob Health Sci Pract. 2024 Mar 02;12(1).

PubMed ID: 38336478

ABSTRACT

INTRODUCTION: Evidence-based resources, including toolkits, guidance, and capacity-building materials, are used by routine immunization programs to achieve critical global immunization targets. These resources can help spread information, change or improve behaviors, or build capacity based on the latest evidence and experience. Yet, practitioners have indicated that implementation of these resources can be challenging, limiting their uptake and use. It is important to identify factors that support the uptake and use of immunization-related resources to improve resource implementation and, thus, adherence to evidence-based practices.

METHODS: A targeted narrative review and synthesis and key informant interviews were conducted to identify practice-based learning, including the characteristics and factors that promote uptake and use of immunization-related resources in low- and middle-income countries and practical strategies to evaluate existing resources and promote resource use.

RESULTS: Fifteen characteristics or factors to consider when designing, choosing, or implementing a resource were identified through the narrative review and interviews. Characteristics of the resource associated with improved uptake and use include ease of use, value-added, effectiveness, and adaptability. Factors that may support resource implementation include training, buy-in, messaging and communication, human resources, funding, infrastructure, team culture, leadership support, data systems, political commitment, and partnerships.

CONCLUSION: Toolkits and guidance play an important role in supporting the goals of routine immunization programs, but the development and dissemination of a resource are not sufficient to ensure its implementation. The findings reflect early work to identify the characteristics and factors needed to promote the uptake and use of immunization-related resources and can be considered a starting point for efforts to improve resource use and design resources to support implementation.

WEB: 10.9745/GHSP-D-23-00343

IMPACT FACTOR: 4.0

CITED HALF-LIFE: 4.5

START COMMENTARY

Jaffe et al. included 11 papers in their rapid review of published and gray literature that identified common barriers and best practices for implementing new toolkits, guidance, or capacity-building materials, collectively labeled as resources. They conducted key informant interviews (KIIs) with two practitioners who had experience with immunization-related resource implementation in low- and middle-income countries (LMICs). Table 1 lists characteristics of resources to consider when designing or choosing a resource and Table 2 outlines factors to consider when implementing resources; both tables include a detailed list of suggested strategies to improve uptake and use of resources. Further research with more KIIs and a more systematic approach to the literature review is warranted to validate these findings.

Return to List of Articles

5. Deployment of vaccine cold chain equipment in resource-limited settings: lessons from the Gavi Cold Chain Optimization Platform in Cameroon.

Nkwain J, Zambou V, Nchinjoh S, Agbor V, Adidja A, Mbanga C, et al.

Int Health. 2024 Feb 09.

PubMed ID: 38333954

ABSTRACT

BACKGROUND: Lack of or use of suboptimal cold chain equipment (CCE) is a major barrier to optimal immunization coverage and equity. Gavi established the CCE optimization platform (CCEOP) in 2015 to help eligible countries modernize their cold chain systems. However, there are limited data on CCE deployment at country level. We present lessons learnt from deploying CCE from the Gavi CCEOP in Cameroon.

METHODS: This cross-sectional study collected data on the number of days items of CCE spent at each point on their trajectory from the entry port to 62 randomly selected health facilities in Cameroon.

RESULTS: Once equipment arrived at the entry port, it took 10 d for customs clearance, 2 d from customs clearance to warehousing and 257 d (>9 mo) from the warehouse to facilities. Upon arrival at the facilities, it took a median of 53 (range 0-395) d from installation to final commissioning: most of the days (median=210) were spent between installation and final commissioning. The major causes of delays included insufficient coordination and communication across all levels, poor documentation and final commissioning.

CONCLUSION: Early engagement on customs clearance, strengthening coordination and communication, ensuring proper documentation, as well as eliminating final commissioning, could significantly improve implementation of the program.

WEB: 10.1093/inthealth/ihae010

IMPACT FACTOR: 2.5

CITED HALF-LIFE: 4.2

START COMMENTARY

In addition to reporting on timeline for cold chain equipment (CCE) installation, Nkwain et al. reported on the quality and functioning of equipment after it was installed at the selected health facilities. Table 1 lists criteria used for grading installation quality and functionality. Authors found

that 93% of CCE and temperature-monitoring devices but only 80% of voltage stabilizers were functional. A limitation of this study is the lack of dated commissioning forms for 89% and lack of delivery and installation documentation for more than 40% of the 71 items of CCE included in the study.

Return to List of Articles

6. Resurgent rotavirus diarrhoea outbreak five years after introduction of rotavirus vaccine in Botswana, 2018.

Weldegebriel G, Okot C, Majingo N, Oumer N, Mokomane M, Monyatsi N, et al.

Vaccine. 2024 Feb 08.

PubMed ID: 38331661

ABSTRACT

INTRODUCTION: Botswana had a resurgent diarrhea outbreak in 2018, mainly affecting children under five years old. Botswana introduced rotavirus vaccine (RotarixTM) into the national immunization programme in July 2012. Official rotavirus vaccine coverage estimates averaged 77.2% over the five years following introduction.

MATERIALS AND METHODS: The outbreak was investigated using multiple data sources, including stool laboratory testing, immunization data review, water assessment, and vaccine storage assessment. We reviewed official reports of the routine immunization data from 2013 to 2017 and compared district-level rotavirus vaccine coverage with district-level attack rates during the outbreak.

RESULTS: During the outbreak, a total of 228 stool samples were tested at the national health laboratory and 152 (67%) of the specimens were positive for rotavirus. A portion of adequate samples (80) were selected for referral to the Regional Reference Lab. The laboratory testing of 80 samples at the Regional Reference Laboratory in South Africa showed that 91% of the stool samples were positive for rotavirus, and the dominant strain 47/80 (58.7%) was G3P[8]. The immunization data showed that rotavirus vaccine coverage varied widely among districts, and there was no correlation between districts with high attack rates and those with low immunization coverage. Water assessment showed that some water sources were contaminated with E Coli. There was no problem with vaccine storage.

CONCLUSION: The outbreak was caused by rotavirus G3P[8], a strain that was not common in the country prior to the outbreak. Despite the significant pressure and anxiety that outbreaks cause, the number of diarrhea cases and deaths were less compared to pre-vaccine era due to the impact of vaccination. This highlights the need for continuous implementation of high impact child survival interventions.

WEB: 10.1016/j.vaccine.2024.01.084

IMPACT FACTOR: 5.5

CITED HALF-LIFE: 7.2

START COMMENTARY

In addition to describing the investigation of a 2018 rotavirus outbreak, Weldegebriel et al. analyzed trends in diarrheal disease among children < 5 years old prior to and after the introduction of rotavirus vaccine in Botswana and found a significant decrease in average hospitalization (Figure 3.2). Authors also found a decrease in deaths among those hospitalized with diarrhea with dehydration among children < 5 years of age following the introduction of the vaccine (Figures 4 & 4.1). Rotavirus vaccination status and data on age of cases during the outbreak were not available for analysis, a key limitation of the study.

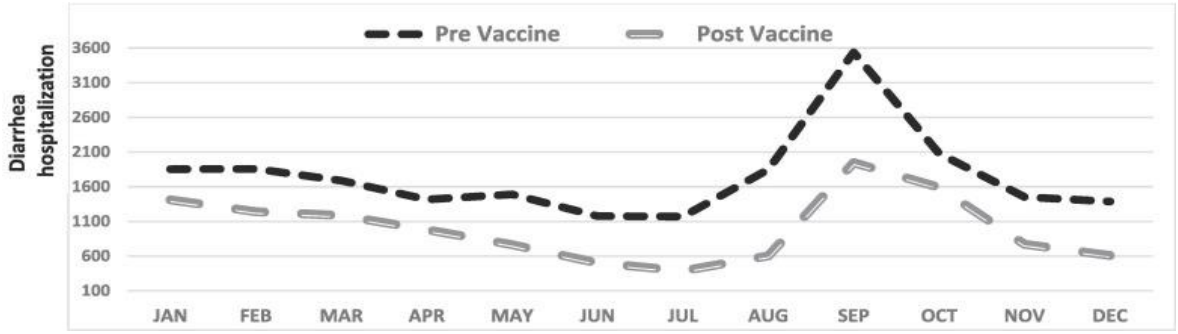

Figure 3.2. *Average diarrhea hospitalization by month Pre-Rotavirus Vaccine (2009-2011) and Post Rotavirus Vaccine (1013-2018) introduction, Botswana*

Return to List of Articles

7. Safety and efficacy of malaria vaccine candidate R21/Matrix-M in African children: a multicentre, double-blind, randomised, phase 3 trial.

Datoo M, Dicko A, Tinto H, Ouédraogo J, Hamaluba M, Olotu A, et al.

Lancet. 2024 Feb 23;403(10426):533-544.

PubMed ID: 38310910

ABSTRACT

BACKGROUND: Recently, we found that a new malaria vaccine, R21/Matrix-M, had over 75% efficacy against clinical malaria with seasonal administration in a phase 2b trial in Burkina Faso. Here, we report on safety and efficacy of the vaccine in a phase 3 trial enrolling over 4800 children across four countries followed for up to 18 months at seasonal sites and 12 months at standard sites.

METHODS: We did a double-blind, randomised, phase 3 trial of the R21/Matrix-M malaria vaccine across five sites in four African countries with differing malaria transmission intensities and seasonality. Children (aged 5-36 months) were enrolled and randomly assigned (2:1) to receive 5 µg R21 plus 50 µg Matrix-M or a control vaccine (licensed rabies vaccine [Abhayrab]). Participants, their families, investigators, laboratory teams, and the local study team were masked to treatment. Vaccines were administered as three doses, 4 weeks apart, with a booster administered 12 months after the third dose. Half of the children were recruited at two sites with seasonal malaria transmission and the remainder at standard sites with perennial malaria transmission using age-based immunisation. The primary objective was protective efficacy of R21/Matrix-M from 14 days after third vaccination to 12 months after completion of the primary series at seasonal and standard sites separately as co-primary endpoints. Vaccine efficacy against multiple malaria episodes and severe malaria, as well as safety and immunogenicity, were also assessed. This trial is registered on ClinicalTrials.gov, NCT04704830, and is ongoing.

FINDINGS: From April 26, 2021, to Jan 12, 2022, 5477 children consented to be screened, of whom 1705 were randomly assigned to control vaccine and 3434 to R21/Matrix-M; 4878 participants received the first dose of vaccine. 3103 participants in the R21/Matrix-M group and 1541 participants in the control group were included in the modified per-protocol analysis (2412 [51·9%] male and 2232 [48·1%] female). R21/Matrix-M vaccine was well tolerated, with injection site pain (301 [18·6%] of 1615 participants) and fever (754 [46·7%] of 1615 participants) as the most frequent adverse events. Number of adverse events of special interest and serious adverse events did not significantly differ between the vaccine groups. There were no treatment-related deaths. 12-month vaccine efficacy was 75% (95% CI 71-79; p<0·0001) at the seasonal sites and 68% (61-74; p<0·0001) at the standard sites for time to first clinical malaria episode. Similarly, vaccine efficacy against multiple clinical malaria episodes was 75% (71-78; p<0·0001) at the seasonal sites and 67% (59-73;

p<0·0001) at standard sites. A modest reduction in vaccine efficacy was observed over the first 12 months of follow-up, of similar size at seasonal and standard sites. A rate reduction of 868 (95% CI 762-974) cases per 1000 children-years at seasonal sites and 296 (231-362) at standard sites occurred over 12 months. Vaccine-induced antibodies against the conserved central Asn-Ala-Asn-Pro (NANP) repeat sequence of circumsporozoite protein correlated with vaccine efficacy. Higher NANP-specific antibody titres were observed in the 5-17 month age group compared with 18-36 month age group, and the younger age group had the highest 12-month vaccine efficacy on time to first clinical malaria episode at seasonal (79% [95% CI 73-84]; p<0·001) and standard (75% [65-83]; p<0·001) sites.

INTERPRETATION: R21/Matrix-M was well tolerated and offered high efficacy against clinical malaria in African children. This low-cost, high-efficacy vaccine is already licensed by several African countries, and recently received a WHO policy recommendation and prequalification, offering large-scale supply to help reduce the great burden of malaria in sub-Saharan Africa.

FUNDING: The Serum Institute of India, the Wellcome Trust, the UK National Institute for Health Research Oxford Biomedical Research Centre, and Open Philanthropy.

WEB: 10.1016/S0140-6736(23)02511-4
IMPACT FACTOR: 168.9
CITED HALF-LIFE: 6.9

START COMMENTARY

Of twenty adverse events of special interest reported, six reports of febrile convulsions were considered likely to be related to the study vaccines; five of these cases occurred in the R21/Matrix-M group and one occurred in the rabies vaccine control group, which was not a statistically significant difference but may warrant further study. Only twelve severe malaria episodes occurred across one year of follow-up, and there were low numbers of hospitalization for malaria, so these outcomes could not be assessed due to lack of power. Figure 2 shows the Kaplan-Meier estimates of time to first episode of clinical malaria in vaccinated and control groups.

Return to List of Articles

8. Using community-based, participatory qualitative research to identify determinants of routine vaccination drop-out for children under 2 in Lilongwe and Mzimba North Districts, Malawi.

Powelson J, Kalepa J, Kachule H, Nkhonjera K, Matemba C, Chisema M, et al.

BMJ Open. 2024 Feb 05;14(2):e080797.

PubMed ID: 38307530

ABSTRACT

OBJECTIVE: In recent years, full childhood routine immunisation coverage has fallen by 5% to levels not seen since 2008; between 2019 and 2021, 67 million children were undervaccinated. We aimed to identify and describe the determinants of vaccination drop-out from the perspectives of caregivers and health workers in Malawi.

DESIGN: We used a community-based participatory research approach to collect data through photo elicitation, short message service exchanges, in-depth interviews and observations. We used a team-based approach for thematic analysis, guided by the Behavioural and Social Drivers of Vaccination framework.

SETTING: The study was conducted in Lilongwe and Mzimba North Districts in Malawi, representing urban and rural settings, respectively.

PARTICIPANTS: Participants included caregivers of partially vaccinated (n=38) and fully vaccinated (n=12) children between 25 and 34 months and Community Health Workers (n=20) who deliver vaccines. Caregiver participants were identified through health facility vaccination registers and with the assistance of community health volunteers.

RESULTS: We identified five principal drivers of routine vaccination drop-out: (1) poor caregiver knowledge of the vaccine schedule and how many vaccines are needed for full vaccination; (2) caregivers' fear of repercussions after not following vaccination guidelines; (3) rumours and concerns if vaccines are repeated or new ones are introduced; (4) high opportunity cost of health facility visits, exacerbated by wait times, stockouts and missed opportunities and (5) limited family support and vaccination burden placed largely on mothers. Key differences between rural and urban settings related to practices around health cards and vaccine wastage, wait times, migrant and tenant communities, and social support systems.

CONCLUSIONS: Immunisation interventions should be tailored to address drivers of drop-out in the community, the health facility and beyond. Service quality, timeliness and reliability need to be improved, and tailored messaging and education are needed, especially in response to COVID-19-related misinformation and introductions of new, routine vaccines.

WEB: 10.1136/bmjopen-2023-080797

IMPACT FACTOR: 2.9

CITED HALF-LIFE: 4.0

START COMMENTARY

Powelson et al. recruited two caregiver researchers from each study district . Requirements for the position included having a child 3 years or younger, fluency in local languages and English, prior researcher experience, and familiarity with the communities of interest. Caregiver researchers were an integral part of the study, providing insight into community-specific experiences with vaccination. The researchers conducted 50 interviews with caregivers of fully- and partially vaccinated children in Lilongwe and Mzimba North using photo-elicitation methods which built on a previous study in Madagascar on vaccination drop-out where caregivers were instructed to take photos that represented their experiences vaccinating their children. A selection of photos from the Madagascar study along with photos that caregiver researchers had taken that were relevant to Malawi-specific vaccine experiences were shown to study participants, and they were asked to choose five that represented their vaccination experiences. Caregiver researchers then discussed the selected photos with participants to learn more about their experiences vaccinating their children.

Return to List of Articles

9. HPV vaccination in Africa in the COVID-19 era: a cross-sectional survey of healthcare providers' knowledge, training, and recommendation practices.

Fokom Domgue J, Dille I, Kapambwe S, Yu R, Gnangnon F, Chinula L, et al.

Front Public Health. 2024 Feb 02;12:1343064.

PubMed ID: 38299075

ABSTRACT

INTRODUCTION: Although the burden of cervical cancer in Africa is highest, HPV vaccination coverage remains alarmingly low in this region. Providers' knowledge and recommendation are key drivers of HPV vaccination uptake. Yet, evidence about providers' knowledge and recommendation practices about the HPV vaccine against a backdrop of emerging vaccine hesitancy fueled by the COVID-19 pandemic is lacking in Africa.

METHODS: A cross-sectional study was conducted in 2021-2022 among healthcare providers involved in cervical cancer prevention activities in Africa. They were invited to report prior training, the availability of the HPV vaccine in their practice, whether they recommended the HPV vaccine, and, if not, the reasons for not recommending it. Their knowledge about the HPV vaccine was assessed through self-reporting (perceived knowledge) and with three pre-tested knowledge questions (measured knowledge).

RESULTS: Of the 153 providers from 23 African countries who responded to the survey (mean age: 38.5 years, SD: 10.1), 75 (54.0%) were female and 97 (63.4%) were based In countries with national HPV immunization programs. Overall, 57 (43.8%) reported having received prior training on HPV vaccine education/counseling, and 40 (37.4%) indicated that the HPV vaccine was available at the facility where they work. Most respondents (109, 83.2%) reported recommending the HPV vaccine in their practice. Vaccine unavailability (57.1%), lack of effective communication tools and informational material (28.6%), and need for adequate training (28.6%) were the most commonly reported reasons for not recommending the HPV vaccine. While 63 providers (52.9%) reported that their knowledge about HPV vaccination was adequate for their practice, only 9.9% responded correctly to the 3 knowledge questions.

CONCLUSION: To increase HPV vaccination coverage and counter misinformation about this vaccine in Africa, adequate training of providers and culturally appropriate educational materials are needed to improve their knowledge of the HPV vaccine and to facilitate effective communication with their patients and the community.

WEB: 10.3389/fpubh.2024.1343064

IMPACT FACTOR: 5.2

CITED HALF-LIFE: 2.3

START COMMENTARY

Findings from this study by Fokom et al. support the need for training to increase healthcare provider's knowledge about HPV vaccination. The three knowledge questions asked of participants focused on 1) vaccine efficacy, 2) vaccine administration schedule, 3) vaccine safety. Of the 121 providers who responded, 14% answered the knowledge question correctly, approximately 25% answered the vaccine administration schedule question correctly, and nearly all (92%) correctly answered the vaccine safety question. The majority (90%) of the respondents were from urban areas, so may not be representative of practitioners in rural areas.

Return to List of Articles

10. Impact of the 'Health on Wheels' (HoW) strategy on COVID-19 vaccination coverage in hard-to-reach communities in Alta Verapaz, Guatemala, 2022.

Balsells E, Vicente M, Reyes S, Figueroa M, Sum K, López Lacán M, et al.

Vaccine. 2024 Feb 26;42(5):1179-1183.
PubMed ID: 38281901

ABSTRACT

BACKGROUND: In April 2022, after a year of COVID-19 vaccination, there were large differences in coverage between urban and rural areas in Guatemala. To address barriers in rural communities, the "Health on Wheels" (HoW) strategy was implemented. The strategy deployed mobile brigades with a dedicated team of health workers and a culturally sensitive health promotion plan in selected communities in 15 districts in Alta Verapaz, a health area with low COVID-19 vaccination uptake and a high-level of COVID-19 vaccine hesitancy. This study evaluates the impact of the HoW strategy.

METHODS: We measured the relative increase in COVID-19 doses administered prior and during the HoW implementation period in the 190 intervened communities and compared to 188 communities without the intervention. Communities were grouped by health district and the impact analyses were stratified by number of COVID-19 vaccine dose (1st, 2nd, and 3rd doses) and history of vaccine hesitancy.

RESULTS: The increase in 1st, 2nd, and 3rd dose-COVID-19 vaccination coverage between before and during HoW implementation was 2.4, 2.2 and 2.6 times higher in intervened communities (20 %, 21 % and 37 % increase in 1st, 2nd and 3rd dose, respectively) than in non-intervened communities (8 %, 10 % and 14 % increase in 1st, 2nd and 3rd dose respectively). For the 1st dose, increase in dose administration was 2.9 times higher in intervened communities (n = 24) with hesitancy (24 % increase) compared to non-intervened communities (n = 188) without hesitancy (8 % increase).

CONCLUSION: The deployment of mobile brigades with a dedicated team of vaccinators and culturally sensitive health promotion through the HoW strategy successfully accelerated the increase in COVID-19 vaccination coverage in rural communities in Guatemala.

WEB: 10.1016/j.vaccine.2024.01.033
IMPACT FACTOR: 5.5
CITED HALF-LIFE: 7.2

START COMMENTARY

Each of the 19 mobile brigades deployed in the "Health on Wheels" strategy consisted of six members: a nurse, two nursing assistants, a driver, a community liaison, and a community health

facilitator–a representative of the area who promoted mobile brigade services provided to the community in the local language. The team provided general health services including reproductive health services, and other vaccines, in addition to the COVID-19 vaccine. Authors note that increase in COVID-19 vaccine uptake was greatest in rural areas and suggest prioritizing those areas for this type of intervention.

Return to List of Articles

11. Supporting National Immunization Technical Advisory Groups (NITAGs) in development of evidence-based vaccine recommendations and NITAG assessments - New tools and approaches.

Hadler S, Shefer A, Cavallaro K, Ebama M, Tencza C, Kennedy E, et al.

Vaccine. 2024 Feb 10.

PubMed ID: 38267328

ABSTRACT

Increasing opportunities for prevention of infectious diseases by new, effective vaccines and the expansion of global immunization programs across the life course highlight the importance and value of evidence-informed decision-making (EIDM) by National Immunization Technical Advisory Groups (NITAGs). The U.S. Centers for Disease Control and Prevention (CDC) and Task Force for Global Health (TFGH) have developed and made available new tools to support NITAGs in EIDM. These include a toolkit for conducting facilitated training of NITAGs, Secretariats, or work groups on the use of the Evidence to Recommendations (EtR) approach to advise Ministries of Health (MoH) on specific vaccine policies, and an eLearning module on the EtR approach for NITAG members, Secretariat and others. The CDC and TFGH have also supported final development and implementation of the NITAG Maturity Assessment Tool (NMAT) for assessing maturity of NITAG capabilities in seven functional domains. The EtR toolkit and eLearning have been widely promoted in collaboration with the World Health Organization (WHO) Headquarters and Regional Offices through workshops engaging over 30 countries to date, and the NMAT assessment tool used in most countries in 3 WHO regions (Americas, Eastern Mediterranean, African). Important lessons have been learned regarding planning and conducting trainings for multiple countries and additional ways to support countries in applying the EtR approach to complete vaccine recommendations. Priorities for future work include the need to evaluate the impact of EtR training and NMAT assessments, working with partners to expand and adapt these tools for wider use, synergizing with other approaches for NITAG strengthening, and developing the best approaches to empower NITAGs to use the EtR approach.

WEB: 10.1016/j.vaccine.2024.01.035

IMPACT FACTOR: 5.5

CITED HALF-LIFE: 7.2

START COMMENTARY

A summary of the National Immunization Technical Advisory Group (NITAG) training material content is found in Table 2 and consist of eight separate modules designed to take 1½ to 2 hours each to complete. In the training, participants are required to identify a specific vaccine policy

question to focus on as they complete each module. Through the training module, participants develop a workplan for collecting evidence to complete a recommendation for the identified policy question. Trainings can be provided in-person, which is preferred, or through an eLearning platform. Hadler et al. stress the importance engaging local subject matter experts to ensure that trainings meet the needs of participants from different regions and countries.

Return to List of Articles

12. Factors impacting sustained coverage in the context of donor transitions: experience from Sri Lanka.

Perera P, Amarasinghe S, Fonseka S, Abeysinghe N, Rannan-Eliya R.

Health Policy Plan. 2024 Jan 24;39(Supplement_1):i33-i49.
PubMed ID: 38258892

ABSTRACT

Although not reliant on donor funding for health, the external assistance that Sri Lanka receives contributes to the improvement of the health system and health outcomes. In this study, we evaluated transition experiences of the expanded programme on immunization (EPI) that received Gavi funding to expand the vaccine portfolio and the Anti-Malaria Campaign (AMC) that received funding from the Global Fund for AIDS, Tuberculosis and Malaria to scale-up interventions to target and achieve malaria elimination. We assessed if EPI and AMC programmes were able to sustain coverage of previously donor-funded interventions post-transition and explain the facilitators and barriers that contribute to this. We used a mixed methods approach using quantitative data to assess coverage indicators and the financing mix of the health programmes and qualitative analysis guided by a framework informed by the Walt and Gilson policy triangle that brought together document review and in-depth interviews to identify facilitators and barriers to transition success. The EPI programme showed sustained coverage of Gavi-funded vaccines post-transition and the funding gap was bridged by mobilizing domestic financing facilitated by the Gavi co-financing mechanism, full integration within existing service delivery structures, well-established and favourable pharmaceutical procurement processes for the public sector and stewardship and financial advocacy by technically competent managers. Although the absence of indigenous cases of malaria since 2012 suggests overall programme success, the AMC showed mixed transition success in relation to its different programme components. Donor-supported programme components requiring mobilization of operational expenses, facilitated by early financial planning, were successfully transitioned (e.g. entomological and parasitological surveillance) given COVID-19-related constraints. Other key programme components, such as research, training, education and awareness that are dependent on non-operational expenses are lagging behind. Additionally, concerns of AMC's future financial sustainability within the current structure remain in the context of low malaria burden.

WEB: 10.1093/heapol/czad099
IMPACT FACTOR: 3.2
CITED HALF-LIFE: 7.0

START COMMENTARY

Perera et al. highlight the need for program-specific factor assessment for program sustainability in the context of donor transition. For the quantitative analysis, data indicators chosen for the expanded programme for immunization (EPI) were third dose of hepatitis B vaccine coverage, pentavalent vaccine coverage, and incidence of diphtheria, pertussis, and neonatal tetanus. Data indicators chosen for the anti-malaria campaign (AMC) were number of blood films screened from at risk populations and total number of entomological surveillance days each year. Overall, 25 key informant interviews were conducted with 6 individuals associated with the EPI program, 11 associated with the AMC, and 8 with relevant experience with both programs. Table 4 provides a detailed summary of facilitators, barriers, and threats for sustaining coverage post-transition for both the EPI and the AMC, providing evidence that the programs required different strategies in order to successfully transition away from donor support.

Return to List of Articles

13. A Holistic Strategy of Mother and Child Health Care to Improve the Coverage of Routine and Polio Immunization in Pakistan: Results from a Demonstration Project.

Habib M, Soofi S, Hussain Z, Ahmed I, Tahir R, Anwar S, et al.

Vaccines (Basel). 2024 Jan 29;12(1).

PubMed ID: 38250902

ABSTRACT

BACKGROUND: The eradication of poliovirus and improving routine immunization (RI) coverage rates present significant challenges in Pakistan. There is a need for interventions that focus on strengthening community engagement to improve routine immunization coverage. Our primary objective is to assess the impact of an integrated strategy designed to enhance community engagement and maternal and child health immunization campaigns on immunization coverage in Pakistan's high-risk union councils of polio-endemic districts.

METHOD: We implemented an integrated approach for routine immunization and maternal and child health in the polio-endemic district of Pakistan. This approach involved setting up health camps and actively engaging and mobilizing the local community. An independent team conducted surveys at three key points: baseline, midline, and endline, to evaluate immunization coverage among children under the age of five. The primary outcome measures for the study were coverage of OPV, IPV, and changes in the proportion of unvaccinated and fully vaccinated children. To select clusters and eligible households in each cluster, we utilized a 30 × 15 cluster sampling technique. Multivariable associations between socio-demographic factors and changes in the proportion of fully vaccinated children at the UC level were assessed using hierarchical linear regression models.

RESULTS: A total of 256,946 children under the age of five (122,950 at baseline and 133,996 at endline) were enrolled in the study. By the endline, full immunization coverage had increased to 60% or more in all three study areas compared to the baseline. Additionally, there was a significant increase in the coverage of both OPV and IPV across all three provinces at the endline. The full immunization rates were assessed on three levels of the framework: the distal, intermediate (access and environment), and proximal level (camp attendance and effectiveness). At the distal level, on multivariate analysis, family size was found to be a significant predictor of change in immunity within the families ($\beta = 0.68$; $p \leq 0.0001$). At the intermediate level, the likelihood of full immunization decreased with the decrease in knowledge about vaccination ($\beta = -0.38$; $p = 0.002$), knowledge about polio vaccine ($\beta = -0.25$; $p = 0.011$), and knowledge about IPV ($\beta = -0.06$; $p = 0.546$). Perceived obstacles to vaccination were fear of adverse events ($\beta = -0.4$; $p \leq 0.0001$) and lack of education ($\beta = 0.23$; $p = 0.031$), which were found to be significant in bivariate and multivariate analyses. At the proximal level, community mobilization ($\beta = 0.26$; $p = 0.008$) and attendance at health camp ($\beta = 0.21$; $p \leq 0.0001$) were found to enhance full immunization coverage. On the other

hand, the most prominent reason for not attending health camp included no need to attend the health camp as the child was not ill (β = -0.13; p = 0.008).

CONCLUSIONS: This study found that community mobilization and attendance at health camps significantly enhanced full immunization coverage. The findings highlight the importance of community engagement and targeted interventions in improving immunization coverage and addressing barriers to healthcare seeking.

WEB: 10.3390/vaccines12010089
IMPACT FACTOR: 7.8
CITED HALF-LIFE: 1.6

START COMMENTARY

To evaluate the impact of community engagement on vaccine uptake, Habib et al. established maternal and child health camps in Karachi, Khyber Pakhtunkhwa, and Baluchistan. Services included immunizations and preventive maternal and child health services. While the study was focused on polio vaccine uptake, the integration of this intervention into a larger health program increased uptake for multiple vaccines. At the end of the study, more than 70% of children under 5 years of age had received 4 doses of oral polio vaccine (OPV) and IPV coverage had increased in all three areas. Additionally, coverage of children by two doses of measles vaccine increased to over 50%, and PCV coverage had also increased in all three areas.

Return to List of Articles

14. Effectiveness of one dose of killed oral cholera vaccine in an endemic community in the Democratic Republic of the Congo: a matched case-control study.

Malembaka E, Bugeme P, Hutchins C, Xu H, Hulse J, Demby M, et al.

Lancet Infect Dis. 2024 Feb 01.

PubMed ID: 3824619138301665

ABSTRACT

BACKGROUND: A global shortage of cholera vaccines has increased the use of single-dose regimens, rather than the standard two-dose regimen. There is sparse evidence on single-dose protection, particularly in children. In 2020, a mass vaccination campaign was conducted in Uvira, an endemic urban setting in eastern Democratic Republic of the Congo, resulting in largely single-dose coverage. We examined the effectiveness of a single-dose of the oral cholera vaccine Euvichol-Plus in this high-burden setting.

METHODS: In this matched case-control study, we recruited individuals with medically attended confirmed cholera in the two cholera treatment facilities in the city of Uvira. The control group consisted of age-matched, sex-matched, and neighbourhood-matched community individuals. We recruited across two distinct periods: Oct 14, 2021, to March 10, 2022 (12-17 months after vaccination), and Nov 21, 2022, to Oct 18, 2023 (24-36 months after vaccination). Study staff administered structured questionnaires to all participants to capture demographics, household conditions, potential confounding variables, and vaccination status. The odds of vaccination for the case and control groups were contrasted in conditional logistic regression models to estimate unadjusted and adjusted vaccine effectiveness.

FINDINGS: We enrolled 658 individuals with confirmed cholera and 2274 matched individuals for the control group. 99 (15·1%) individuals in the case group were younger than 5 years at the time of vaccination. The adjusted single-dose vaccine effectiveness was 52·7% (95% CI 31·4 to 67·4) 12-17 months after vaccination and 44·7% (24·8 to 59·4) 24-36 months after vaccination. Although protection in the first 12-17 months after vaccination was similar for children aged 1-4 years and older individuals, the estimate of protection in children aged 1-4 years appeared to wane during the third year after vaccination (adjusted vaccine effectiveness 32·9%, 95% CI -30·7 to 65·5), with CIs spanning the null.

INTERPRETATION: A single dose of Euvichol-Plus provided substantial protection against medically attended cholera for at least 36 months after vaccination in this cholera-endemic setting. Although the evidence provides support for similar levels of protection in young children and others in the short term, protection among children younger than 5 years might wane significantly during the third year after vaccination.

FUNDING: Wellcome Trust and Gavi, the Vaccine Alliance.

WEB: 10.1016/S1473-3099(23)00742-9
IMPACT FACTOR: 56.3
CITED HALF-LIFE: 3.7

START COMMENTARY

Table 3 provides estimates of the effectiveness of a single dose of oral cholera vaccine by age (1-4 years and ≥ 5 years) and time since vaccination (overall, 12-17 months, 24-36 months). A secondary analysis provided an adjusted cumulative vaccine effectiveness of 45.6% (95%CI: 33.5-55.5) across both study periods. Authors were unable to estimate two-dose vaccine effectiveness due to small sample size. One key limitation is that vaccination status was self-reported.

Return to List of Articles

15. Evaluating the potential impact of rubella-containing vaccine introduction on congenital rubella syndrome in Afghanistan, Dem. Republic of Congo, Ethiopia, Nigeria, and Pakistan: A mathematical modeling study.

Rodriguez-Cartes S, Zhang Y, Mayorga M, Swann J, Allaire B.

PLOS Glob Public Health. 2024 Feb 10;4(1):e0002656.

PubMed ID: 38227558

ABSTRACT

We assessed the potential impact of introducing rubella-containing vaccine (RCV) on congenital rubella syndrome (CRS) incidence in Afghanistan (AFG), Democratic Republic of Congo (COD), Ethiopia (ETH), Nigeria (NGA), and Pakistan (PAK). We simulated several RCV introduction scenarios over 30 years using a validated mathematical model. Our findings indicate that RCV introduction could avert between 86,000 and 535,000 CRS births, preventing 2.5 to 15.8 million disability-adjusted life years. AFG and PAK could reduce about 90% of CRS births by introducing RCV with current measles routine coverage and executing supplemental immunization activities (SIAs). However, COD, NGA, and ETH must increase their current routine vaccination coverage to reduce CRS incidence significantly. This study showcases the potential benefits of RCV introduction and reinforces the need for global action to strengthen immunization programs.

WEB: 10.1371/journal.pgph.0002656

IMPACT FACTOR: N/A

CITED HALF-LIFE: N/A

START COMMENTARY

Rodriguez-Cartes et al. developed a country-level deterministic compartmental model to characterize the dynamics of rubella infections and congenital rubella syndrome (CRS) births in Afghanistan, Democratic Republic of Congo, Ethiopia, Nigeria, and Pakistan. Six rubella-containing vaccine (RCV) implementation scenarios detailed in Table 1 were modelled that included various combinations of routine vaccination and catch-up supplementary immunization activities. CRS births and DALYs averted for the various scenarios are shown in Table 2. Limitations include the inability of the model to account for changes in transmission dynamics across time.

Return to List of Articles

16. Equity in vaccine coverage in Uganda from 2000 to 2016: revealing the multifaceted nature of inequity.

Ssebagereka A, de Broucker G, Ekirapa-Kiracho E, Kananura R, Driwale A, Mak J, et al.

BMC Public Health. 2024 Jan 17;24(1):185.

PubMed ID: 38225582

ABSTRACT

BACKGROUND: This study analyses vaccine coverage and equity among children under five years of age in Uganda based on the 2016 Uganda Demographic and Health Survey (UDHS) dataset. Understanding equity in vaccine access and the determinants is crucial for the redress of emerging as well as persistent inequities.

METHODS: Applied to the UDHS for 2000, 2006, 2011, and 2016, the Vaccine Economics Research for Sustainability and Equity (VERSE) Equity Toolkit provides a multivariate assessment of immunization coverage and equity by (1) ranking the sample population with a composite direct unfairness index, (2) generating quantitative measure of efficiency (coverage) and equity, and (3) decomposing inequity into its contributing factors. The direct unfairness ranking variable is the predicted vaccination coverage from a logistic model based upon fair and unfair sources of variation in vaccination coverage. Our fair source of variation is defined as the child's age - children too young to receive routine immunization are not expected to be vaccinated. Unfair sources of variation are the child's region of residence, and whether they live in an urban or rural area, the mother's education level, the household's socioeconomic status, the child's sex, and their insurance coverage status. For each unfair source of variation, we identify a "more privileged" situation.

RESULTS: The coverage and equity of the Diphtheria-Pertussis-Tetanus vaccine, 3rd dose (DPT3) and the Measles-Containing Vaccine, 1st dose (MCV1) - two vaccines indicative of the health system's performance - improved significantly since 2000, from 49.7% to 76.8% and 67.8% to 82.7%, respectively, and there are fewer zero-dose children: from 8.4% to 2.2%. Improvements in retaining children in the program so that they complete the immunization schedule are more modest (from 38.1% to 40.8%). Progress in coverage was pro-poor, with concentration indices (wealth only) moving from 0.127 (DPT3) and 0.123 (MCV1) in 2000 to -0.042 and -0.029 in 2016. Gains in overall equity (composite) were more modest, albeit significant for most vaccines except for MCV1: concentration indices of 0.150 (DPT3) and 0.087 (MCV1) in 2000 and 0.054 and 0.055 in 2016. The influence of the region and settings (urban/rural) of residence significantly decreased since 2000.

CONCLUSION: The past two decades have seen significant improvements in vaccine coverage and equity, thanks to the efforts to strengthen routine immunization and ongoing supplemental immunization activities such as the Family Health Days. While maintaining the regular provision of

vaccines to all regions, efforts should be made to alleviate the impact of low maternal education and literacy on vaccination uptake.

WEB: 10.1186/s12889-023-17592-6
IMPACT FACTOR: 4.5
CITED HALF-LIFE: 5.5

START COMMENTARY

In the decomposition analysis for the 2016 Uganda Demographic and Health Survey dataset conducted by Ssebagereka et al., geographic region of household and maternal education were the most salient factors, followed by household setting (rural vs. urban). In 2000, maternal education and the setting where the household is located (rural vs urban) were the two most salient factors. Child sex assigned at birth, household socioeconomic status, and health insurance coverage were not found to contribute to zero-dose status in this analysis. An uneven distribution of zero-dose children was found across regions, with the highest inequity in Bunyoro, which had a Wagstaff concentration index of 0.553, and the lowest inequity in Busoga, which had a concentration index of score of -0.142, indicating that fewer children among the most disadvantaged households were zero-dose than among more privileged households.

Return to List of Articles

Additional Articles of Interest

1 Descriptive Analysis of Measles Outbreak in Liberia, 2022. {Full Article}
2 Knowledge and practice of childhood immunisation among parents in Kelantan, Malaysia: A cross-sectional study. {Full Article}
3 Improved vaccination coverage after two rounds of multi-antigenic catch-up vaccination in Mauritania. {Full Article}
4 The Drivers of Low Vaccination Utilization in Niger. {Full Article}
5 Vaccination against emerging and reemerging infectious diseases in places of detention: a global multistage scoping review. {Full Article}
6 Vaccine decision making in New Zealand: a discrete choice experiment. {Full Article}
7 “Why has this new vaccine come and for what reasons?” key antecedents and questions for acceptance of a future maternal GBS vaccine: Perspectives of pregnant women, lactating women, and community members in Kenya. {Full Article}
8 Exploring the reasons for defaulting from childhood immunization: a qualitative study in Pakistan. {Full Article}
9 Impact of BCG vaccination disruptions during the COVID-19 pandemic on tuberculosis incidence in infants: a nationwide study in Brazil. {Full Article}
10 How Do Past Immunization Strategies Compare With the COVID-19 Immunization Rollout: A New Zealand Analysis. {Full Article}
11 In-depth reasons for the high proportion of zero-dose children in underserved populations of Ethiopia: Results from a qualitative study. {Full Article}
12 A review of potential use cases for measles-rubella, measles-mumps-rubella, and typhoid-conjugate vaccines presented on microarray patches. {Full Article}
13 Coverage and determinants of childhood vaccination during the COVID-19 pandemic in Fortaleza, Northeastern Brazil: a longitudinal analysis. {Full Article}
14 Spatial pattern and associated factors of timely vaccination in Ethiopia using EDHS-2016 data: A multilevel and spatial analysis. {Full Article}
15 How to address vaccine hesitancy? Lessons from National Hepatitis B Immunization Program in China. {Full Article}
16 Safety and efficacy of malaria vaccine candidate R21/Matrix-M in African children: a multicentre, double-blind, randomised, phase 3 trial. {Full Article}
17 Costs of human papillomavirus vaccine delivery in low- and middle-income countries: A systematic review. {Full Article}
18 Effect of unequal vaccination coverage and migration on long-term pathogen evolution in a metapopulation. {Full Article}
19 Knowledge, attitudes and perceptions of nursing students regarding vaccines. {Full Article}

20 Motivators and barriers of seasonal influenza vaccination among primary health care physicians in Qatar. {Full Article}
21 Covid-19 pandemic and equity of global human papillomavirus vaccination: descriptive study of World Health Organization-Unicef vaccination coverage estimates. {Full Article}
22 Systematic review of cost projections of new vaccine introduction. {Full Article}
23 Using intervention mapping to develop an implementation strategy to improve timely uptake of streamlined birth-dose vaccines in the Democratic Republic of the Congo. {Full Article}
24 Impact of Meningococcal ACWY Vaccination Program during 2017-18 Epidemic, Western Australia, Australia. {Full Article}
25 Impact of innovative immunization strategy on PCV13 vaccination coverage among children under 5 years in Weifang city, China: A retrospective study. {Full Article}
26 Vaccination coverage and adverse events following a reactive vaccination campaign against hepatitis E in Bentiu displaced persons camp, South Sudan. {Full Article}
27 The application of behavioral change theories in addressing vaccine hesitancy: A Literature Review. {Full Article}
28 Why does the COVAX facility fail to bridge the 'immunization gap'? {Full Article}
29 Child malaria vaccine uptake in Ghana: Factors influencing parents' willingness to allow vaccination of their children under five (5) years. {Full Article}
30 Sri Lanka's COVID-19 response and maintaining health services: implications for future pandemics. {Full Article}
31 Perceptions toward Ebola vaccination and correlates of vaccine uptake among high-risk community members in North Kivu, Democratic Republic of the Congo. {Full Article}
32 Higher local Ebola incidence causes lower child vaccination rates. {Full Article}
33 Generative artificial intelligence can have a role in combating vaccine hesitancy. {Full Article}
34 Trends of inequality in DPT3 immunization services utilization in Ethiopia and its determinant factors: Evidence from Ethiopian demographic and health surveys, 2000-2019. {Full Article}
35 Global perspectives of determinants influencing HPV vaccine introduction and scale-up in low- and middle-income countries. {Full Article}

Appendix

The literature search for the March 2024 Vaccine Delivery Research Digest was conducted on February 20, 2024. We searched English language articles indexed by the US National Library of Medicine and published between January 15, 2024 and February 14, 2024. The search resulted in 435 items.

SEARCH TERMS

(((((vaccine[tiab] OR vaccines[tiab] OR vaccination[tiab] OR immunization[tiab] OR immunisation[tiab] OR vaccine[mesh] OR immunization[mesh]) 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[LA]) (“2024/15/01”[PDAT] : “2024/14/02”[PDAT]))