START CENTER

STRATEGIC ANALYSIS, RESEARCH & TRAINING CENTER

Department of Global Health | University of Washington

# VACCINE DELIVERY RESEARCH DIGEST

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

REPORT TO THE BILL & MELINDA GATES FOUNDATION

FEBRUARY 15, 2017

PRODUCED BY: LEVINE, GA; SLYKER, J.

## TABLE OF CONTENTS

1. **Knowledge and perceptions of polio and polio immunization in polio high-risk areas of Pakistan.**

Habib MA, Soofi SB, Ali N, Hussain I, Tabassum F, Suhag Z, Anwar S, Ahmed I, Bhutta ZA.

J Public Health Policy. 2017 Jan 11. [Epub ahead of print]

PMID: 28077864


## ABSTRACT

Pakistan and Afghanistan remain the only countries where polio is endemic, and Pakistan reports the most cases in the world. Although the rate is lower than in previous years, the situation remains alarming. We conducted a mixed methods study in high-risk areas of Pakistan to identify knowledge, attitudes, and practices of target populations about polio vaccine and its eradication, and to estimate coverage of routine immunization and oral polio vaccine. We surveyed 10,685 households in Karachi, 2522 in Pishin, and 2005 in Bajaur. Some knowledge of polio is universal, but important misconceptions persist. The findings of this study carry strategic importance for program direction and implementation.



**WEB:** http://dx/doi.10.1057/s41271-016-0056-6

**IMPACT FACTOR:** 0.91

**CITED HALF-LIFE:** 5.50


**START SCIENTIFIC COMMENT:** Attitudes: In focus group discussions and interviews caregivers and decision makers indicated that the most "reliable and preferred' sources of information about child health were healthcare providers, 'Ulama' (religious leaders and scholars), school teachers, radio, doctors, mosque announcements, and awareness camps. However, survey results indicated that mass marketing campaigns and sources such as television, radio, and posters and newspapers were the most frequently-sited source of information about polio. In qualitative research, many respondents reporting not being provided adequate information about the purpose of the vaccine when vaccinators visited their home, and not understanding the benefit of the drops was common. Concerns about possible sterility resulting from the vaccine were also common.

Knowledge/beliefs: Although more than 90% of respondents overall had heard of polio, less than half of those in Pishin knew it could be prevented with vaccination/polio drops. Substantial proportions of participants in all three regions had incorrect knowledge/beliefs about the causes of a child's infection. For instance, between 20% and 40% of participants in each region believed '*Allah's* will" was a cause of infection. Approximately 65-85% of respondents believed completing routine EPI vaccinations would prevent polio, while less than 10% knew that polio drops could prevent polio. The knowledge and attitudes varied considerably across the three regions studied.

## 2. What drivers will influence global immunizations in the era of grand convergence in global health?

Levine OS.

Vaccine. 2017 Jan 20;35 Suppl 1:A6-A9.

PMID: 28017439

### ABSTRACT

Recent projections suggest that by 2035 global health will look dramatically different than it does today. In what's called a 'grand convergence' the world is likely to be characterized by far more similarities than differences in the prevailing health and medical problems across populations. This manuscript considers how key drivers for vaccine use and uptake might change as a result of the grand convergence and how decisions taken now might anticipate those changes in ways that position immunizations to continue playing an important role in the future.

**WEB:** http://dx/doi: 10.1057/s41271-016-0056-6

**IMPACT FACTOR:** 3.62

**CITED HALF-LIFE:** 5.50

**START SCIENTIFIC COMMENT:** The author provides the following key recommended activities and approaches to addressing each of the key drivers of use and uptake, to ensure vaccines continue to contribute to improving population health as the global context changes:

- Encourage agile and flexible vaccine development platforms
- Strengthen delivery systems
- Define and measure the broader value of vaccination
- Make vaccines as safe as possible
- Improve local institutional capacity for evidence-based policy decisions
- Increase local ownership of vaccination programs

The author emphasizes specifically the importance of strong national and local ownership of vaccination programs, specifically the importance of their prioritization of vaccination programs and the need to ensure such programs are implemented with quality. The author emphasizes the potential challenges encountered in achieving this, particularly in countries that support their vaccine programs through external donor funding versus via national government budgets. Authors recommend countries which rely primarily on donor funding be prioritized now for transition programs, to ensure successful transition of ownership and self-funding.

Table 1 summarizes the key drivers of immunization, implications of each driver on recommended approaches and activities, and potential barriers encountered via these implications.

3. **Household experience and costs of seeking measles vaccination in rural Guinea-Bissau.**
Byberg S, Fisker AB, Rodrigues A, Balde I, Enemark U, Aaby P, Benn CS, Griffiths UK.

Trop Med Int Health. 2017 Jan;22(1):12-20.

PMID: 27717100


## ABSTRACT

**Objectives** Children younger than 12 months of age are eligible for childhood vaccines through the public health system in Guinea-Bissau. To limit open vial wastage, a restrictive vial opening policy has been implemented; 10-dose measles vaccine vials are only opened if six or more children aged 9– 11 months are present at the vaccination post. Consequently, mothers who bring their child for measles vaccination can be told to return another day. We aimed to describe the household experience and estimate household costs of seeking measles vaccination in rural Guinea-Bissau.

**Methods** Within a national sample of village clusters under demographic surveillance, we interviewed mothers of children aged 9–21 months about their experience with seeking measles vaccination. From information about time and money spent, we calculated household costs of seeking measles vaccination.

**Results** We interviewed mothers of 1308 children of whom 1043 (80%) had sought measles vaccination at least once. Measles vaccination coverage was 70% (910/1308). Coverage decreased with increasing distance to the health centre. On average, mothers who had taken their child for vaccination took their child 1.4 times. Mean costs of achieving 70% coverage were 2.04 USD (SD 3.86) per child taken for vaccination. Half of the mothers spent more than 2 h seeking vaccination and 11% spent money on transportation.

**Conclusions** We found several indications of missed opportunities for measles vaccination resulting in suboptimal coverage. The household costs comprised 3.3% of the average monthly income and should be taken into account when assessing the costs of delivering vaccinations.



**WEB:** http://dx.doi.org/10.1111/tmi.12793

**IMPACT FACTOR:** 2.33

**CITED HALF-LIFE:** 2.90


**START SCIENTIFIC COMMENT:** Among children who were unvaccinated for measles, 9% of their caregivers had sought measles vaccination (MV) 3+ times, 6% had sought MV 2 times, 19% had sought MV one time, and 66% had never sought MV for their child. Overall, 34% of those who were MV unvaccinated had been brought for vaccination at least once, indicating substantial missed opportunity to vaccinate.

This study only included children who had a vaccination card available, and thus may over-represent the coverage prevalence in the target population, since children without a card would likely be less likely to be vaccinated than those with a card.

Authors note that this strategy to reduce waste by restricting vaccination to groups of 6 of more children has a substantial negative impact on MV coverage, and recommend a change in policy. They suggest a vial be opened for as few as one child presenting at any age, which they propose be re-branded in the campaign as a “1+ dose” vial.

4. **Monitoring equity in vaccination coverage: A systematic analysis of demographic and health surveys from 45 Gavi-supported countries.**

Arsenault C, Harper S, Nandi A, Mendoza RodrÌguez JM, Hansen PM, Johri M.

Vaccine. 2017 Feb 7;35(6):951-959.

PMID: 28069359

## ABSTRACT

**Objectives**: (1) To conduct a systematic analysis of inequalities in childhood vaccination coverage in GAVI supported countries; (2) to comparatively assess alternative measurement approaches and how they may affect cross-country comparisons of the level of inequalities.

**Methods**: Using the most recent Demographic and Health Surveys (2005–2014) in 45 GAVI-supported countries, we measured inequalities in vaccination coverage across seven dimensions of social stratification and of vulnerability to poor health outcomes. We quantified inequalities using pairwise comparisons (risk differences and ratios) and whole spectrum measures (slope and relative indices of inequality). To contrast measurement approaches, we pooled the estimates using random-effects meta-analyses, ranked countries by the magnitude of inequality and compared agreement in country ranks.

**Results**: At the aggregate level, maternal education, multidimensional poverty, and wealth index poverty were the dimensions associated with the largest inequalities. In 36 out of 45 countries, inequalities were substantial, with a difference in coverage of 10 percentage points or more between the top and bottom of at least one of these social dimensions. Important inequalities by child sex, child malnutrition and urban/ rural residence were also found in a smaller set of countries. The magnitude of inequality and ranking of countries differed across dimension and depending on the measure used. Pairwise comparisons could not be estimated in certain countries. The slope and relative indices of inequality were estimated in all countries and produced more stable country rankings, and should thus facilitate more reliable international comparisons.

**Conclusion**s: Inequalities in vaccination coverage persist in a large majority of GAVI-supported countries. Inequalities should be monitored across multiple dimensions of vulnerability. Using whole spectrum measures to quantify inequality across multiple ordered social groups has important advantages. We illustrate these findings using an equity dashboard designed to support decision-making in the Sustainable Development Goals period.

**WEB:** http://dx.doi.org/ 10.1016/j.vaccine.2016.12.04

**IMPACT FACTOR:** 3.62

**CITED HALF-LIFE:** 5.50

**START SCIENTIFIC COMMENT:** Authors explain that the slope index of inequality (SII) represents the percentage point difference of the expected vaccination coverage between the top and bottom ranked groups of the socioeconomic distribution, assuming a linear relationship between social rank and vaccination, after categorizing individuals intro ordered, ranked groups based on cumulative distribution of socioeconomic status. Similarly, the relative index of inequality (RII) represents the ratio in vaccination coverage between the top and bottom ranked groups. Figure 1 depicts country rankings by the level of inequality in DTP3 coverage according to different measurement approaches. Nigeria, India, Pakistan, Cameroon, Madagascar, Cote d'Ivoire, Mali and Ethiopia tended to have highest inequality rankings, regardless of the measures used.

Authors propose an "equity dashboard" (Figure 3), to be used to provide a brief snapshot of equity indicators for a country, to inform development approaches. DTP and MCV data from Ghana are used as an example.

Note that the DHS data that was used for estimation came from the most recent available survey year for each country, but this ranged from 2005 to 2013, depending on the country.

## 5. Vaccination Coverage and Timelines Among Children 0-6 Months in Kinshasa, the Democratic Republic of Congo: A Prospective Cohort Study.

Zivich PN, Kiketa L, Kawende B, Lapika B, Yotebieng M.

Matern Child Health J. 2017 Jan 5. [Epub ahead of print]

PMID: 28058663

### ABSTRACT

**Objectives** The Democratic Republic of Congo (DR Congo) is one of the ten countries, which accounts for 60% of unvaccinated children worldwide. The aim of this study was to assess predictors of incomplete and untimely immunization among a cohort of infants recruited at birth and followed up through 24 weeks in Kinshasa.

**Methods** Complete immunization for each vaccine was defined as receiving all the recommended doses. Untimely immunization was defined as receiving the given dose before (early) or after (delayed) the recommended time window. Infants not immunized by the end of the follow-up time were considered missing. Multivariate hierarchical model and generalized logistic model were used to assess the independent contribution of each socio-economic and demographic factors considered to complete immunization and timeliness, respectively.

**Results** Overall, of 975 infants from six selected clinics included in the analysis 84.7% were fully immunized the three doses of DTP or four doses of Polio by 24 weeks of age. Independently of the vaccine considered, the strongest predictor of incomplete and untimely immunization was the clinic in which the infant was enrolled. This association was strengthened after adjustment for socioeconomic and demographic characteristics. Education and the socio-economic status also were predictive of completion and timeliness of immunization in our cohort.

**Discussion** In conclusion, the strongest predictor for incomplete and untimely immunization among infants in Kinshasa was the clinics in which they were enrolled. The association was likely due to the user fee for well-baby clinic visits and its varying structure by clinic.

**WEB:** http://dx.doi.org/1007/s10995-016-2201-z

**IMPACT FACTOR:** 2.13

**CITED HALF-LIFE:** 4.70

**START SCIENTIFIC COMMENT:** In DR Congo, although the vaccinations themselves are free, caregivers are required to register and pay for the well-baby visits at which vaccines are administered. Authors explain that the costs of well-baby visits, as well as the payment collection process/structure, vary substantially by clinic and may thus be a barrier to accessing both well-baby care and recommended vaccinations.

In analyses of the effect of "clinic" on outcomes including non-completion and out-of-time-window receipt of DPT, polio, and PCV, authors compared each of the other clinics to Clinic 1, which had the lowest proportion of children with incomplete status. Though they conclude that vaccination coverages "depended on clinic", the estimation provided and statistical tests used only compared whether each clinic differed from Clinic 1, not whether they differed from one another. Authors note that in Clinic 1, user fees for well-baby visits are included in the delivery fee, whereas for some of the other clinics, separate fees apply to well-baby visits. Authors do not provide the specific costs of well-baby registration/visits for each clinic nor provide clinic-specific descriptions of the well-baby visit payment schemes, thus it's not possible to evaluate whether differences in cost and fee organization/process can in fact explain differences in completeness and timeliness of vaccination.

## 6. A systems approach to vaccine decision making.

Lee BY, Mueller LE, Tilchin CG.

Vaccine. 2017 Jan 20;35 Suppl 1:A36-A42.

PMID: 28017430

### ABSTRACT

Vaccines reside in a complex multiscale system that includes biological, clinical, behavioral, social, operational, environmental, and economical relationships. Not accounting for these systems when making decisions about vaccines can result in changes that have little effect rather than solutions, lead to unsustainable solutions, miss indirect (e.g., secondary, tertiary, and beyond) effects, cause unintended consequences, and lead to wasted time, effort, and resources. Mathematical and computational modeling can help better understand and address complex systems by representing all or most of the components, relationships, and processes. Such models can serve as "virtual laboratories" to examine how a system operates and test the effects of different changes within the system. Here are ten lessons learned from using computational models to bring more of a systems approach to vaccine decision making: (i) traditional single measure approaches may overlook opportunities; (ii) there is complex interplay among many vaccine, population, and disease characteristics; (iii) accounting for perspective can identify synergies; (iv) the distribution system should not be overlooked; (v) target population choice can have secondary and tertiary effects; (vi) potentially overlooked characteristics can be important; (vii) characteristics of one vaccine can affect other vaccines; (viii) the broader impact of vaccines is complex; (ix) vaccine administration extends beyond the provider level; and (x) the value of vaccines is dynamic.

**WEB:** http://dx.doi.org/10.1016/j.vaccine.2016.11.033

**IMPACT FACTOR:** 3.62

**CITED HALF-LIFE:** 5.50

**START SCIENTIFIC COMMENT:** Figure 1 is a visual depiction of the multiscale system within which authors propose vaccine decision-making exists, visually depicting the properties specific to the vaccine, the vaccine delivery system and the individual decision-maker. For each of the lessons learned, authors provide real-world examples of how computational modeling has contributed to informing the impact of different decisions or approaches to vaccine development or distribution, ultimately informing approaches to ensure decision-makers' objectives are met. As an example, of Lesson 4: "Do not overlook the distribution system" authors describe how the Highly Extensible Resource for modeling Supply Chains (HERMES) platform was used to simulate the influence of introducing rotavirus and/or pneumococcal vaccine into the EPI program in Niger. The model indicated that bottlenecks at the district and health center levels in Niger, due to transport and storage limitations, would be exacerbated by introduction of the additional vaccines, resulting in lower overall vaccine availability. The information about the impact of current distributional constraints in the system was used to inform programmatic strategies and prevent further limitations to vaccine availability.

## 7. Demand- and supply-side determinants of diphtheria-pertussis-tetanus nonvaccination and dropout in rural India.

Ghosh A, Laxminarayan R.

Vaccine. 2017 Jan 9. [Epub ahead of print]

PMID: 28081971

**ABSTRACT**

**Background**: Although 93% of 12- to 23-month-old children in India receive at least one vaccine, typically Bacillus Calmette–Guérin, only 75% complete the recommended three doses of diphtheria-pertussistetanus (DPT, also referred to as DTP) vaccine. Determinants can be different for nonvaccination and dropout but have not been examined in earlier studies. We use the three-dose DPT series as a proxy for the full sequence of recommended childhood vaccines and examine the determinants of DPT nonvaccination and dropout between doses 1 and 3.

**Methods**: We analyzed data on 75,728 6- to 23-month-old children in villages across India to study demand- and supply-side factors determining nonvaccination with DPT and dropout between DPT doses 1 and 3, using a multilevel approach. Data come from the District Level Household and Facility Survey 3 (2007–08).

**Results**: Individual- and household-level factors were associated with both DPT nonvaccination and dropout between doses 1 and 3. Children whose mothers had no schooling were 2.3 times more likely not to receive any DPT vaccination and 1.5 times more likely to drop out between DPT doses 1 and 3, compared with children whose mothers had 10 or more years of schooling. Although supply-side factors related to availability of public health facilities and immunization-related health workers in villages were not correlated with dropout between DPT doses 1 and 3, children in districts where 46% or more villages had a healthcare subcentre were 1.5 times more likely to receive at least one dose of DPT vaccine compared with children in districts where 30% or fewer villages had subcentres.

**Conclusions**: Nonvaccination with DPT in India is influenced by village- and district-level contextual factors over and above individuals' background characteristics. Dropout between DPT doses 1 and 3 is associated more strongly with demand-side factors than with village- and district-level supply-side factors.

**WEB:** http://dx.doi.org/10.1016/j.vaccine.2016.12.024

**IMPACT FACTOR:** 3.62

**CITED HALF-LIFE:** 5.50

**START SCIENTIFIC COMMENT:** Authors point out that even among states with high DPT1 coverage (>90%), there is substantial variation in DPT3 coverage (between 96-87%). However, states with high DPT1 coverage, in general, also tend to have high coverage of DPT3. That is to say, the gap between 1- and 3-dose coverage appears to be larger in states with lower 1-dose coverage than in states with a larger proportion of children receiving at least 1 dose (Figure 1). Authors found that individual-level factors that influenced uptake of the first dose differed from those that influenced completion/dropout, and that in general, individual-level and household-level factors had a larger magnitude of effect on initiation than on dropout. For example, the effect estimates for the effect of paternal education and maternal lack of awareness of vaccination schedule/timing, were substantially larger for uptake than for completion.

Authors therefore attribute gaps in completion in places where first dose coverage is high to demand side factors resulting from poor quality of care received at the first dose, and lack of knowledge/understanding in the need for additional doses.

## 8. Budget impact of polio immunization strategy for India: introduction of one dose of inactivated poliomyelitis vaccine and reductions in supplemental polio immunization.

Khan MM, Sharma S, Tripathi B, Alvarez FP

Public Health. 2017 Jan;142:31-38.

PMID: 28057194

### ABSTRACT

**Objectives**: To conduct a budget impact analysis (BIA) of introducing the immunization recommendations of India Expert Advisory Group (IEAG) for the years 2015-2017. The recommendations include introduction of one inactivated poliomyelitis vaccine (IPV) dose in the regular child immunization programme along with reductions in oral polio vaccine (OPV) doses in supplemental programmes.

**Study design**: This is a national level analysis of budget impact of new polio immunization recommendations. Since the states of India vary widely in terms of size, vaccine coverage and supplemental vaccine needs, the study estimated the budget impact for each of the states of India separately to derive the national level budget impact.

**Methods:** Based on the recommendations of IEAG, the BIA assumes that all children in India will get an IPV dose at 14 weeks of age in addition to the OPV and DPT (or Pentavalent-3) doses. Cost of introducing the IPV dose was estimated by considering vaccine price and vaccine delivery and administration costs. The cost savings associated with the reduction in number of doses of OPV in supplemental immunization were also estimated. The analysis used India-specific or international cost parameters to estimate the budget impact.

**Results**: Introduction of one IPV dose will increase the cost of vaccines in the regular immunization programme from $20 million to $47 million. Since IEAG recommends lower intensity of supplemental OPV vaccination, polio vaccine cost of supplemental programme is expected to decline from $72 million to $53 million. Cost of administering polio vaccines will also decline from $124 million to $105 million mainly due to the significantly lower intensity of supplemental polio vaccination. The net effect of adopting IEAG's recommendations on polio immunization turns out to be cost saving for India, reducing total polio immunization cost by $6 million. Additional savings could be achieved if India adopts the new policy regarding the handling of multi-dose vials after opening. Introduction of three doses of IPV with the existing polio immunization schedule will increase the budget requirement by $102 million but replacing OPV doses with IPV will increase the budget by about $59 million. Discontinuation of supplemental OPV immunization with replacement of OPV by IPV will reduce the Government of India's (GOI) polio immunization budget by $99 million.

**Conclusion**: Although the overall cost of polio programme will decline with the adoption of IEAG's recommendations, state-level costs will vary widely. In states like Kerala, Karnataka, Uttar Pradesh and Andhra Pradesh, cost of polio immunization will increase while in Punjab and Jharkhand the costs will remain more or less constant. Significant cost reductions will happen in states with high intensity of supplemental polio immunizations (Bihar, Haryana and Delhi). The cost of procuring polio vaccines will more than double from $20 million to about $47 million requiring allocation of additional foreign exchanges. In some states (like Bihar), the decline in polio-related employment will be very high requiring reallocation of personnel from polio to other programmes.

**WEB:** http://dx.doi.org/10.1016/j.puhe.2016.10.016

**IMPACT FACTOR:** 0.84

**CITED HALF-LIFE:** 6.60

**START SCIENTIFIC COMMENT:** Table 1 lists the parameters, specific to each Indian state, where appropriate, used in the BIA. Cost components included routine and supplemental program costs: polio vaccines, polio immunization supplies, transportation, polio vaccine costs, storage, administration, waste management, trainings/social mobilization, overhead, and medical care for vaccine-associated polio paralysis. Table 4 summarizes per-component and total cost of the OPV-based schedule versus OPV plus IPV. Decreases in vaccine administration activity costs contribute the largest absolute amount to projected cost savings.

9. **Informing vaccine decision-making: A strategic multi-attribute ranking tool for vaccines-SMART Vaccines 2.0.**

Knobler S, Bok K, Gellin B.

Vaccine. 2017 Jan 20;35 Suppl 1:A43-A45.

PMID: 28017435

## ABSTRACT

SMART Vaccines 2.0 software is being developed to support decision-making among multiple stakeholders in the process of prioritizing investments to optimize the outcomes of vaccine development and deployment. Vaccines and associated vaccination programs are one of the most successful and effective public health interventions to prevent communicable diseases and vaccine researchers are continually working towards expanding targets for communicable and non-communicable diseases through preventive and therapeutic modes. A growing body of evidence on emerging vaccine technologies, trends in disease burden, costs associated with vaccine development and deployment, and benefits derived from disease prevention through vaccination and a range of other factors can inform decision-making and investment in new and improved vaccines and targeted utilization of already existing vaccines. Recognizing that an array of inputs influences these decisions, the strategic multi-attribute ranking method for vaccines (SMART Vaccines 2.0) is in development as a web-based tool—modified from a U. S. Institute of Medicine Committee effort (IOM, 2015)—to highlight data needs and create transparency to facilitate dialogue and information-sharing among decision-makers and to optimize the investment of resources leading to improved health outcomes. Current development efforts of the SMART Vaccines 2.0 framework seek to generate a weighted recommendation on vaccine development or vaccination priorities based on population, disease, economic, and vaccine-specific data in combination with individual preference and weights of user-selected attributes incorporating valuations of health, economics, demographics, public concern, scientific and business, programmatic, and political considerations. Further development of the design and utility of the tool is being carried out by the National Vaccine Program Office of the Department of Health and Human Services and the Fogarty International Center of the National Institutes of Health. We aim to demonstrate the utility of SMART Vaccines 2.0 through the engagement of a community of relevant stakeholders and to identify a limited number of pilot projects to determine explicitly defined attribute preferences and the related data and model requirements that are responsive to user needs and able to improve the use of evidence for vaccine-related decision-making and consequential priorities of vaccination options.

**WEB:** http://dx.doi.org/10.1016/j.vaccine.2016.10.086

**IMPACT FACTOR:** 3.62

**CITED HALF-LIFE:** 5.50

**START SCIENTIFIC COMMENT:** The tool is considered to be at "prototype" stage and developers continue to refine it to expand upon utility and to ensure the needs of diverse stakeholders are met. At the recent The "Global Health 2035: Mission Grand Convergence, Multi-Criteria Systems Analysis" meeting, stakeholders identified the following key attributes for the software to use to determine prioritization: disease severity; disease incidence; scientific feasibility; operational (financial and implementation) feasibility; regulatory feasibility; vaccine safety; risk of epidemic or pandemic potential; lack of availability of alternative disease interventions. Additionally, a measure to more comprehensively capture the valuation or benefit of the vaccine, including influences on cognitive development, educational attainment, prevented work days lost, reduced long-term disability, was also proposed.

Authors propose that that in both well-resourced settings and low- and middle-income countries, the tool can be used to support transparency in priority-setting for new vaccine targets and vaccine program strategy decisions. For example, the choices of attributes entered, the weighting scheme chosen for these attributes, the quantitative 'scores' resulting from these different user-defined inputs, and the ability to see how changes to these inputs and weights change results, are all readily available.

## 10. Oral Cholera Vaccine Coverage during an Outbreak and Humanitarian Crisis, Iraq, 2015.

Lam E, Al-Tamimi W, Russell SP, Butt MO, Blanton C, Musani AS, Date K.

Emerg Infect Dis. 2017 Jan;23(1):38-45.

PMID: 27983502

### ABSTRACT

During November–December 2015, as part of the 2015 cholera outbreak response in Iraq, the Iraqi Ministry of Health targeted ≈255,000 displaced persons ≥1 year of age with 2 doses of oral cholera vaccine (OCV). All persons who received vaccines were living in selected refugee camps, internally displaced persons camps, and collective centers. We conducted a multistage cluster survey to obtain OCV coverage estimates in 10 governorates that were targeted during the campaign. In total, 1,226 household and 5,007 individual interviews were conducted. Overall, 2-dose OCV coverage in the targeted camps was 87% (95% CI 85%–89%). Two-dose OCV coverage in the 3 northern governorates (91%; 95% CI 87%–94%) was higher than that in the 7 southern and central governorates (80%; 95% CI 77%–82%). The experience in Iraq demonstrates that OCV campaigns can be successfully implemented as part of a comprehensive response to cholera outbreaks among high-risk populations in conflict settings.

**WEB:** http://dx.doi.org10.3201/eid2301.160881

**IMPACT FACTOR:** 4.89

**CITED HALF-LIFE:** 6.30

**START SCIENTIFIC COMMENT:** The most commonly reported reasons for not being vaccinated were not being present when the campaign occurred, and having the household not be visited by a vaccination team. Lack of vaccine availability during their campaign, being sick and not "having faith" in the vaccine, or the household decision-maker not being home when the vaccination teams visited were also reported, but less frequently.

Television, friends and neighbors, radio, health staff, poster/banners were all approximately equally reported as sources of information about the campaign. A little more than half of respondents also reported receiving specific cholera prevention messages (such as hand-washing and boiling of water), as part of the campaign.

The lack of mobility and "closed" structure of camps was indicated as a facilitating factor to achieving high coverage in the campaigns. Coverage was substantially lower in central and southern regions than northern regions, which authors attribute to higher unrest/civil strife, rain, and program management challenges in those regions.

Authors note that 2-dose coverage estimates from the survey are higher than coverage estimated from vaccination cards alone, which they explain is because individuals often fail to bring cards with them for repeat doses. Authors recommend vaccinators receive training in emphasizing to vaccine recipients the importance of bringing cards to subsequent visits, to improve the quality of coverage estimates.

## APPENDIX: PUBMED 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]) ("2016/12/15"[PDAT] : "2017/1/14"[PDAT]))

* On February 2, 2017, this search of English language articles published between December 15, 2016 and January 14, 2017 and indexed by the US National Library of Medicine resulted in 219 unique manuscripts.