VACCINE DELIVERY RESEARCH DIGEST

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

REPORT TO THE BILL & MELINDA GATES FOUNDATION

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AUGUST 2023

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1. Inequity in the global distribution of monkeypox vaccines.

Tovani-Palone M, Doshi N, Pedersini P.

World J Clin Cases. 2023 Jul 21;11(19):4498-4503.
PubMed ID: 37469745

ABSTRACT

Monkeypox (mpox) has been a public health emergency of international concern that emerged in mid-2022 and has spread to 110 countries. The clinical findings of the disease vary according to the seriousness of the cases. Although its case fatality risk has not been high, a significant percentage of patients require hospitalization. In this context, local initiatives were taken to extend the limited supply of vaccines against the disease; however, such measures have not been sufficient to contain the spread of cases and ensure an equitable distribution of health resources. As a result, endemic regions of low-income countries continue to have insufficient access to mpox vaccination. Despite this and considering the global scope of the disease, there is still little discussion in the literature about the difficulties in achieving adequate vaccination coverage rates for the target population of interest. In this article, we briefly discussed general aspects of the disease, including its surveillance, the current global context of challenges for mpox vaccination, and issues on global allocation of health resources as well as proposed related recommendations.

WEB: 10.12998/wjcc.v11.i19.4498
IMPACT FACTOR: 1.1
CITED HALF-LIFE: 2.8

START COMMENTARY

In this review paper, *Tovani-Palone et al* describe the current state of the monkeypox (mpox) global health emergency. Authors discuss the burden, etiology, and response to this emerging issue. *Figure 1* details the basic mechanism and disease progression of mpox and highlights two primary manifestations of mpox infection (specific symptoms and systemic symptoms). WHO set the following implementation priorities to control mpox outbreaks globally: (1) Provide accurate information to those at risk; (2) Ensure access to pre- and post-exposure mpox vaccination for at-risk populations; (3) Prevent the spread of MPXV; and (4) Protect vulnerable individuals and frontline healthcare workers. Authors note that mpox transmission and burden has decreased in some countries (e.g., the United Kingdom and the United States) with access to vaccines and therapies, while burden remains in many African countries without access to these interventions. Challenges

with access to affordable vaccines and enough supply and inadequate surveillance and screening have contributed to this disparity, emphasizing the continued challenges with equitable vaccinations and allocation of health resources. Future assessments on the success or effectiveness of these strategies would be beneficial.

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2. Determinants of COVID-19 vaccine readiness and hesitancy among adults in sub-Saharan Africa.

Abubakari S, Workneh F, Asante K, Hemler E, Madzorera I, Wang D, et al.

PLOS Glob Public Health. 2023 Jul 18;3(7):e0000713.

PubMed ID: 37450441

ABSTRACT

There is very limited data on the extent and determinants of COVID-19 vaccine hesitancy among adults living in sub-Saharan Africa since the global roll-out of vaccines began in 2021. This multi-country survey sought to investigate COVID-19 vaccine hesitancy and other predictors of readiness to get vaccinated. We conducted surveys among adults residing in nine urban and rural areas in Burkina Faso, Ethiopia, Ghana, Nigeria, and Tanzania in late 2021. Log binomial regression models were used to identify prevalence and factors associated with vaccine hesitancy and beliefs around COVID-19 misinformation. We completed a total of 2,833 interviews. Among all respondents, 9% had never heard of a COVID-19 vaccine, 12% had been vaccinated, and 20% knew someone else who had been vaccinated. The prevalence of vaccine hesitancy varied by country (Ethiopia 29%, Burkina Faso 33%, Nigeria 34%, Ghana 42%, Tanzania 65%), but not by rural or urban context. People who did not think the vaccine was safe or effective, or who were unsure about it, were more likely to be vaccine hesitant. Those who reported they did not have a trusted source of information about the vaccine (aPR: 1.25, 95% CI: 1.18,1.31) and those who thought the vaccine would not be made available to them within the year were more likely to be vaccine hesitant. Women were more likely to be vaccine hesitant (aPR: 1.31, 95% CI: 1.19,1.43) and believe COVID-19 falsehoods (aPR: 1.05, 95% CI: 1.02,1.08). The most commonly believed falsehoods were that the vaccine was developed too fast and that there was not enough information about whether the vaccine was effective or not. Educational campaigns targeted at misinformation and tailored to suit each country are recommended to build trust in COVID-19 vaccines and reduce hesitancy.

WEB: 10.1371/journal.pgph.0000713

IMPACT FACTOR: 3.7

CITED HALF-LIFE: 7.3

START COMMENTARY

In this review, *Abubakari et al* outline factors contributing to COVID-19 vaccine hesitancy in sub-Saharan Africa (included geographies: Burkina Faso, Ethiopia, Nigeria, Tanzania, and Ghana). Utilizing survey data from a novel mobile platform, households from both urban and rural communities are included. *Figure 1* summarizes respondent willingness to receive the COVID-19 vaccine, perceived safety, and perceived effectiveness, stratified by study site. Respondents from

Tanzania and Nigeria are among the least willing to receive the vaccine are more likely to have a negative perception of vaccine safety and effectiveness. *Table 2* reports on the reasons for vaccine readiness or hesitancy. Respondents reported interest in receiving the vaccine to keep themselves safe (90.3% overall), the most reported reason for not wanting the vaccine was the belief it was not needed (42.5% overall). Additionally, 24.31% of respondents reported the location of the vaccine site to be too far, and 26.50% of respondents were concerned about cost. *Figure 2* may be the most illuminating part of this article, detailing reported beliefs in vaccine falsehoods by study site. This showcases the importance of combating misinformation, continued vaccine education and outreach, and equitable access to vaccine doses across sub-Saharan Africa.

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3. Cost-effectiveness of measles and rubella elimination in low-income and middle-income countries.

Levin A, Burgess C, Shendale S, Morgan W, Cw Hutubessy R, Jit M.

BMJ Glob Health. 2023 Jul 12;8(7).

PubMed ID: 37429697

ABSTRACT

BACKGROUND: Since 2000, the incidence of measles and rubella has declined as measles-rubella (MR) vaccine coverage increased due to intensified routine immunisation (RI) and supplementary immunisation activities (SIAs). The World Health Assembly commissioned a feasibility assessment of eliminating measles and rubella. The objective of this paper is to present the findings of cost-effectiveness analysis (CEA) of ramping up MR vaccination with a goal of eliminating transmission in every country.

METHODS: We used projections of impact of routine and SIAs during 2018-2047 for four scenarios of ramping up MR vaccination. These were combined with economic parameters to estimate costs and disability-adjusted life years averted under each scenario. Data from the literature were used for estimating the cost of increasing routine coverage, timing of SIAs and introduction of rubella vaccine in countries.

RESULTS: The CEA showed that all three scenarios with ramping up coverage above the current trend were more cost-effective in most countries than the 2018 trend for both measles and rubella. When the measles and rubella scenarios were compared with each other, the most cost-effective scenario was likely to be the most accelerated one. Even though this scenario is costlier, it averts more cases and deaths and substantially reduces the cost of treatment.

CONCLUSIONS: The Intensified Investment scenario is likely the most cost-effective of the vaccination scenarios evaluated for reaching both measles and rubella disease elimination. Some data gaps on costs of increasing coverage were identified and future efforts should focus on filling these gaps.

WEB: 10.1136/bmjgh-2022-011526

IMPACT FACTOR: 8.1

CITED HALF-LIFE: 2.7

START COMMENTARY

Levin et al modeled the health and economic impact of four different scenarios for measles and rubella vaccination on measles and rubella for 93 low- and middle-income countries from 2018-2047. The scenarios focused on routine immunization and supplementary immunization activities (SIAs) but did not include cost estimates for rapid outbreak response or enhanced surveillance. The four scenarios compared were Base Case, where baseline vaccination coverage from 2018 did not change, Continuing Trends, based on annual improvements consistent with historic trends in coverage, Constant Improvement, based on a linear annual increase in coverage of one percentage point per year, and Intensified Investment, where coverage increased by 4.4% annually for all countries and included more frequent SIAs. For the countries modeled across the 2018-2047 time horizon, estimated costs for measles vaccination ranged from $10.5 billion in the Base Case scenario to $14.8 billion in the Intensified Investment scenario. Treatment costs declined from $10.0 billion under the Base Case scenario to $3.5 billion under the Intensified Investment scenario, and a decline in DALYs from 783 million (Base Case) to 158 million (Intensified Investment). For rubella, the estimated vaccination costs range from $2.9 billion (Base Case) to $4.6 billion (Intensified Investment), and DALYs decrease from 23.8 million (Base Case) to 5.9 million (Intensified Investment). Overall, these findings indicate that an accelerated ramp-up strategy is likely to be most cost-effective; all three higher-coverage scenarios were more cost effective than the Base Case scenario. Limitation of the analysis include limited data availability on costs of surveillance, vaccination and treatment.

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4. Estimating vaccine coverage in conflict settings using geospatial methods: a case study in Borno state, Nigeria.

Sbarra A, Rolfe S, Haeuser E, Nguyen J, Adamu A, Adeyinka D, et al.

Sci Rep. 2023 Jul 10;13(1):11085.

PubMed ID: 37422502

ABSTRACT

Reliable estimates of subnational vaccination coverage are critical to track progress towards global immunisation targets and ensure equitable health outcomes for all children. However, conflict can limit the reliability of coverage estimates from traditional household-based surveys due to an inability to sample in unsafe and insecure areas and increased uncertainty in underlying population estimates. In these situations, model-based geostatistical (MBG) approaches offer alternative coverage estimates for administrative units affected by conflict. We estimated first- and third-dose diphtheria-tetanus-pertussis vaccine coverage in Borno state, Nigeria, using a spatiotemporal MBG modelling approach, then compared these to estimates from recent conflict-affected, household-based surveys. We compared sampling cluster locations from recent household-based surveys to geolocated data on conflict locations and modelled spatial coverage estimates, while also investigating the importance of reliable population estimates when assessing coverage in conflict settings. These results demonstrate that geospatially-modelled coverage estimates can be a valuable additional tool to understand coverage in locations where conflict prevents representative sampling.

WEB: 10.1038/s41598-023-37947-8

IMPACT FACTOR: 4.6

CITED HALF-LIFE: 4.5

START COMMENTARY

In this geospatial modelling analysis, *Sbarra et al.* estimate vaccine coverage in the conflict-affected Borno state, Nigeria. Authors focused primarily on estimating diptheria-tetanus-pertusis (DTP) first dose (DTP1) and third dose (DTP3) coverage; comparisons of survey-reported and model-based spatiotemporal estimates are shown in *Table 1.* Results show large discrepancies between the survey samples for the included years (2016-2017: Multiple Indicator Cluster Survey (MICS/NICS); 2018: Demographic and Health Survey (DHS)) and the model-based geostatistical (MBG) estimates (i.e., 2016-2017 MISC/NICS DTP1 coverage: 72.9%, 2016 MBG DTP1 estimate 38.4% [95% UI: 33.2–43.7%]; 2018 DHS DTP1 coverage: 56.2%, 2018 MBG DTP1 estimate 41.3% [95% UI: 35.7–

47.3%]). *Figure 1* shows the location of survey clusters in comparison to areas of conflict within the state, providing valuable context for the generalizability of results. Many challenges Many challenges associated with conflict settings could skew results (sampling bias, resources, accessibility, infrastructure), suggesting that though valuable, results should be interpreted with limitations in mind.

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5. Leading from the frontlines: community-oriented approaches for strengthening vaccine delivery and acceptance.

Dhaliwal B, Seth R, Thankachen B, Qaiyum Y, Closser S, Best T, et al.

BMC Proc. 2023 Jul 04;17(Suppl 7):5.

PubMed ID: 37391823

ABSTRACT

BACKGROUND: Although immunization is one of the most successful public health interventions, vaccine hesitancy and the COVID-19 pandemic have strained health systems, contributing to global reductions in immunization coverage. Existing literature suggests that involving community members in vaccine interventions has been beneficial, but efforts to facilitate community ownership to motivate vaccine acceptance have been limited.

METHODS: Our research leveraged community-based participatory research to closely involve the community from conception to implementation of an intervention to facilitate vaccine acceptance in Mewat District in Haryana, an area in India with extremely low vaccination coverage. Through the development of a community accountability board, baseline data collection on vaccination barriers and facilitators, and two human-centered design workshops, our team co-created a six-pronged intervention with community leaders and community health workers. This intervention included involving religious leaders in vaccine discussions, creating pamphlets of local vaccine champions for dissemination to parent and child caregivers, creating short videos of local leaders advocating for vaccines, implementing communication training exercises for community health workers, and implementing strategies to strengthen coordination between health workers and supervisors.

RESULTS: Post-intervention data suggested parents and child caregivers had improvements in knowledge of the purpose of vaccines and side effects of vaccines. They noted that the involvement of religious leaders was beneficial, they were more willing to travel to vaccinate their children, and they had fewer non-logistical reasons to refuse vaccination services. Interviews with community leaders and community health workers who were involved in the creation of the intervention suggested that they experienced higher levels of ownership, they were better equipped to address community concerns, and that vaccine misinformation decreased in the post-intervention period.

CONCLUSION: Through this unique intervention to strengthen vaccine uptake that incorporated the needs, interests, and expertise of local community members, we developed a community-driven approach to strengthen vaccine acceptance in a population with low uptake. This comprehensive approach is essential to amplify local voices, identify local concerns and advocates, and leverage bottom-up strategies to co-design successful interventions to facilitate long-term change.

WEB: 10.1186/s12919-023-00259-w

IMPACT FACTOR: 2.521

CITED HALF-LIFE: 6.0

START COMMENTARY

Using a community-based participatory research framework, Dhaliwal, et al, developed strategies to increase vaccine acceptance in Mewat district in India. This study built on previous work that had identified community health workers were influential in vaccine acceptance in the region but their expertise was underutilized. The intervention sought to increase community health worker's ability to increase vaccine acceptance and access. The intervention (described in Table 3) included involvement of religious leaders, pamphlets of vaccine champions, videos of vaccine champions, training and exercises for community health workers to practice skills, and improved coordination between community health workers and supervisors. After intervention implementation, interviews with community health workers indicated that they felt more prepared to address community concerns about vaccinations and better able to address vaccine misinformation (Tables 4). Follow-up surveys with parent/caregivers indicated an improvement in knowledge of the purpose of vaccination. This study points to the importance of adapting interventions to the communities served through inclusion of key stakeholders in developing and refining interventions. While these qualitative findings demonstrating a change in perceptions and attitudes are encouraging, data on the impact on vaccination uptake was not collected or reported in this study.

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6. Expanding global vaccine manufacturing capacity: Strategic prioritization in small countries.

Mukherjee S, Kalra K, Phelan A.

PLOS Glob Public Health. 2023 Jul 03;3(6):e0002098.

PubMed ID: 37384623

ABSTRACT

The COVID-19 pandemic highlighted significant gaps in equitable access to essential medical countermeasures such as vaccines. Manufacturing capacity for pandemic vaccines, therapeutics, and diagnostics is concentrated in too few countries. One of the major hurdles to equitable vaccine distribution was “vaccine nationalism”, countries hoarded vaccines to vaccinate their own populations first which significantly reduced global vaccine supply, leaving significant parts of the world vulnerable to the virus. As part of equitably building global capacity, one proposal to potentially counter vaccine nationalism is to identify small population countries with vaccine manufacturing capacity, as these countries could fulfill their domestic obligations quickly, and then contribute to global vaccine supplies. This cross-sectional study is the first to assesses global vaccine manufacturing capacity and identifies countries with small populations, in each WHO region, with the capacity and capability to manufacture vaccines using various manufacturing platforms. Twelve countries were identified to have both small populations and vaccine manufacturing capacity. 75% of these countries were in the European region; none were identified in the African Region and South-East Asia Region. Six countries have facilities producing subunit vaccines, a platform where existing facilities can be repurposed for COVID-19 vaccine production, while three countries have facilities to produce COVID-19 mRNA vaccines. Although this study identified candidate countries to serve as key vaccine manufacturing hubs for future health emergencies, regional representation is severely limited. Current negotiations to draft a Pandemic Treaty present a unique opportunity to address vaccine nationalism by building regional capacities in small population countries for vaccine research, development, and manufacturing.

WEB: 10.1371/journal.pgph.0002098

IMPACT FACTOR: 3.7

CITED HALF-LIFE: 7.3

START COMMENTARY

In this cross-sectional analysis, *Mukherjee et al.* assess the impact of implementing vaccine manufacturing facilities in small countries, attempting to increase vaccine equity and reduce vaccine nationalism. Overall, 12 countries were identified as having a small population and vaccine manufacturing capacity: Austria, Azerbaijan, Belgium, Bulgaria, Cuba, Czech Republic, Denmark,

Serbia, Singapore, Sweden, Switzerland, and Tunisia. Notably, 75% of the identified countries are within the European region, and none are within South Asia or Africa (*Figure 2)*. In its current state, an estimated 55% of vaccine manufacturing capacity is in East Asia and 40% in Europe and North America, with less than 5% of worldwide vaccine manufacturing capacity within Africa and South America. Aside from manufacturing capacity, current intellectual property laws compound barriers to equitable vaccine manufacturing and highlight a need for global reform. Authors support the development of manufacturing facilities in small countries, global policy regulations on exporting a "fair share of domestic production," and a pandemic treaty addressing strategies to build global capacities for vaccine research, development, and manufacturing in strategic locations in all WHO regions.

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7. National Vaccine Coverage Survey 2020: methods and operational aspects.

Barata R, França A, Guibu I, Vasconcellos M, Moraes J, Teixeira M, et al.

Rev Bras Epidemiol. 2023 Jun 30;26:e230031.
PubMed ID: 37377252

ABSTRACT

OBJECTIVE: The national vaccination coverage survey on full vaccination at 12 and 24 months of age was carried out to investigate drops in coverage as of 2016.

METHODS: A sample of 37,836 live births from the 2017 or 2018 cohorts living in capital cities, the Federal District, and 12 inner cities with 100 thousand inhabitants were followed for the first 24 months through vaccine record cards. Census tracts stratified according to socioeconomic levels had the same number of children included in each stratum. Coverage for each vaccine, full vaccination at 12 and 24 months and number of doses administered, valid and timely, were calculated. Family, maternal and child factors associated with coverage were surveyed. The reasons for not vaccinating analyzed were: medical contraindications, access difficulties, problems with the program, and vaccine hesitancy.

RESULTS: Preliminary results showed that less than 1% of children were not vaccinated, full coverage was less than 75% at all capitals and the Federal District, vaccines requiring more than one dose progressively lost coverage, and there were inequalities among socioeconomic strata, favorable to the highest level in some cities and to the lowest in others.

CONCLUSION: There was an actual reduction in full vaccination in all capitals and the Federal District for children born in 2017 and 2018, showing a deteriorating implementation of the National Immunization Program from 2017 to 2019. The survey did not measure the impacts of the COVID-19 pandemic, which may have further reduced vaccination coverage.

WEB: 10.1590/1980-549720230031
IMPACT FACTOR: NA
CITED HALF-LIFE: NA

START COMMENTARY

Barata et al. utilize a national vaccination household survey in Brazil to estimate changes in vaccine coverage for the first 24 months of life. *Figure 1* shows the definitions for valid and timely doses for all vaccines assessed, which included the vaccines given at the first year of life (bacille Calmette-Guérin (BCG), hepatitis B, three doses of pentavalent and polio vaccine, two doses of rotavirus, meningococcus C and pneumococcus, and one dose of yellow fever) and through 24 months of age

(two doses of measles, mumps and rubella (MMR) vaccine, one dose of hepatitis A, varicella, and polio, and one booster dose of DTaP, meningococcus C and pneumococcus). *Table 3* includes national vaccine coverage for each vaccine. Authors divided the population into four socioeconomic stratum (A is highest quartile, D is the lowest) and assessed the inequality in vaccine coverage when comparing the highest to the lowest quartile (*Table 4).* Authors found a difference of up to 18.2 percentage points when comparing the highest to lowest socioeconomic stratum (Porto Velho, 64.0 [58.0 – 71.1]). An overall drop in vaccination coverage nationally was found from 2017 to 2019, especially for those vaccines requiring more than one dose, suggesting that interventions targeted at reducing disparities and increasing coverage generally are both needed.

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8. Measuring National Immunization System Performance: A Systematic Assessment of Available Resources.

Patel C, Rendell N, Sargent G, Ali A, Morgan C, Fields R, et al.

Glob Health Sci Pract. 2023 Jun 26;11(3).

PubMed ID: 37348935

ABSTRACT

BACKGROUND: Vaccination coverage is widely used to assess immunization performance but, on its own, provides insufficient information to drive improvements. Assessing the performance of underlying components of immunization systems is less clear, with several monitoring and evaluation (M&E) resources available for use in different operational settings and for different purposes. We studied these resources to understand how immunization system performance is measured.

METHODS: We reviewed peer-reviewed and gray literature published since 2000 to identify M&E resources that include national-level indicators measuring the performance of immunization systems or their components (governance, financing, regulation, information systems, vaccine logistics, workforce, service delivery, and demand generation). We summarize indicators by the system components or outcomes measured and describe findings narratively.

RESULTS: We identified 20 resources to monitor immunization program objectives and guide national strategic decision-making, encompassing 631 distinct indicators. Indicators for immunization program outcomes comprised the majority (124/631 [19.7%]), largely vaccination coverage (110/124 [88.7%]). Almost all resources (19/20 [95%]) included indicators for vaccine logistics (83/631 [13.2%]), and those for regulation (19/631 [3.0%]) and demand generation (28/631 [4.4%]) were least common. There was heterogeneity in how information systems (92/563 [14.6%]) and workforce (47/631 [7.4%]) were assessed across resources. Indicators for vaccination coverage in adults, data use in decision-making, equity and diversity, effectiveness of safety surveillance, and availability of a public health workforce were notably lacking.

CONCLUSIONS: Between the resources identified in this review, we identified considerable variability and gaps in indicators assessing the performance of some immunization system components. Given the multitude of indicators, policymakers may be better served by tailoring evaluation resources to their specific context to gain useful insight into health system performance and improve data use in decision-making for immunization programs.

WEB: 10.9745/GHSP-D-22-00555

IMPACT FACTOR: 2.352

CITED HALF-LIFE: 3.6

START COMMENTARY

In this review, *Patel et al.* identified key indicators for monitoring and evaluation of national immunization system performance utilizing published resources, with a focus on those that examine a performance of immunization system or the system-wide impact of a disease-specific immunization program or initiative, published in 2000 or later. Indicators were categorized utilizing the following primary categories: 1) system impact, 2) system outcomes, 3) demand generation, 4) financing, 5) governance, 6) program planning, and management, 7) information systems, 8) regulation and pharmacovigilance, 9) service provision, 10) vaccines logistics, products, and supplies, and 11) workforce, identifying 631 distinct indicators across resources. Among the indicator categories, authors highlighted specific monitoring and evaluation indicators for measuring immunization system impacts and outcomes (*Table 3)* and the performance of immunization system components (*Table 4*). With the wide array of indicator areas, this work highlights the complexity of immunization programs and global changes in policies, priorities, and reporting requirements. Though this is a comprehensive review, and numerous indicator areas were identified, gaps remain in measuring adult immunization, data use in decision-making, and development of indicators for equity.

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9. Microarray patches for managing infections at a global scale.

Anjani Q, Sabri A, Hutton A, Cárcamo-Martínez &, Wardoyo L, Mansoor A, et al.

J Control Release. 2023 Jul 14;359:97-115.
PubMed ID: 37263545

ABSTRACT

Since the first patent for micro array patches (MAPs) was filed in the 1970s, research on utilising MAPs as a drug delivery system has progressed significantly, evidenced by the transition from the simple 'poke and patch' of solid MAPs to the development of bio responsive systems such as hydrogel-forming and dissolving MAPs. In addition to the extensive research on MAPs for improving transdermal drug delivery, there is a growing interest in using these devices to manage infectious diseases. This is due to the minimally invasive nature of this drug delivery platform which enable patients to self-administer therapeutics without the aid of healthcare professionals. This review aims to provide a critical analysis on the potential utility of MAPs in managing infectious diseases which are still endemic at a global scale. The range of diseases covered in this review include tuberculosis, skin infections, malaria, methicillin-resistant Staphylococcus aureus infections and Covid-19. These diseases exert a considerable socioeconomic burden at a global scale with their impact magnified in low- and middle-income countries (LMICs). Due to the painless and minimally invasive nature of MAPs application, this technology also provides an efficient solution not only for the delivery of therapeutics but also for the administration of vaccine and prophylactic agents that could be used in preventing the spread and outbreak of emerging infections. Furthermore, the ability of MAPs to sample and collect dermal interstitial fluid that is rich in disease-related biomarkers could also open the avenue for MAPs to be utilised as a minimally invasive biosensor for the diagnosis of infectious diseases. The efficacy of MAPs along with the current limitations of such strategies to prevent and treat these infections will be discussed. Lastly, the clinical and translational hurdles associated with MAP technologies will also be critically discussed.

WEB: 10.1016/j.jconrel.2023.05.038
IMPACT FACTOR: 10.8
CITED HALF-LIFE: 6.7

START COMMENTARY

In this review, *Anjani et al.* provide an overview of micro array patches (MAPs) and discuss the potential utility of MAPs in infectious disease management. MAPs have been used as a transdermal delivery system for therapeutics, and have been modified to be used in more complex, bio-responsive delivery system (e.g., hydrogel forming and dissolving MAPs), but are underutilized for

the delivery of vaccines and diagnosis of infectious diseases. *Figure 4* graphically represents the design of the micro-needle device, while *Table 1* summarizes the various MAP design and materials used, including the needle design, microneedle type, and antimicrobial agent. In addition to being a safe and effective method of administering various medication doses, MAPs offer other advantages to traditional technologies. MAPs are less painful, self-disabling, and enable self-administration, additionally, the use of MAPs eliminates the need for cold-chain storage and could greatly improve global access to vaccines. It appears that this is an under-utilized technology, and additional research should be done on the feasibility of widespread use of MAPs for diagnostics and vaccine delivery.

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10. The Origins and Risk Factors for Serotype-2 Vaccine-Derived Poliovirus Emergences in Africa During 2016-2019.

Gray E, Cooper L, Bandyopadhyay A, Blake I, Grassly N.

J Infect Dis. 2023 Jun 30;228(1):80-88.

PubMed ID: 36630295

ABSTRACT

Serotype 2 oral poliovirus vaccine (OPV2) can revert to regain wild-type neurovirulence and spread to cause emergences of vaccine-derived poliovirus (VDPV2). After its global withdrawal from routine immunization in 2016, outbreak response use has created a cycle of VDPV2 emergences that threaten eradication. We implemented a hierarchical model based on VP1 region genetic divergence, time, and location to attribute emergences to campaigns and identify risk factors. We found that a 10 percentage point increase in population immunity in children younger than 5 years at the campaign time and location corresponds to a 18.0% decrease (95% credible interval [CrI], 6.3%-28%) in per-campaign relative risk, and that campaign size is associated with emergence risk (relative risk scaling with population size to a power of 0.80; 95% CrI, .50-1.10). Our results imply how Sabin OPV2 can be used alongside the genetically stable but supply-limited novel OPV2 (listed for emergency use in November 2020) to minimize emergence risk.

WEB: 10.1093/infdis/jiad004

IMPACT FACTOR: 6.4

CITED HALF-LIFE: 9.5

START COMMENTARY

In this modeling analysis, Gray et al. identify Serotype 2 oral poliovirus vaccine (OPV2) campaigns and risk factors associated with emergences of vaccine- derived poliovirus type 2 (VDPV2). Figure 2 shows probability of emergences of VDPV2 and the associated campaigns by country and year; analysis was done using genetic divergence, time, and location to attribute emergences to campaigns and identify risk factors. Figure 5 shows the expected distances (km) and times (days) between the causal campaign and the first detection of VDPV2, by country (Angola, Central African Republic, Chad, Democratic Republic of the Congo, Ethiopia, Mozambique, Nigeria, Togo, & Zambia represented). Authors found a small number of campaigns (n=17) in Nigeria, Democratic Republic of the Congo, and Ethiopia were the likely sources of circulating VDPV2 from 2016 – 2019 (n = 46 emergences). This demonstrates the risk of cVDPV2 emergence is highest following the first campaign use of Sabin OPV type 2 in areas without recent use of serotype 2-containing vaccine,

and when the campaign is small in scale. Results suggest that early response to emergences in areas with low immunity should be prioritized to receive nOPV2 to minimize risk of outbreak.
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Appendix

The literature search for the August 2023 Vaccine Delivery Research Digest was conducted on August 3, 2023. We searched English language articles indexed by the US National Library of Medicine and published between June 15, 2023 and July 14, 2023. The search resulted in 532 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])) 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]) (“2023/15/6”[PDAT] : “2023/14/7”[PDAT]))