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1. [Monitoring and Evaluation of National Vaccination Implementation: A Scoping Review of How Frameworks and Indicators Are Used in the Public Health Literature.](#)

Marzouk M, Omar M, Sirison K, Ananthakrishnan A, Durrance-Bagale A, Pheerapanyawaranun C, et al.

Vaccines (Basel). 2022 Apr 29;10(4).

PubMed ID: 35455316

ABSTRACT

An effective Monitoring and Evaluation (M&E) framework helps vaccination programme managers determine progress and effectiveness for agreed indicators against clear benchmarks and targets. We aimed to identify the literature on M&E frameworks and indicators used in national vaccination programmes and synthesise approaches and lessons to inform development of future frameworks. We conducted a scoping review using Arksey and O'Malley's six-stage framework to identify and synthesise sources on monitoring or evaluation of national vaccination implementation that described a framework or indicators. The findings were summarised thematically. We included 43 eligible sources of 4291 screened. Most (95%) were in English and discussed high-income (51%) or middle-income (30%) settings, with 13 in Europe (30%), 10 in Asia-Pacific (23%), nine in Africa (21%), and eight in the Americas (19%), respectively, while three crossed regions. Only five (12%) specified the use of an M&E framework. Most (32/43; 74%) explicitly or implicitly included vaccine coverage indicators, followed by 12 including operational (28%), five including clinical (12%), and two including cost indicators (5%). The use of M&E frameworks was seldom explicit or clearly defined in our sources, with indicators rarely fully defined or benchmarked against targets. Sources focused on ways to improve vaccination programmes without explicitly considering ways to improve assessment. Literature on M&E framework and indicator use in national vaccination programmes is limited and focused on routine childhood vaccination. Therefore, documentation of more experiences and lessons is needed to better inform vaccination M&E beyond childhood.

WEB: [10.3390/vaccines10040567](https://doi.org/10.3390/vaccines10040567)

IMPACT FACTOR: 4.086

CITED HALF-LIFE: 3.4

START COMMENTARY

Marzouk *et al.* conducted a scoping literature review on the use of monitoring and evaluation (M&E) frameworks in vaccine programs to identify indicators for framework development and

adaption and lessons for future M&E framework development for national vaccine roll out. This study makes an important contribution in understanding the use of M&E frameworks, which an important role in vaccine delivery by consolidating indicators to plan and track immunization efforts. Criteria for inclusion for articles were: a focus on national vaccine implementation, included outcomes such as frameworks, indicators, lessons, or impact. Authors included primary research, review, commentaries, conference abstracts, and book chapters. Detailed eligibility and exclusion criteria are outlined in *Table 2*. From 2,199 initial articles which were title/abstract screened, 43 were included in the scoping review. A key strength of this work is that initial review findings were discussed with stakeholders to ensure that scoping review findings would be useful.

Among 43 articles included, five (12%) described using an M&E framework and four (9%) described an assessment process/method (i.e., but not a formal M&E framework). Frameworks included the WHO M&E framework for hepatitis B, the mHealth Assessment and Planning for Scale, the Cervical Cancer Prevention and Control Costing tool, the WHO Extended Programme on Immunization framework, the Plan-Do-Check Act cycle with continuous quality improvement, and a logical framework for participant engagement. There were many articles which included coverage indicators (32 articles [72%] described target population estimation, equity, and uptake; three [7%] described equity or disaggregated data; 16 [37%] described uptake). Fewer articles considered operational indicators (two [5%] included health service capacity indicators; three [7%] described supply chain and logistics indicators; five [12%] mentioned human resource indicators; two [5%] included vaccination costing). Lastly, only 5 (12%) of articles included clinical indicators such as adverse events. Overall, the use of M&E frameworks was rare, despite being described as 'essential' in the Global Vaccine Action Plan. Marzouk *et al.* also concluded that literature was scarce for conflict and fragile settings, and for equity and operational indicators. In conclusion, this scoping review demonstrates the need for further research and for greater utilization of M&E frameworks to reach national immunization targets.

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2. [Operational lessons learned in conducting an international study on pharmacovigilance in pregnancy in resource-constrained settings: The WHO Global Vaccine safety Multi-Country collaboration project.](#)

Sharan A, Jahagirdar S, Stuurman A, Elango V, Riera-Montes M, Kumar Kashyap N, et al.

Vaccine X. 2022 May 02;11:100160.

PubMed ID: 35434599

ABSTRACT

The WHO Global Vaccine Safety Multi-Country Collaboration study on safety in pregnancy aims to estimate the minimum detectable risk for selected perinatal and neonatal outcomes and assess the applicability of standardized case definitions for study outcomes and maternal immunization in low- and middle-income countries (LMICs). This paper documents the operational lessons learned from the study. A prospective observational study was conducted across 21 hospitals in seven countries. All births occurring at sites were screened to identify select perinatal and neonatal outcomes from May 2019 to August 2020. Up to 100 cases per outcome were recruited to assess the applicability of standardized case definitions. A multi-pronged study quality assurance plan was implemented. The impact of the COVID-19 pandemic on site functioning and project implementation was also assessed. Multi-layered ethics and administrative approvals, limited clinical documentation, difficulty in identifying outcomes requiring in-hospital follow-up, and poor quality internet connectivity emerged as important barriers to study implementation. Use of electronic platforms, application of a rigorous quality assurance plan with frequent interaction between the central and site teams helped improve data quality. The COVID-19 pandemic disrupted data collection for up to 6 weeks in some sites. Our study succeeded in establishing an international hospital-based surveillance network for evaluating perinatal and neonatal outcomes using common study protocol and procedures in geographically diverse sites with differing levels of infrastructure, clinical and health-utilization practices. The enhanced surveillance capacity of participating sites shall help support future pharmacovigilance efforts for pregnancy interventions.

WEB: [10.1016/j.jvacx.2022.100160](https://doi.org/10.1016/j.jvacx.2022.100160)

IMPACT FACTOR: N/A

CITED HALF-LIFE: N/A

START COMMENTARY

In this prospective observational study, Sharan *et al.* describe operational lessons learned from implementing pharmacovigilance in pregnancy across 21 hospitals in 7 countries. This study is important as it outlines lessons from developing a large multi-country surveillance system for maternal pharmacovigilance in resource-constrained settings, which may be relevant for other multi-

site studies across disease areas. Six low- and middle-income countries (LMICs) and one high income country (HIC) were included in this work. Detailed study site characteristics are presented in *Table 1*. The initial study outcomes included low birthweight, stillbirth, pre-term birth, small for gestational age, in-hospital neonatal death, neonatal infection, postnatally diagnosed congenital microcephaly. This study focused on understanding the barriers and facilitators during stages of study implementation.

In the early stages of the study (i.e., protocol development, ethics/administrative approach, and training and study support documents), there were high levels of engagement and feedback from investigators, in-country partners, and the scientific advisory committee. However, there were delays to study initiation due to complicated and time-consuming activities related to ethics/administrative approval. Training was successful in promoting understanding of the study but did not fully prevent errors and issues with data entry at sites. During the preparation and implementation phase, issues arose including delays due to nonavailability of dedicated study staff and the onset of COVID-19 ending data collection early. Relatedly, there were challenges related to the data collection, including complexity due to the use of multiple electronic study tools, lags between collection and submission of data, an absence of quality information (i.e., maternal immunization cards) to be collected, and limited reliable network. A strength of the study was the concurrent remote monitoring of study data to detect errors which allowed for course-correction. The remote monitoring necessitated more on-site monitoring visits than intended (i.e., one visit to 19 of 21 sites; multiple visits to four sites with repeat errors and non-compliance to standard operating procedures). Overall, this study describes the operational lessons learned at each stage of setting up an international hospital-based surveillance network for evaluating perinatal and neonatal outcomes. Challenges including delays due to ethics approval, nonavailability of study staff, and data entry and quality issues (i.e., errors, limited network) should be considered when similar studies or surveillance systems are set up across multiple sites.

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3. [Public health impact and cost-effectiveness of gonorrhoea vaccination: an integrated transmission-dynamic health-economic modelling analysis.](#)

Whittles L, Didelot X, White P.

Lancet Infect Dis. 2022 May 02.

PubMed ID: 3542749135500591

ABSTRACT

BACKGROUND: Gonorrhoea is a rapidly growing public health threat, with rising incidence and increasing drug resistance. Evidence that the MeNZB and four-component serogroup B meningococcal (4CMenB) vaccines, designed against *Neisseria meningitidis*, can also offer protection against gonorrhoea has created interest in using 4CMenB for this purpose and for developing gonorrhoea-specific vaccines. However, cost-effectiveness, and how the efficacy and duration of protection affect a gonorrhoea vaccine's value, have not been assessed.

METHODS: We developed an integrated transmission-dynamic health-economic model, calibrated using Bayesian methods to surveillance data (from the Genitourinary Medicine Clinic Activity Dataset and the Gonococcal Resistance to Antimicrobials Surveillance Programme) on men who have sex with men (MSM) in England. We considered vaccination of MSM from the perspective of sexual health clinics, with and without vaccination offered to all adolescents in schools (vaccination before entry [VbE]), comparing three realistic approaches to targeting: vaccination on attendance (VoA) for testing; vaccination on diagnosis (VoD) with gonorrhoea; or vaccination according to risk (VaR), offered to patients diagnosed with gonorrhoea plus individuals who test negative but report having more than five sexual partners per year. For the primary analysis, vaccine impact was assessed relative to no vaccination in a conservative baseline scenario wherein time-varying behavioural parameters (sexual risk behaviour and screening rates) stabilise. To calculate the value of vaccination per dose administered, the value of vaccination was calculated by summing the averted costs of testing and treatment, and the monetary value of quality-adjusted life-year (QALY) gains with a QALY valued at 20,000. Costs were in 2018-19 GB, and both costs and QALYs were discounted at 35% per year. We analysed the effects of varying vaccine uptake (0.5, 1, or 2 times HPV vaccine uptake by MSM in sexual health clinics in England), vaccine efficacy (1-100%) and duration of protection (1-20 years), and the time-horizon considered (10 years and 20 years). In addition, we calculated incremental cost-effectiveness ratios for the use of 4CMenB using assumed vaccine prices.

FINDINGS: VbE has little impact on gonorrhoea diagnoses, with only 17% of MSM vaccinated per year. VoA has the largest impact but requires more vaccine doses than any other strategy, whereas VoD has a moderate impact but requires many fewer doses than VoA. VaR has almost the same impact as VoA but with fewer doses administered than VoA. VaR is the most cost-effective strategy

for vaccines of moderate efficacy or duration of protection (or both), although VoD is more cost-effective for very protective and long-lasting vaccines. Even under conservative assumptions (efficacy equivalent to that of MeNZB and protection lasting for 18 months after two-dose primary vaccination and 36 months after single-dose booster vaccination), 4CMenB administered under VaR would likely be cost-saving at its current National Health Service price, averting an estimated mean 110...200 cases (95% credible interval 36...500-223...600), gaining a mean 1003 QALYs (310-2158), and saving a mean 79 million (00-205) over 10 years. A hypothetical gonorrhoea vaccine's value is increased more by improving its efficacy than its duration of protection-eg, 30% protection lasting 2 years has a median value of 48 (22-85) per dose over 10 years; doubling efficacy increases the value to 102 (53-144) whereas doubling the duration of protection increases it to 72 (34-120).

INTERPRETATION: We recommend vaccination of MSM against gonorrhoea according to risk in sexual health clinics in England, with the 4CMenB vaccine considered for this purpose. Development of gonorrhoea-specific vaccines should prioritise maximising efficacy over duration of protection.

FUNDING: Medical Research Council (UK), National Institute for Health Research (UK).

WEB: [10.1016/S1473-3099\(21\)00744-1](https://doi.org/10.1016/S1473-3099(21)00744-1)

IMPACT FACTOR: 24.44

CITED HALF-LIFE: 4.7

START COMMENTARY

In this health economic modelling study, Whittles *et al.* developed an integrated transmission dynamic health-economic model for men who have sex with men (MSM) in England to understand the public health impact and cost effectiveness of a gonorrhoea vaccine. This article makes a substantial contribution as it is the first health-economic analysis of gonorrhoea vaccine reporting impact on future infections among MSM in England who are disproportionately impacted by gonorrhoea (i.e., the country with the highest per capita rate of infection). The authors varied vaccine efficacy (0-100%), duration of protection (1-2) and targeting strategies (described in detail in *Table 1*). Vaccine targeting strategies included vaccinating: adolescents before they are sexually active ('vaccine before entry'), MSM who attend health clinics, persons diagnosed with gonorrhoea, and by risk profile (defined as current infection with gonorrhoea or by reporting more than 5 sexual partners per year). Two notable strengths of this analysis are that the authors include varying duration of protection ranging from 1-7.5 years and that incorporated temporal trends in increasing tests, diagnoses, and symptomatic diagnoses. The vaccine 4CMenB has been estimated to be cost-effective at inflation-adjust £8 per dose, excluding administration costs.

Temporal effects of different vaccine-targeting strategies for a hypothetical vaccine that has 40% protection for 4 years are shown in *Figure 2*. Outcomes include the annual number of cases,

annual vaccine doses administered, vaccine value (calculated as summing the averted costs of testing and treatment, and monetary value of quality-adjusted-life-year [QALY] gains) per dose, and duration of protection. All strategies showed an increasing value over time as cases of gonorrhea decrease. Cases averted by year 10 results are as follows: Vaccine before entry: 18,700 cases (95% CrI 9,700–30,300); vaccine at health clinic attendance: 182,200 cases [95% CrI 77,300–296,500]; vaccine at diagnosis: 85 800 cases [49 300–131 000]; and vaccine at risk: 181 000 cases (75 600–295 700). Costs vary substantially based on scenario (i.e., £23 value per dose for vaccination on attendance compared to £99 for vaccination according to risk). Overall, Whittles *et al.* conclude that the most impactful vaccine scenario (defined as averting the most infections) would be providing gonorrhea vaccine to MSM attending sexual health clinics, although this is the least cost-effective given the high number of vaccine doses required. Offering vaccines based on risk was to be more cost-effective, with a marginally smaller public health impact, indicating this may be the best approach. However, efficacy and duration greatly impacted these results. As the efficacy and duration increase, the probability that another method such as vaccination on diagnosis may be most impactful and cost-effective increases. This study finds that vaccinating MSM against gonorrhea in England is likely cost saving.

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4. [Screening for Hepatitis B in partners and children of women positive for surface antigen, Burkina Faso.](#)

Guingan A, Kabor R, Shimakawa Y, Som E, Kania D, Pisoni A, et al.

Bull World Health Organ. 2022 Apr 08;100(4):256-267.

PubMed ID: 35386558

ABSTRACT

OBJECTIVE: To evaluate the implementation of a screening strategy for the partners and children of pregnant women with hepatitis B virus (HBV) attending antenatal care.

METHODS: We identified pregnant women positive for HBV surface antigen (HBsAg) at antenatal consultation in Ouagadougou, Burkina Faso. At post-test counselling, women were advised to disclose their HBV status to partners and to encourage their partner and children to be screened for HBsAg. We used multivariable logistic regression to explore factors associated with uptake of screening and HBsAg positivity among family members.

FINDINGS: Of 1000 HBsAg-positive women, 436/1000 partners and 215/1281 children were screened. HBsAg was detected in 55 (12.6%) partners and 24 (11.2%) children. After adjusting for confounders, uptake of screening was higher in partners who were married, who attended the woman's first post-test consultation and to whom the woman had disclosed her HBV status. In children, HBsAg positivity was associated with being born before the introduction of infant hepatitis B vaccination in Burkina Faso (not significant in the multivariable analysis), having a mother positive for HBV e-antigen (adjusted OR: 8.57; 95% CI: 2.49-29.48) or having a mother with HBV DNA level 200,000IU/mL (OR: 6.83; 95% CI: 1.61-29.00).

CONCLUSION: In low-income countries, the antenatal consultation provides a cost-effective opportunity to identify HBV-infected household contacts and link them to care. Children born before the introduction of infant hepatitis B vaccination and whose mother has higher viral load or infectivity should be a priority for testing and linkage to care.

WEB: [10.2471/BLT.21.287015](#)

IMPACT FACTOR: 6.960

CITED HALF-LIFE: 12.4

START COMMENTARY

In this prospective cohort study, Guingané *et al.* evaluate the impact of a screening program for pregnant women with hepatitis B virus (HBV) attending antenatal care on family members' screening uptake and hepatitis B surface antigen (HBsAg) positivity. This study is important as HBV

is a substantial source of morbidity and mortality in Burkina Faso and other LMICs, creating a need for means of identifying people with chronic HBV to prevent complications (e.g., cirrhosis, liver failure). The screening program involved training primary care health workers to provide HBV counseling and HBsAg screening for pregnant women during the first antenatal care visit, a simplified referral to the hepato-gastroenterology department for women testing positive, and post-test counseling for HBsAg-positive women. At each visit, physicians reminded women about screening family members for HBV. Outcomes included HBV screening, seroprevalence of HBsAg among partners and children of HBsAg-positive women, and sociodemographic and biological factors associated with HBV infection in partners and children.

Overall, 1000 HBsAg-positive women were recruited into the study; 10.3% had positive hepatitis B viral protein (HbeAg) indicating active viral replication, and 9.5% had a high viral load. Women identified 2,281 eligible family members. Most (88.6%) of women reported their positive status to their partners. Overall, 651 family members (436 partners [43.6%] and 215 children [16.8%]) were screened. In multivariate analysis, uptake of screening among partners was higher in married couples, those with higher level of education, when the woman was retained in antenatal care, when the woman disclosed her positive status, and when partners who attended the first post-test specialist visit. Maternal factors such as higher education, greater number of pregnancies, retention in care, and sharing HBV status with partner were associated with higher child screening uptake. Detailed findings on factors associated with partner screening and child screening are presented in *Table 3* and *Table 4*, respectively. Overall, 12.1% of the screened family members tested positive for HBsAg. This study demonstrates that it is feasible to screen of family members of women identified as HBsAg positive at antenatal care, which can increase diagnoses, linkages to care, and may reduce morbidity and mortality from HBV-associated complications.

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5. [Improving the availability of vaccines in primary healthcare facilities in South Africa: is the time right for a system redesign process?](#)

Iwu-Jaja C, Jordan P, Ngcobo N, Jaca A, Iwu C, Mulenga M, et al.

Hum Vaccin Immunother. 2022 Apr 14;18(1):1926184.

PubMed ID: 35349379

ABSTRACT

An uninterrupted supply of vaccines at different supply chain levels is a basic component of a functional immunization programme and care service. There can be no progress toward achieving universal health coverage and sustainable development without continuous availability of essential medicines and vaccines in healthcare facilities. Shortages of vaccines, particularly at health facility level is an issue of grave concern that requires urgent attention in South Africa. The causes of vaccine stock-outs are multifactorial and may be linked to a broader systems issue. These factors include challenges at higher levels such as delays in the delivery of stock from the pharmaceutical depot; health facility level factors, which include a lack of commitment from healthcare workers and managers; human resource factors, such as, staff shortages, and lack of skilled personnel. Therefore, there is a compelling need to address the factors associated with shortages of vaccines in health facilities. This paper highlights the challenges of vaccine availability in South Africa, the associated factors, the available interventions, and recommended interventions for the expanded programme on immunization in South Africa. We propose a system redesign approach as a potentially useful intervention.

WEB: [10.1080/21645515.2021.1926184](https://doi.org/10.1080/21645515.2021.1926184)

IMPACT FACTOR: 2.619

CITED HALF-LIFE: 3.9

START COMMENTARY

Iwu-Jaja *et al.* describe challenges related to vaccine availability in South Africa including factors associated with vaccine shortages and available interventions. Authors present findings from the yearly telephone survey on stock outs conducted by Stop Stock-out Project, showing that stockouts range from 4-13% in 2015, with substantial geographical and vaccine variation in the stock-outs across the country. When summarizing literature on causes of vaccine stock-outs at health facilities, poor stock management, delays in stock delivery from pharmaceutical depots, poor communication between the depot and facilities, distance, and human resources (e.g., staff shortages, lack of skilled personnel) were associated with stockouts. Interventions to address shortage issues include supply chain interventions such as clearing back orders at the plot, providing guidelines for stock management, and offering supportive supervision and training. In

addition electronic stock management systems (such as the existing Stock Visibility Solution) should be utilized in primary care settings given the evidence supporting such interventions in prior literature. Such systems could improve monitoring, reporting, and responses to prevent stockouts. Other interventions include human resource-targeted interventions such as training/supervision of healthcare workers, and performance appraisal to hold managers accountable. Lastly, Iwu-Jaja *et al.* present a case for system redesign approach, which involves overhauling and restructuring the complete stock management and information system. Steps include assessing current practices to identify strengths and weaknesses, providing recommendations and advocacy to stakeholders, developing key performance indicators with stakeholders, and modeling the vaccine management system and scenarios (including improvement/redesign options). The scenario with the best indicators should be selected for implementation. Overall, this commentary makes a compelling case for redesigning the vaccine supply chain systems in South Africa to reduce shortages.

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6. [Optimal resource allocation with spatiotemporal transmission discovery for effective disease control.](#)

Ren J, Liu M, Liu Y, Liu J.

Infect Dis Poverty. 2022 Mar 28;11(1):34.

PubMed ID: 35331329

ABSTRACT

BACKGROUND: The new waves of COVID-19 outbreaks caused by the SARS-CoV-2 Omicron variant are developing rapidly and getting out of control around the world, especially in highly populated regions. The healthcare capacity (especially the testing resources, vaccination coverage, and hospital capacity) is becoming extremely insufficient as the demand will far exceed the supply. To address this time-critical issue, we need to answer a key question: How can we effectively infer the daily transmission risks in different districts using machine learning methods and thus lay out the corresponding resource prioritization strategies, so as to alleviate the impact of the Omicron outbreaks?

METHODS: We propose a computational method for future risk mapping and optimal resource allocation based on the quantitative characterization of spatiotemporal transmission patterns of the Omicron variant. We collect the publicly available data from the official website of the Hong Kong Special Administrative Region (HKSAR) Government and the study period in this paper is from December 27, 2021 to July 17, 2022 (including a period for future prediction). First, we construct the spatiotemporal transmission intensity matrices across different districts based on infection case records. With the constructed cross-district transmission matrices, we forecast the future risks of various locations daily by means of the Gaussian process. Finally, we develop a transmission-guided resource prioritization strategy that enables effective control of Omicron outbreaks under limited capacity.

RESULTS: We conduct a comprehensive investigation of risk mapping and resource allocation in Hong Kong, China. The maps of the district-level transmission risks clearly demonstrate the irregular and spatiotemporal varying patterns of the risks, making it difficult for the public health authority to foresee the outbreaks and plan the responses accordingly. With the guidance of the inferred transmission risks, the developed prioritization strategy enables the optimal testing resource allocation for integrative case management (including case detection, quarantine, and further treatment), i.e., with the 300,000 testing capacity per day; it could reduce the infection peak by 87.1% compared with the population-based allocation strategy (case number reduces from 20,860 to 2689) and by 24.2% compared with the case-based strategy (case number reduces from 3547 to 2689), significantly alleviating the burden of the healthcare system.

CONCLUSIONS: Computationally characterizing spatiotemporal transmission patterns allows for the effective risk mapping and resource prioritization; such adaptive strategies are of critical importance in achieving timely outbreak control under insufficient capacity. The proposed method can help guide public-health responses not only to the Omicron outbreaks but also to the potential future outbreaks caused by other new variants. Moreover, the investigation conducted in Hong Kong, China provides useful suggestions on how to achieve effective disease control with insufficient capacity in other highly populated countries and regions.

WEB: [10.1186/s40249-022-00957-1](https://doi.org/10.1186/s40249-022-00957-1)

IMPACT FACTOR: 3.067

CITED HALF-LIFE: 3.0

START COMMENTARY

In this study, Ren *et al.* propose a computational method for future risk mapping and optimal resource allocation based on spatiotemporal transmission patterns of the Omicron variant of SARS-CoV-2. This study is important as such approaches can reduce the negative impacts of disease outbreaks. The authors used data on COVID-19 cases in Hong Kong from March 17, 2020 to February 5, 2022. COVID-19 to construct a daily disease transmission matrix (details provided in *Additional File 1*). The matrix was used to predict future transmission risks at a district level. Beyond the transmission risk mapping, Ren *et al.* developed a strategy for resource allocation, which considered population, infection numbers, and transmission risk using a compartmental model at the meta-population level (a Susceptible-Detected-Non-detected-Recovered (SDNR) model).

Figure 2 shows examples of the transmission networks from the constructed daily spatiotemporal transmission matrices in Hong Kong. There is evident spatial heterogeneity in daily transmission (denoted by differing colors in the figure). The transmission risk of all 18 administrative areas in Hong Kong are shown in *Figure 3*. There is great heterogeneity in daily transmission risk levels on the district level both spatially and temporally. Ren *et al.* included several simulations with different testing capacity (300,000, 500,000 and 700,000 per day) for the resource allocation. Allocation scenarios included: 1) no specific strategy; 2) testing strategy based on district population; 3) testing strategy based on the number of cases in each district; and 4) testing based on the transmission-guided prioritization (i.e., considering population, case numbers, and transmission risk). Overall, results (presented in *Figure 4*) indicate that the transmission guided strategy would flatten outbreak peaks effectively (87.1% case number reduction) compared to the population-based strategy. Additional results for other testing scenarios are presented in *Figure 5A* and *B*. This study demonstrates that proposed resource allocation strategies are more effective than methods based on population or number of cases, indicating this is a promising strategy to use in future outbreaks.

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7. [Progress Toward Achieving and Sustaining Maternal and Neonatal Tetanus Elimination - Worldwide, 2000-2020.](#)

Kanu F, Yusuf N, Kassogue M, Ahmed B, Tohme R.

MMWR Morb Mortal Wkly Rep. 2022 Mar 24;71(11):406-411.

PubMed ID: 35298457

ABSTRACT

Maternal and neonatal tetanus (MNT)* remains a major cause of neonatal mortality with an 80%-100% case-fatality rate among insufficiently vaccinated mothers after unhygienic deliveries, especially in low-income countries (1). In 1989, the World Health Assembly endorsed elimination... of neonatal tetanus; the activity was relaunched in 1999 as the MNT elimination (MNTE) initiative, targeting 59 priority countries. MNTE strategies include 1) achieving 80% coverage with 2 doses of tetanus toxoid-containing vaccine (TTCV2+)** among women of reproductive age through routine and supplementary immunization activities (SIAs) in high-risk districts. 2) achieving 70% of deliveries by a skilled birth attendant, and 3) implementing neonatal tetanus case-based surveillance (2). This report summarizes progress toward achieving and sustaining MNTE during 2000-2020 and updates a previous report (3). By December 2020, 52 (88%) of 59 priority countries had conducted TTCV SIAs. Globally, infants protected at birth*** against tetanus increased from 74% (2000) to 86% (2020), and deliveries assisted by a skilled birth attendant increased from 64% (2000-2006) to 83% (2014-2020). Reported neonatal tetanus cases worldwide decreased by 88%, from 17,935 (2000) to 2,229 (2020), and estimated deaths decreased by 92%, from 170,829 (2000) to 14,230 (2019). By December 2020, 47 (80%) of 59 priority countries were validated to have achieved MNTE, five of which conducted postvalidation assessments. To achieve elimination in the 12 remaining countries and sustain elimination, innovation is needed, including integrating SIAs to cover multiple vaccine preventable diseases and implementing TTCV life course vaccination.

WEB: [10.15585/mmwr.mm7111a2](https://doi.org/10.15585/mmwr.mm7111a2)

IMPACT FACTOR: 13.606

CITED HALF-LIFE: 4.4

START COMMENTARY

In this article, Kanu *et al.* provides information on progress of the MNT initiative launched in 59 priority countries in 1999. This article is important as MNT is a major source of neonatal mortality, despite the wide availability of tetanus toxoid-containing vaccine (TTCV). In 2020, 27% of priority countries had greater than 80% TTCV dose 2 coverage. The global proportion of infants protected increased from 74% in 2000 to 86% in 2020. Overall, 52 of the countries conducted supplementary immunization activities, reaching 67% of targeted women (168 of 250 million). Great strides have

been made in deliveries attended by skilled birth attendants (64% in 2000-2006; 83% in 2014-2020). Modelling studies have indicated that neonatal tetanus deaths have decreased by 92% (170,829 in 2000 and 14,230 in 2020). Most countries (80%; 47) have validated achieving MNT elimination through a series of validation activities such as the review of district-level core indicators, reported neonatal cases, surveillance system, vaccine coverage, and percentage of clean deliveries by a skilled birth attendant. Once elimination is achieved, it is critical to sustain this achievement with activities such as administering 3 doses of DTP for infants and 3 TTCV boosters, checking tetanus vaccination status and providing TTCV2+ during antenatal visits, promoting $\geq 60\%$ clean deliveries, and maintaining neonatal tetanus surveillance. Indicators for these varied across the 59 countries in post validation assessments. Overall, Kanu *et al.* highlight the substantial progress which has been made through MNT elimination efforts. However, there are several (12) countries which have not achieved elimination, while others are struggling to sustain elimination, indicating the need additional efforts to reduce the global burden of MNT.

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8. [Using long-range freeze-preventive vaccine carriers in Nepal: A study of equipment performance, acceptability, systems fit, and cost.](#)

Kumar S, Lennon P, Muller N, Uranw S, Mvundura M, Sibole A, et al.

Vaccine X. 2022 Mar 05;10:100146.

PubMed ID: 35243322

ABSTRACT

Preventing vaccine freezing is one of the biggest challenges in vaccine management. Until 2018, vaccine carriers used in the immunization program lacked features to prevent vaccine freezing. Freeze-preventive vaccine carriers (FPVCs) have an engineered liner that buffers vaccines from direct exposure to frozen ice packs. A field evaluation of three FPVCs was conducted in 24 health posts in eastern Nepal. The objective was to evaluate the FPVCs' performance, acceptability, systems fit, and cost, to inform prequalification and introduction planning. The study was carried out in two phases: in the first phase, FPVCs containing dummy vaccines (labeled "Not for Human Use") were transported to outreach sessions along with a standard vaccine carrier (SVC); in the second phase, the FPVCs were used for transporting vaccines taken to outreach sessions and used for vaccinating eligible children. The study gathered quantitative and qualitative data from health workers, logbooks, and electronic temperature monitors placed inside and outside the FPVCs. Results indicate the FPVCs successfully prevented temperatures below 0C more than 99% of the time-except at one site, where ambient temperatures were below the minimum rated testing temperature specified by the World Health Organization. Internal cool-down times for the FPVCs were highly variable, as were mean kinetic temperatures, possibly driven by the wide range of ambient temperatures and higher-than-expected variations in freezer performance, which, along with the need to transport ice packs to some locations, affected ice-pack temperatures. Almost all health workers requested smaller, lighter-weight FPVCs but appreciated the FPVCs' ability to prevent vaccines from freezing while avoiding undue heat exposure. FPVCs had benefit-cost ratios greater than 1 and hence good value for money. Results point to the importance of understanding the intended environment of use and the need for smaller, short-range as well as long-range carriers.

WEB: [10.1016/j.jvacx.2022.100146](https://doi.org/10.1016/j.jvacx.2022.100146)

IMPACT FACTOR: N/A

CITED HALF-LIFE: N/A

START COMMENTARY

In this study, Kumar *et al.* assess the performance, acceptability, systems fit, and cost, to inform prequalification and introduction planning of freeze-preventive vaccine carriers (FPVCs) in 24 health posts in Nepal. This work is important as vaccine freezing poses a major threat to

immunization efforts as freezing can reduce vaccine potency and compromise immunogenicity. As such, technologies such as FPVCs have great potential to address issues with freezing by maintaining a suitable internal temperature. Three laboratory-tested and conditionally qualified long-range FPVCs were tested in this study. Quantitative data on the temperature was collected through automatic monitoring devices and used to calculate the frequency/ extent of temperature excursions, effect of ambient temperature on internal temperature, cool-down rates, and other indicators. Qualitative data were collected through in-depth interviews with cold chain handlers, auxiliary health workers, and auxiliary nurse midwives. The multiple methods are a key strength of this analysis. Another strength is the inclusion of costs.

In terms of thermal performance, the FPVCs were successful in slowing down the rapid drop in temperature when ice packs are introduced (*Figure 2*). Kumar *et al.* also calculated the mean temperature (*Table 1; Figure 3*) and found that there were no freezing temperatures in the FPVCs in the first phase, and only one internal FPVS temperature below 0°C in the second phase. In terms of acceptability and systems fit, health workers universally appreciated the protection from freezing that the products offered and the reduced wastage (as labels did not peel off as they would through water damage). Health workers did have concerns about the size and the weight of the FPVCs. There were some challenges with opening/closing the lid, difficulty with removing ice packs if frozen, accidentally tearing foam, and with the physical design of the product (i.e., uncomfortable strap and backpack design). Health workers had different preferences for each product, but overall stated that all enhanced safety, reduced wastage, and prevented vaccines from freezing. Cost data were obtained from outreach session and used to calculate the price per dose, volume per dose, and the value of vaccines (i.e., the cost in USD) carried per outreach session. These indicators were used to calculate and present the benefit-cost ratio per health facility per year (*Table 6*). Overall, the price for an FPVC ranges from \$39-55. Based on the benefit-cost threshold of 1, nearly all options indicate that the benefits outweigh the costs with the exception of scenarios which use the minimum value of freeze-sensitive vaccines and the 5-year annualized purchase price of the product. This study demonstrates that FPVCs were largely effective, acceptable, and cost-effective, indicating that they could be implemented elsewhere to prevent vaccine freezing.

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9. [Building the concept for WHO Evidence Considerations for Vaccine Policy \(ECVP\): Tuberculosis vaccines intended for adults and adolescents as a test case.](#)

Kochhar S, Barreira D, Beattie P, Cavaleri M, Cravioto A, Frick M, et al.

Vaccine. 2022 Mar 10;40(12):1681-1690.

PubMed ID: 35164990

ABSTRACT

Currently, no formal mechanisms or systematic approaches exist to inform developers of new vaccines of the evidence anticipated to facilitate global policy recommendations, before a vaccine candidate approaches regulatory approval at the end of pre-licensure efficacy studies. Consequently, significant delays may result in vaccine introduction and uptake, while post-licensure data are generated to support a definitive policy decision. To address the uncertainties of the evidence-to-recommendation data needs and to mitigate the risk of delays between vaccine recommendation and use, WHO is evaluating the need for and value of a new strategic alignment tool: Evidence Considerations for Vaccine Policy (ECVP). ECVPs aim to fill a critical current gap by providing early (pre-phase 3 study design) information on the anticipated clinical trial and observational data or evidence that could support WHO and/or policy decision making for new vaccines in priority disease areas. The intent of ECVPs is to inform vaccine developers, funders, and other key stakeholders, facilitating stakeholder alignment in their strategic planning for late stage vaccine development. While ECVPs are envisaged as a tool to support dialogue on evidence needs between regulators and policy makers at the national, regional and global level, development of an ECVP will not preclude or supersede the independent WHO's Strategic Advisory Group of Experts on Immunization (SAGE) evidence to recommendation (EtR) process that is required for all vaccines seeking WHO policy recommendation. Tuberculosis (TB) vaccine candidates intended for use in the adolescent and adult target populations comprise a portfolio of priority vaccines in late-stage clinical development. As such, TB vaccines intended for use in this target population provide a 'test case' to further develop the ECVP concept, and develop the first WHO ECVP considerations guidance.

WEB: [10.1016/j.vaccine.2021.10.062](https://doi.org/10.1016/j.vaccine.2021.10.062)

IMPACT FACTOR: 3.143

CITED HALF-LIFE: 7.3

START COMMENTARY

Kochhar *et al.* summarize findings from two stakeholder consultations on the strategic tool, Evidence Considerations for Vaccine Policy (ECVP) and its application to TB vaccines for adults and adolescents. This study is important as it summarizes views on ECVPs, which WHO is now developing as a tool to provide early (pre-phase 3 study design) on the anticipated data and

evidence that could support decision making for new vaccines on an international and national level. ECVPs can be used after WHO defines and identifies Preferred Product Characteristics (PPC) to ensure that there are no delays at the end of efficacy studies. The stakeholder meetings included global, regional, and country partners working in vaccine production, financing, policy, implementation, and community engagement and experts on TB vaccine development. The sessions included a draft framework for a ECVP and TB vaccines as a test case to facilitate discussions. Presentations were given on: lessons learned from other vaccines (RTS,S and COVID-19), the urgent need for TB vaccines; modelling health and economic impacts of TB vaccines, and others. During the second meeting, four roundtables with experts were convened. The experts shared their views on ECVP use. Details on the discussion points from the roundtables are presented in *Table 1*. Some notable challenges were that there was a disconnect between the guidance of PPCs and what is typically considered for policy recommendations (i.e., vaccine stability and storage, prioritization of population; the vaccine delivery strategy), a requirement for the ECVP to be a living document with frequent changes as needed, and a need for implementation and community engagement studies along with efficacy studies. Perceived benefits included that the ECVP could be used strategically to enhance dialogue between stakeholders, lead to early engagement with regulators, and could be used to clarify the role of vaccines in disease control strategies. Stakeholders agreed that ECVPs could be a potential method to fill gaps between WHO PPCs, national regulatory authorities, and other policy bodies such as SAGE. If successfully implemented, ECVPs could result in greater stakeholder engagement, higher predictability of the vaccine development process, and reduced risk of investments in vaccine. Kochhar *et al.* conclude by summarizing recommendations for key next steps including for WHO to finalize a generic ECVP framework and a ECVP for TB vaccines in adults and adolescents.

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10. [Multiple cohort HPV vaccination in Zimbabwe: 2018-2019 program feasibility, awareness, and acceptability among health, education, and community stakeholders.](#)

Garon J, Mukavhi A, Rupfutse M, Bright S, Brennan T, Manangazira P, et al.

Vaccine. 2022 Apr 18;40 Suppl 1:A30-A37.

PubMed ID: 34144852

ABSTRACT

INTRODUCTION: Zimbabwe introduced human papillomavirus (HPV) vaccine nationally in May 2018, targeting multiple cohorts (girls aged 10-14 years) through a school-based vaccination campaign. One year later, the second dose was administered to the multiple cohorts concurrently with the first dose given to a new single cohort of girls in grade 5. We conducted cross-sectional surveys among health workers, school personnel, and community members to assess feasibility of implementation, training, social mobilization, and community acceptability.

METHODS: Thirty districts were selected proportional to the volume of the HPV vaccine doses delivered in 2018; two health facilities were randomly selected within each district. One health worker, school health coordinator, village health worker, and community leader were surveyed at each selected health facility and surrounding area during January-February 2020, using standard questionnaires. Descriptive analysis was completed across groups.

RESULTS: There were 221 interviews completed. Over 60% of health workers reported having enough staff to carry out vaccination sessions in schools while maintaining routine vaccination services in health facilities. All school health coordinators felt the HPV vaccine should be delivered in schools in the future. Knowledge of the correct target cohort eligibility decreased from 91% in 2018 to 50% in 2020 among health workers. Understanding of HPV infection and use of HPV vaccine for cervical cancer prevention was above 90% for all respondents. Forty-two percent of respondents reported hearing rumors about the HPV vaccine, primarily regarding infertility and safety.

CONCLUSIONS: Findings demonstrate the presence of highly knowledgeable staff at health facilities and schools, strong community acceptance, and a school-based HPV program considered feasible to implement in Zimbabwe. However, misunderstandings regarding target eligibility and rumors persist, which can impact vaccine uptake and coverage. Continued social mobilization efforts to maintain community demand and training on eligibility were recommended. Integration, partnerships, and resource mobilization are also needed to ensure program sustainability.

WEB: [10.1016/j.vaccine.2021.05.074](https://doi.org/10.1016/j.vaccine.2021.05.074)

IMPACT FACTOR: 3.143

CITED HALF-LIFE: 7.3

START COMMENTARY

In this cross-sectional study, Garon *et al.* present findings on the feasibility, acceptability, and awareness of a multiple cohort HPV vaccination study among stakeholders in Zimbabwe. This study is informative as it provides an example of conducting an immunization program in a challenge setting with limited resources, which can inform other programs elsewhere. Further, it focuses on the perspectives of community members, which are key for program success in Zimbabwe and elsewhere. Data was collected through two cross-sectional surveys with health workers, school health coordinators, village health workers, and leaders in the community. Districts were selected using a two-stage cluster sampling approach which considered urban/rural difference and volume of HPV doses delivered. Within districts, health facilities were randomly selected, and health workers were purposively selected based on level of involvement with HPV immunization efforts. Other community members were selected through convenience sampling. The representation and diversity participants are key strengths of this study.

In total, 221 participants were included. *Table 1* presents detailed demographics of health workers, school health coordinators, village health workers, and community leaders. Most participants were female (75% of health workers; 62% of health school coordinators; and 84% of village health workers) and most community leaders were male (82%). School coordinators reported that HPV vaccine delivery in schools was feasible and should continue. Overall, 66% of school health coordinators reported that they had enough staff to carry out the recent HPV vaccination campaigns in schools, and that 61% reported being able to have enough to maintain routine vaccination services. However, the majority (75%) also reported that HPV vaccine introduction increased their workload. Programmatic challenges noted by participants are described in *Table 3*, including insufficient transportation of staff and supplies, inadequate training, staff shortages, and lack of funds for delivering the vaccine. When asked to identify the target age group and eligibility for HPV vaccination, most participants were well informed (shown graphically in *Figure 1*). Notable negative findings included that rumors (such as 'HPV affect fertility'; 'HPV vaccines are experimental'; 'HPV vaccines will cause severe side effects') were quite common based on 36%, 47%, 56%, and 29% of health workers, school health coordinators, village health workers, and community leaders, hearing them from others, respectively. However, the study did not note if the participants believed these rumors. Overall, the findings on feasibility, awareness, and acceptability indicate that HPV introduction has been successful, and future programming in Zimbabwe and elsewhere should address some of the community-reported challenges.

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Appendix

The literature search for the May 2021 Vaccine Delivery Research Digest was conducted on April 27, 2022. We searched English language articles indexed by the US National Library of Medicine and published between March 15, 2021 and May 14, 2021. The search resulted in 688 items.

SEARCH TERMS

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(((((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])) 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]) ("2022/03/15"[PDAT] : "2022/14/04"[PDAT]))
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