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REPORT TO THE BILL & MELINDA GATES FOUNDATION

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1. Cost-effectiveness of sub-national geographically targeted vaccination programs: A systematic review.

Getchell M, Mantaring E, Yee K, Pronyk P.

Vaccine. 2023 Feb 13.

PubMed ID: 36781333

ABSTRACT

Immunization is an essential component of national health plans. However, the growing number of new vaccine introductions, vaccination campaigns and increasing administrative costs create logistic and financial challenges, especially in resource-limited settings. Sub-national geographic targeting of vaccination programs is a potential strategy for governments to reduce the impact of infectious disease outbreaks while optimizing resource allocation and reducing costs, promoting sustainability of critically important national immunization plans. We conducted a systematic review of peer-reviewed literature to identify studies that investigated the cost-effectiveness of geographically targeted sub-national vaccination programs, either through routine immunization or supplementary immunization activities. A total of 16 studies were included in our review, covering nine diseases of interest: cholera, dengue, enterotoxigenic Escherichia coli (ETEC), hepatitis A, Japanese encephalitis, measles, rotavirus, Shigella and typhoid fever. All studies modelled cost-effectiveness of geographically targeted vaccination. Despite the variation in study design, disease focus and country context, studies generally found that in countries where a heterogenous burden of disease exists, sub-national geographic targeting of vaccination programs in areas of high disease burden was more cost-effective than a non-targeted strategy. Sensitivity analysis revealed that cost-effectiveness was most sensitive to variations in vaccine price, vaccine efficacy, mortality rate, administrative and operational costs, discount rate, and treatment costs. This systematic review identified several key characteristics related to geographic targeting of vaccination, including the vaccination strategy used, variations in modelling parameters and their impact on cost-effectiveness. Additional research and guidance is needed to support the appropriateness and feasibility of geographically targeted vaccination and to determine what country context would make this a viable complement to routine immunization programs.

WEB: 10.1016/j.vaccine.2023.02.006

IMPACT FACTOR: 4.169

CITED HALF-LIFE: 7.3

START COMMENTARY

In this systematic review, *Getchell et al*. evaluated the cost-effectiveness of sub-nationally targeted vaccination programs in the form of routine immunization or supplementary immunization activities in countries with heterogenous burden of disease. This review included studies covering nine diseases of interest (rotavirus (n = 4), measles (n = 3), hepatitis A (n = 2), dengue (n = 2), Japanese encephalitis (n = 2), cholera (n = 1), ETEC/Shigella (n = 1), and typhoid (n = 1), and spanned across countries with varied income levels (LMICs: n= 8, UMICs: n = 3, HIC: (n=2), multi-country studies across LIC, LMIC, and UMICs: n = 3). Authors evaluated included studies based on country context, disease focus, model type, sensitivity analyses and cost-effectiveness. *Table 2* summarizes the cost effectiveness findings of each study, including the study's conclusion, perspective of the evaluation, and most sensitive parameters. Despite varying contexts, study design, disease area, and model type utilized, authors found sub-national geographic targeting of vaccination programs in areas of high disease incidence or high mortality was more cost-effective than a non-targeted strategy in countries with heterogenous burden of disease. These findings can make a case for geographic targeting of vaccination, especially in setting with limited resources for policy makers.

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2. Global inequity creates local insufficiency: A qualitative study of COVID-19 vaccine implementation challenges in low-and-middle-income countries.

Haldane V, Ariyarajah A, Berry I, Loutet M, Salamanca-Buentello F, Upshur R.

PLoS One. 2023 Feb 15;18(2):e0281358.

PubMed ID: 36780502

ABSTRACT

INTRODUCTION: The COVID-19 pandemic has amplified pre-existing challenges to health promotion and care across the world, and particularly in low- and middle-income countries (LMICs). This qualitative study draws on data from a panel of immunisation experts and uses a novel framework of vaccine delivery domains to explore perspectives from those who live and work in these settings on the challenges to implementing COVID-19 vaccine programs in LMICs.

METHODS: We conducted a thematic content analysis of 96 participant free text replies to questions from Round I of a three-round Delphi consensus study amongst global experts on COVID-19 vaccine implementation.

RESULTS: Participant responses highlighted challenges to vaccine program implementation including issues related to equity; governance, decision-making, and financing; regulatory structures, planning, and coordination; prioritisation, demand generation, and communication; vaccine, cold chain, logistics, and infrastructure; service delivery, human resources, and supplies; and surveillance, monitoring, and evaluation.

CONCLUSION: We reflect on our findings in light of global efforts to address vaccine inequity and emphasise three key areas salient to improving vaccination efforts during novel infectious disease outbreaks: 1) Ensuring safe and sustainable service delivery in communities and at points of care; 2) Strengthening systems for end-to-end delivery of vaccines, therapeutics, diagnostics, and essential supplies; 3) Transforming structural paradigms towards vaccine equity.

WEB: 10.1371/journal.pone.0281358

IMPACT FACTOR: 3.752

CITED HALF-LIFE: 6.8

START COMMENTARY

In this qualitative study, *Haldane et al.* identified key thematic areas of challenges and barriers faced in implementing COVID-19 vaccination programs in low- and middle-income countries (LMICs). Authors used a modified framework, combining the previously established World Health Organization (WHO) *COVID-19 Vaccine Introduction Readiness Assessment Tool* (VIRAT) and the World

Bank *Vaccine Readiness Assessment Framework* (VRAF) to evaluate country readiness for vaccine deployment. Presented in *Figure 1*, this framework is rooted in equity as an overarching theme, and additionally includes domains of: governance, regulatory structures, prioritization, cold chain logistics, service delivery, and monitoring and evaluation. *Table 2* includes illustrative examples of challenges faced in each domain of the framework, such as “unequal competition with high-income countries for the acquisition of vaccines, especially due to lack of resources,” highlighted in the equity domain. This article is limited in the granularity in which regional challenges can be reported as respondents were able to select multiple regions of expertise at time of response. However, responses may have been more generalized as this was framed as a global consensus-building exercise. Overall, challenges identified in this article outline the domains necessary for a more equitable vaccine implementation in LMICs broadly, not only limited to the COVID-19 pandemic response.

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3. Cost-Effectiveness Analysis of the South African Infant National Immunization Program for the Prevention of Pneumococcal Disease.

Huang L, McDade C, Perdrizet J, Wilson M, Warren S, Nzenze S, et al.

Infect Dis Ther. 2023 Feb 14:1-18.

PubMed ID: 36774428

ABSTRACT

INTRODUCTION: Pneumococcal disease, which presents a substantial health and economic burden, is prevented through pneumococcal vaccination programs. We assessed the impact of switching from a 13-valent-based (PCV13) to lower 10-valent-based (PCV10-GlaxoSmithKline [GSK] or PCV10-Serum Institute of India [SII]) or higher-valent (PCV15 or PCV20) vaccination programs in South Africa.

METHODS: A previously published decision-analytic model was adapted to a South African setting. Historical invasive pneumococcal disease (IPD) incidence data were used to project IPD incidence over time for each vaccination program on the basis of serotype coverage. Historical incidence (IPD, pneumonia, otitis media), mortality, costs, and utilities were obtained from the published literature. Cases of disease, direct medical costs (i.e., vaccination, IPD, pneumonia, and otitis media costs) (in 2022 South African rands), life-years, quality-adjusted life-years (QALY), and incremental cost per QALY were estimated over a 5- and 10-year horizon for PCV13 and the PCV10 vaccines. Additionally, a public health impact analysis was conducted comparing PCV13, PCV15, and PCV20.

RESULTS: Continuing use of PCV13 would substantially reduce disease incidence over time compared with switching to either of the PCV10 lower-valent vaccines. Cases of IPD were reduced by 4.22% and 34.70% when PCV13 was compared to PCV10-GSK and PCV10-SII, respectively. PCV13 was also found to be cost saving over 5- and 10-year time horizons compared with PCV10-SII and to be cost-effective over a 5-year time horizon and cost-saving over a 10-year time horizon compared with PCV10-GSK. PCV20 was consistently estimated to prevent more cases than the PCV10 vaccines, PCV13, or PCV15.

CONCLUSIONS: Switching from a higher-valent to a lower-valent vaccine may lead to disease incidence re-emergence caused by previously covered serotypes. Maintaining PCV13 was estimated to improve public health further by averting additional pneumococcal disease cases and saving more lives and also to reduce total costs in most scenarios. Higher-valent PCVs can achieve the greatest public health impact in the pediatric vaccination program in South Africa.

WEB: 10.1007/s40121-023-00767-4
IMPACT FACTOR: 6.119
CITED HALF-LIFE: 2.3

START COMMENTARY

In this cost-effectiveness analysis, *Huang et al.* assessed the impact of switching from a 13-valent-based pneumococcal vaccine (PCV13) to a 10-valent-based pneumococcal vaccine (PVC10), a 15-valent-based pneumococcal vaccine (PVC15), or a 20-valent-based pneumococcal vaccine (PCV20) in South African vaccination programs. Authors aimed to identify a vaccine that could maximize health and economic benefits, as there are multiple pneumococcal vaccines available currently or very soon. *Figure 1* shows the serotype coverage for each of the pneumococcal vaccines assessed in this analysis; *Table 1* includes the general model input parameters. Authors found switching from PCV13 to either PCV10 options could result in more pneumococcal disease cases (PCV10-GSK: +217,599; PCV10-SII: +1,074,862) and deaths (PCV10-GSK: +1,733; PCV10-SII: +16,490), summarized in *Table 2*. This supports countries maintaining use of the broader coverage PCV13 for both health and economic outcomes. Additionally, authors found that use of higher valent vaccines (PCV15 or PCV20) would result in a greater impact on disease burden, suggesting countries consider switching once these vaccines are available.

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4. Estimating the future global dose demand for measles-rubella microarray patches.

Ko M, Malvolti S, Cherian T, Mantel C, Biellik R, Jarrahian C, et al.

Front Public Health. 2023 Feb 03;10:1037157.
PubMed ID: 36726626

ABSTRACT

BACKGROUND: Progress toward measles and rubella (MR) elimination has stagnated as countries are unable to reach the required 95% vaccine coverage. Microarray patches (MAPs) are anticipated to offer significant programmatic advantages to needle and syringe (N/S) presentation and increase MR vaccination coverage. A demand forecast analysis of the programmatic doses required (PDR) could accelerate MR-MAP development by informing the size and return of the investment required to manufacture MAPs.

METHODS: Unconstrained global MR-MAP demand for 2030-2040 was estimated for three scenarios, for groups of countries with similar characteristics (archetypes), and four types of uses of MR-MAPs (use cases). The base scenario 1 assumed that MR-MAPs would replace a share of MR doses delivered by N/S, and that MAPs can reach a proportion of previously unimmunised populations. Scenario 2 assumed that MR-MAPs would be piloted in selected countries in each region of the World Health Organization (WHO); and scenario 3 explored introduction of MR-MAPs earlier in countries with the lowest measles vaccine coverage and highest MR disease burden. We conducted sensitivity analyses to measure the impact of data uncertainty.

RESULTS: For the base scenario (1), the estimated global PDR for MR-MAPs was forecasted at 30 million doses in 2030 and increased to 220 million doses by 2040. Compared to scenario 1, scenario 2 resulted in an overall decrease in PDR of 18%, and scenario 3 resulted in a 21% increase in PDR between 2030 and 2040. Sensitivity analyses revealed that assumptions around the anticipated reach or coverage of MR-MAPs, particularly in the hard-to-reach and MOV populations, and the market penetration of MR-MAPs significantly impacted the estimated PDR.

CONCLUSIONS: Significant demand is expected for MR-MAPs between 2030 and 2040, however, efforts are required to address remaining data quality, uncertainties and gaps that underpin the assumptions in this analysis.

WEB: 10.3389/fpubh.2022.1037157
IMPACT FACTOR: 6.461
CITED HALF-LIFE: 2.2

START COMMENTARY

In this modeling analysis, *Ko et al.* evaluated the use of measles and rubella (MR) microarray patches (MAPs) in three scenarios (base, regional pilots, need-based accelerated adoption) to advance MR elimination. Countries included in this analysis were grouped into four archetypes: 1. Countries exclusively using MMR or MMRV, 2. Countries using MMR or MMRV in routine schedules but utilizing Measles monovalent and MR for SIA activities, 3. Countries using MR located in WHO's African and Eastern Mediterranean Region, and 4. Countries that use M or MR in WHO's Southeast Asian and Western Pacific Region. Additionally, as the use of MR-MAPs would require less skill and training for administration, authors evaluated six use cases of delivery settings: UC1: fixed health post with full cold chain capabilities by health worker or community health worker, UC2 & UC3: reduced or no cold chain capacity by health worker or community health worker, UC4: no cold chain capacity by community health worker in their “home” community, UC5: Self-administration with supervision, and UC6: Self-administration without supervision. *Figure 4* shows the estimated MR-MAP doses required based on the four archetype groups, showing the demand to be up to 240 million doses annually from 2030 to 2040. Estimates from this analysis show that MR-MAPs dose demand may stabilize by 2038 around 210 million doses per year. This forecast indicates that there will be a substantial for MR-MAPs as part of national immunization programs. Though MR-MAPs have recently entered Phase I clinical trials, and there many uncertainties, the use of MAPs could address current barriers countries are facing with under-immunized children.

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5. Real-world effectiveness of a single dose of mpox vaccine in males.

Wolff Sagy Y, Zucker R, Hammerman A, Markovits H, Arieh N, Abu Ahmad W, et al.

Nat Med. 2023 Feb 17:1-5.

PubMed ID: 36720271

ABSTRACT

The recent global outbreak of the monkeypox (mpox) virus in humans was declared a public health emergency by the World Health Organization in July 2022. The smallpox and mpox vaccine (JYNNEOS; Modified Vaccinia Ankara-Bavarian Nordic; MVA-BN), provided as a two-dose regimen, is currently the primary vaccine utilized against mpox. However, the efficacy of MVA-BN against mpox has never been demonstrated in clinical trials to date. Due to the limited supply of vaccines, the World Health Organization has recommended prioritizing the vaccination of high-risk groups. We evaluated the real-world effectiveness of a single, subcutaneous dose of MVA-BN in this observational, retrospective cohort study, which included the analysis of electronic health records of all members of Clalit Health Services eligible for the vaccine on 31 July 2022. We used a Cox proportional hazards regression model with time-dependent covariates to estimate the association between vaccination and mpox while adjusting for sociodemographic and clinical risk factors. In an analysis of 2,054 male individuals who met vaccine eligibility criteria, 1,037 (50%) were vaccinated during the study recruitment period and completed at least 90 d of follow-up. During the study period, 5 and 16 infections were confirmed in vaccinated and unvaccinated individuals, respectively. The adjusted vaccine effectiveness was estimated at 86% (95% confidence interval, 59-95%). Our results suggest that a single dose of subcutaneous MVA-BN in this high-risk cohort is associated with a significantly lower risk of MPXV infection.

WEB: 10.1038/s41591-023-02229-3

IMPACT FACTOR: 87.244

CITED HALF-LIFE: 6.4

START COMMENTARY

In this observational cohort study, *Wolff Sagy et al.* assessed the real-world effectiveness of the smallpox and monkeypox vaccine (Modified Vaccinia Ankara-Bavarian Nordic; MVA-BN) among eligible individuals. Authors used electronic health record data from 2,054 male individuals of Clalit Health Services (CHS) in Israel; 50% (1,037 individuals) were vaccinated during study recruitment and had 90 days of follow up. *Figure 1* shows the cumulative hazard for monkeypox infection for vaccinated and unvaccinated individuals; unsurprisingly, the number of infections was higher in the unvaccinated cohort over the follow up period, with 9.3 events per 100,000 person-days in

unvaccinated individuals and 4.3 events per 100,000 person-days among those vaccinated. The results demonstrate that vaccination with one dose of MVA-BN was associated with an 86% reduction in the risk for monkeypox among those considered at high risk of infection. Additional data is needed to assess the efficacy of one dose compared to the recommended two doses. It should also be noted that the sample size and number of infections in the study period are both limited, but these results could be used as justification for further trials.

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6. The cost and cost-effectiveness of novel tuberculosis vaccines in low- and middle-income countries: A modeling study.

Portnoy A, Clark R, Quaife M, Weerasuriya C, Mukandavire C, Bakker R, et al.

PLoS Med. 2023 Jan 26;20(1):e1004155.

PubMed ID: 36693081

ABSTRACT

BACKGROUND: Tuberculosis (TB) is preventable and curable but eliminating it has proven challenging. Safe and effective TB vaccines that can rapidly reduce disease burden are essential for achieving TB elimination. We assessed future costs, cost-savings, and cost-effectiveness of introducing novel TB vaccines in low- and middle-income countries (LMICs) for a range of product characteristics and delivery strategies.

METHODS AND FINDINGS: We developed a system of epidemiological and economic models, calibrated to demographic, epidemiological, and health service data in 105 LMICs. For each country, we assessed the likely future course of TB-related outcomes under several vaccine introduction scenarios, compared to a "no-new-vaccine" counterfactual. Vaccine scenarios considered 2 vaccine product profiles (1 targeted at infants, 1 at adolescents/adults), both assumed to prevent progression to active TB. Key economic inputs were derived from the Global Health Cost Consortium, World Health Organization (WHO) patient cost surveys, and the published literature. We estimated the incremental impact of vaccine introduction for a range of health and economic outcomes. In the base-case, we assumed a vaccine price of $4.60 and used a 1× per-capita gross domestic product (GDP) cost-effectiveness threshold (both varied in sensitivity analyses). Vaccine introduction was estimated to require substantial near-term resources, offset by future cost-savings from averted TB burden. From a health system perspective, adolescent/adult vaccination was cost-effective in 64 of 105 LMICs. From a societal perspective (including productivity gains and averted patient costs), adolescent/adult vaccination was projected to be cost-effective in 73 of 105 LMICs and cost-saving in 58 of 105 LMICs, including 96% of countries with higher TB burden. When considering the monetized value of health gains, we estimated that introduction of an adolescent/adult vaccine could produce $283 to 474 billion in economic benefits by 2050. Limited data availability required assumptions and extrapolations that may omit important country-level heterogeneity in epidemiology and costs.

CONCLUSIONS: TB vaccination would be highly impactful and cost-effective in most LMICs. Further efforts are needed for future development, adoption, and implementation of novel TB vaccines.

WEB: 10.1371/journal.pmed.1004155
IMPACT FACTOR: 11.613
CITED HALF-LIFE: 8.5

START COMMENTARY

In this cost effectiveness analysis, Portnoy et al. assess costs, cost-savings, and cost-effectiveness of Tuberculosis (TB) vaccines in 105 low- and middle-income countries (LMICs) from both a health system and societal perspective. Authors included vaccines targeted at two different populations: 1 targeted at infants, and another at adolescents and adults. Results showed that an effective TB vaccine would have health and economic benefits projected for 2028 to 2050, with the adolescent and adult vaccine showing to be cost-effective from a health system perspective (64/105 LMICs), and from a societal perspective (73/105 LMICs). The infant vaccine was shown to be cost-effective in both a health system perspective (47/105 LMICs) and from a societal perspective (56/105 LMICs). Figure 1 shows the cost-effectiveness from the health system perspective for both vaccine product profiles, stratified by TB incidence per 100,000. Neither vaccine product profiles were shown to be cost saving, but the health and economic benefits appear to outweigh the required expenditure. These results support that the introduction of a new TB vaccine would be impactful and cost-effective for a range of assumptions on vaccine price and delivery strategies, for both health and economic benefits.

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7. Advancing Immunization Coverage and Equity: A Structured Synthesis of Pro-Equity Strategies in 61 Gavi-Supported Countries.

Ivanova V, Shahabuddin A, Sharkey A, Johri M.

Vaccines (Basel). 2023 Feb 02;11(1).

PubMed ID: 36680034

ABSTRACT

BACKGROUND: Global immunization inequities persist, reflected in the 25 million underimmunized and 18 million zero-dose children in 2021. To identify country approaches to reach underimmunized and zero-dose children, we undertook a structured synthesis of pro-equity strategies across 61 countries receiving programmatic support from Gavi, the Vaccine Alliance.

METHODS: We extracted data from 174 Country Joint Appraisals and Multi-Stakeholder Dialogue reports (2016-2020). We identified strategies via a targeted keyword search, informed by a determinants of immunization coverage framework. Strategies were synthesized into themes consolidated from UNICEF's Journey to Health and Immunization (JTHI) and the Global Routine Immunization Strategies and Practices (GRISP) frameworks.

RESULTS: We found 607 unique strategies across 61 countries and 24 themes. Strategies to improve care at the point of service (44%); to improve knowledge, awareness and beliefs (25%); and to address preparation, cost and effort barriers (13%) were common. Fewer strategies targeted experience of care (8%), intent, (7%) and after-service (3%). We also identified strategies addressing gender-related barriers to immunization and targeting specific types of communities.

CONCLUSIONS: We summarize the range of pro-equity immunization strategies employed in Gavi-supported countries and interpret them thematically. Findings are incorporated into a searchable database which can be used to inform equity-driven immunization programs, policies and decision-making which target underimmunized and zero-dose communities.

WEB: 10.3390/vaccines11010191

IMPACT FACTOR: 4.961

CITED HALF-LIFE: 1.4

START COMMENTARY

In this landscape review, *Ivanova et al.* analyzed immunization equity strategies from 61 countries receiving programmatic support from Gavi. Authors utilized thematic frameworks from UNICEF's Journey to Health and Immunization (JTHI) and the Global Routine Immunization Strategies and Practices (GRISP) to synthesize and assess how countries are addressing equity gaps in immunization

delivery. *Figure 1* shows the number of strategies per country on a map, with strategies by country ranging from 27 to 1. *Figure 3* shows the number of strategies, determinants of immunization coverage, and overarching theme across the 6 dimensions of the JTHI framework for caregivers and health workers: 1. Knowledge, Awareness, and Beliefs, 2. Intent, 3. Preparation, Cost, and Effort, 4. Point of Service, 5. Experience of Care, and 6. After-Service. Within these 6 dimensions, authors identified 24 themes, with the largest number of strategies found to be directed at Social Norms (within knowledge, awareness, and beliefs) and Utilization (within point of service). This work highlights the need of an intentional approach to equity-driven immunization programs and decision0making around targeting zero-dose children.

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8. Vaccination against poliomyelitis in Brazil from 2011 to 2021: successes, setbacks, and challenges ahead.

Donalisio M, Boing A, Sato A, Martinez E, Xavier M, Almeida R, et al.

Cien Saude Colet. 2023 Jan 19;28(2):337.

PubMed ID: 36651390

ABSTRACT

The drop in childhood vaccination coverage (VC), including poliomyelitis, has become a health concern. The objective was to analyze the temporal trend of coverage of the three doses of the polio vaccine in the first 12 months of life between 2011 and 2021, in addition to mapping vaccination coverage in Brazil, including the COVID-19 pandemic period. An ecological study was carried out using interrupted time series (STI) techniques and spatial analysis, with data from the National Immunization Program Information System. The VC trend was adjusted by the Newey-West variance estimator according to the federated units and the Brazilian Deprivation Index. The VC distribution was estimated by Bayesian models and the spatial clusters by the global and local Moran index, identifying areas of lower coverage in the health regions. There was a reduction in the VC over the period in all regions, being more pronounced in the North and Northeast regions and during the Covid-19 pandemic. The biggest drops were identified in states and health regions with greater social vulnerability after 2019. The drop in VC shows that the risk of reintroduction of the wild virus is imminent and the challenges need to be faced with the strengthening of the Brazilian Health System (SUS).

WEB: 10.1590/1413-81232023282.17842022

IMPACT FACTOR: 1.917

CITED HALF-LIFE: 5.3

START COMMENTARY

In this population-based study, *Donalisio et al.* assess the temporal trend of the three-dose poliomyelitis vaccine coverage in Brazil. Authors utilized interrupted time series (STI) techniques and spatial analysis to evaluate trends between 2011 and 2021. *Figures 1 – 3* show the trends in polio vaccine coverage regionally in Brazil (1. Southeast and South, 2. North and Midwest, 3. Northeast). Authors also assessed based on a constructed Brazilian Deprivation Index to classify municipalities into quintiles of deprivation; trends in vaccine coverage by lowest and highest quintiles are shown in *Figure 4.* All regions show a decline in vaccine coverage from 2011 to 2021 and show an additional decline in coverage after the onset of the COVID-19 pandemic. In 2011, almost half of the federation units had vaccine coverage estimated at 100% or more; this was not observed in any state in 2021. The states of the North (*Figure 2*) and Northeast (*Figure 3*) reported the most significant drops in

vaccine coverage. This study also shows a loss of adequate vaccination coverage targets (95% vaccine coverage) in the country, suggesting a real risk of reintroduction and circulation of wild type poliovirus in Brazil.

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9. A systematic review of communication interventions for countering vaccine misinformation.

Whitehead H, French C, Caldwell D, Letley L, Mounier-Jack S.

Vaccine. 2023 Feb 02;41(5):1018-1034.

PubMed ID: 36628653

ABSTRACT

BACKGROUND: Misinformation and disinformation around vaccines has grown in recent years, exacerbated during the Covid-19 pandemic. Effective strategies for countering vaccine misinformation and disinformation are crucial for tackling vaccine hesitancy. We conducted a systematic review to identify and describe communications-based strategies used to prevent and ameliorate the effect of mis- and dis-information on people's attitudes and behaviours surrounding vaccination (objective 1) and examined their effectiveness (objective 2).

METHODS: We searched CINAHL, Web of Science, Scopus, MEDLINE, Embase, PsycInfo and MedRxiv in March 2021. The search strategy was built around three themes(1) communications and media; (2) misinformation; and (3) vaccines. For trials addressing objective 2, risk of bias was assessed using the Cochrane risk of bias in randomized trials tool (RoB2).

RESULTS: Of 2000 identified records, 34 eligible studies addressed objective 1, 29 of which also addressed objective 2 (25 RCTs and 4 before-and-after studies). Nine 'intervention approaches' were identified; most focused on content of the intervention or message (debunking/correctional, informational, use of disease images or other 'scare tactics', use of humour, message intensity, inclusion of misinformation warnings, and communicating weight of evidence), while two focused on delivery of the intervention or message (timing and source). Some strategies, such as scare tactics, appear to be ineffective and may increase misinformation endorsement. Communicating with certainty, rather than acknowledging uncertainty around vaccine efficacy or risks, was also found to backfire. Promising approaches include communicating the weight-of-evidence and scientific consensus around vaccines and related myths, using humour and incorporating warnings about encountering misinformation. Trying to debunk misinformation, informational approaches, and communicating uncertainty had mixed results.

CONCLUSION: This review identifies some promising communication strategies for addressing vaccine misinformation. Interventions should be further evaluated by measuring effects on vaccine uptake, rather than distal outcomes such as knowledge and attitudes, in quasi-experimental and real-life contexts.

WEB: 10.1016/j.vaccine.2022.12.059
IMPACT FACTOR: 4.169
CITED HALF-LIFE: 7.3

START COMMENTARY

In this systematic review, *Whitehead et al.* describe and evaluate communication strategies used to counter vaccine mis- and dis-information surrounding vaccination. Data were synthesized based on format of communication intervention (i.e., pamphlet, social media-based intervention, informational text) and content or communication strategy/approach (i.e., informational, myths vs facts approach, use of humor and logic). Study outcomes were grouped into four classifications: (1) belief in or endorsement of mis- or disinformation, (2) knowledge about vaccines and related diseases, (3) attitudes and beliefs about vaccination, including measures of vaccine hesitancy, and (4) intention to vaccinate. Table 2 shows the format and intervention approach (debunking, informational, images and scare tactics, message timing) for each included communication strategies. Included papers that assessed the effectiveness of strategies were assessed using a risk of bias tool (RoB 2), summarized in *Figure 2*. This review points out several gaps in the body of literature, including that only a small number of studies examined actual interventions as they would be realistically delivered, and most did not assess effectiveness.

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10. SARS-CoV-2 seroprevalence in children worldwide: A systematic review and meta-analysis.

Naeimi R, Sepidarkish M, Mollalo A, Parsa H, Mahjour S, Safarpour F, et al.

EClinicalMedicine. 2023 Jan 03;56:101786.

PubMed ID: 36590788

ABSTRACT

BACKGROUND: The higher hospitalisation rates of those aged 0-19 years (referred to herein as 'children') observed since the emergence of the immune-evasive SARS-CoV-2 Omicron variant and subvariants, along with the persisting vaccination disparities highlighted a need for in-depth knowledge of SARS-CoV-2 sero-epidemiology in children. Here, we conducted this systematic review to assess SARS-CoV-2 seroprevalence and determinants in children worldwide.

METHODS: In this systematic review and meta-analysis study, we searched international and preprinted scientific databases from December 1, 2019 to July 10, 2022. Pooled seroprevalences were estimated according to World Health Organization (WHO) regions (at 95% confidence intervals, CIs) using random-effects meta-analyses. Associations with SARS-CoV-2 seroprevalence and sources of heterogeneity were investigated using sub-group and meta-regression analyses. The protocol used in this study has been registered in PROSPERO (CRD42022350833).

FINDINGS: We included 247 studies involving 757,075 children from 70 countries. Seroprevalence estimates varied from 7.3% (5.8-9.1%) in the first wave of the COVID-19 pandemic to 37.6% (18.1-59.4%) in the fifth wave and 56.6% (52.8-60.5%) in the sixth wave. The highest seroprevalences in different pandemic waves were estimated for South-East Asia (17.9-81.8%) and African (17.2-66.1%) regions; while the lowest seroprevalence was estimated for the Western Pacific region (0.01-1.01%). Seroprevalence estimates were higher in children at older ages, in those living in underprivileged countries or regions, and in those of minority ethnic backgrounds.

INTERPRETATION: Our findings indicate that, by the end of 2021 and before the Omicron wave, around 50-70% of children globally were still susceptible to SARS-CoV-2 infection, clearly emphasising the need for more effective vaccines and better vaccination coverage among children and adolescents, particularly in developing countries and minority ethnic groups.

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START COMMENTARY

In this systematic review and meta-analysis, *Naeimi et al.* evaluated the seroprevalence of SARS-CoV-2 in children globally (n = 757,075 children; 70 countries). Seroprevalence was defined as the number of children who tested positive for a specific SARS-CoV-2 serum antibodies, divided by the total number of children tested. *Table 1* shows SARS-CoV-2 seroprevalence estimates across WHO regions and sub-regions and are reported by pandemic wave (wave 1- 6). Data were not available for all regions across all waves, but during pandemic waves with available data for each region, the highest and lowest seroprevalences were estimated for Southeast Asia and the Western Pacific regions, respectively. *Table 1* includes pooled seroprevalence data in children (ages 0 – 19) by country and is represented in *Figure 3* by a map. The highest seroprevalence seen was 66.12% (95% CI: 60.53 – 71.41) in Central African Republic; seroprevalence estimates were generally higher in low- and middle-income countries. This study included data up to July 2022, so it does entirely cover the Omicron variant waves; additional investigation should be done to assess the Omicron waves.

Return to List of Articles

Appendix

The literature search for the March 2023 Vaccine Delivery Research Digest was conducted on February 27, 2023. We searched English language articles indexed by the US National Library of Medicine and published between January 15, 2023 and February 14, 2023. The search resulted in 624 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]) (“2022/15/11”[PDAT] : “2022/14/12”[PDAT]))