VACCINE DELIVERY RESEARCH DIGEST

**UNIVERSITY OF WASHINGTON STRATEGIC ANALYSIS,
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REPORT TO THE BILL & MELINDA GATES FOUNDATION

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1. [Global impact of rotavirus vaccine introduction on rotavirus hospitalisations among children under 5 years of age, 2008-16: findings from the Global Rotavirus Surveillance Network](#)

Aliabadi N, Antoni S, Mwenda JM, Weldegebriel G, Biey JNM, Cheikh D, et al.

ABSTRACT

BACKGROUND:

Rotavirus vaccine use in national immunisation programmes has led to declines in hospital admissions for rotavirus gastroenteritis among children; however, the global impact of rotavirus vaccine introduction has not been described using primary data. We describe the impact of rotavirus vaccine introduction on admissions for acute rotavirus gastroenteritis in primarily low-income and middle-income countries, using 9 years of data from the WHO-coordinated Global Rotavirus Surveillance Network (GRSN).

METHODS:

Between Jan 1, 2008, and Dec 31, 2016, children younger than 5 years of age who were admitted to hospital with acute gastroenteritis were prospectively enrolled in GRSN sites. We included sites that enrolled children and collected stool specimens monthly and tested at least 100 specimens annually in the impact analysis, with a separate analysis taking into account site continuity. We compared proportions of acute gastroenteritis cases positive for rotavirus in the pre-vaccine and post-vaccine periods and calculated mean proportion changes for WHO regions, with 95% CIs; these findings were then compared with interrupted time series analyses. We did further sensitivity analyses to account for rotavirus vaccination coverage levels and sites that collected specimens for at least 11 months per year and tested at least 80 specimens per year. We also analysed the age distribution of rotavirus-positive cases before and after vaccine introduction.

FINDINGS:

403 140 children younger than 5 years of age admitted to hospital with acute gastroenteritis from 349 sites in 82 countries were enrolled over the study period, of whom 132 736 (32·9%) were positive for rotavirus. We included 305 789 children from 198 sites in 69 countries in the impact analysis. In countries that had not introduced rotavirus vaccine in their national immunisation

programmes, rotavirus was detected in 38·0% (95% CI 4·8-73·4) of admissions for acute gastroenteritis annually whereas in those that have introduced the vaccine, rotavirus was detected in 23·0% (0·7-57·7) of admissions for acute gastroenteritis, showing a 39·6% (35·4-43·8) relative decline following introduction. Interrupted time series analyses confirmed these findings. Reductions by WHO regions ranged from 26·4% (15·0-37·8) in the Eastern Mediterranean Region to 55·2% (43·0-67·4) in the European Region and were sustained in nine countries (contributing up to 31 sites) for 6-10 years. The age distribution of children with rotavirus gastroenteritis shifted towards older children after rotavirus vaccine introduction.

INTERPRETATION:

A significant and sustained reduction in the proportion of hospital admissions for acute gastroenteritis due to rotavirus was seen among children younger than 5 years in GRSN sites following rotavirus vaccine introduction. These findings highlight the need to incorporate rotavirus vaccines into immunisation programmes in countries that have not yet introduced them and underline the importance of high-quality surveillance.

WEB: 10.1016/S2214-109X(19)30207-4
IMPACT FACTOR: 18.705
CITED HALF-LIFE: 1.00

START COMMENTARY

Aliabadi et al. described three rotavirus vaccine analyses—a descriptive analysis, an impact analysis, and an age distribution analysis—using primary surveillance data spanning from 2008 to 2016 from the Global Rotavirus Surveillance Network (GRSN). Authors standardized data to year of vaccine introduction, counting years before and after time 0 (year of vaccine introduction), and included the year of introduction in the pre-vaccine period. For these analyses, authors found reductions in laboratory-confirmed rotavirus hospitalizations (Figures 4 and 5) and shifts in rotavirus-positive gastroenteritis to older age groups (Figure 6) since the introduction of the rotavirus vaccine. Interestingly, Aliabadi et al. noted smaller vaccine impact among Gavi-eligible countries compared to Gavi-ineligible countries and posited that differences in vaccine efficacy and effectiveness by country income status as a possible explanation for this observation. Authors highlighted four main limitations to the study. The same sites and countries were not included in the pre- and post-vaccine periods due to sites falling in and out of eligibility year to year, but an analysis examining countries with pre- and post-vaccine data found similar results. The ecological design of this study prevented authors to determine vaccination status of individual children which could result in misclassification of exposure, but would underestimate of the impact of vaccine. Not all sites in the GRSN were included in the analysis because they did not meet eligibility criteria. Mortality were not assessed due to few deaths reported to GRSN sites. Despite these limitations, Aliabadi et al. presented

compelling evidence for the impact of rotavirus vaccine and showcased the value of robust surveillance system to allow for such an investigation.

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2. Implementation of the World's largest measles-rubella mass vaccination campaign in Bangladesh: a process evaluation

Sarma H, Budden A, Luies SK, Lim SS, Shamsuzzaman M, Sultana T, et al.

ABSTRACT

BACKGROUND:

Gavi, the Vaccine Alliance, supported a mass vaccination Measles-Rubella Campaign (MRC) in Bangladesh during January-February 2014.

METHODS:

We conducted a mixed-method process evaluation to understand the successes and challenges in implementation of the MRC. We reviewed documents for the MRC and the immunization programme in Bangladesh; observed meetings, vaccination sessions, and health facilities; and conducted 58 key informant interviews, 574 exit interviews with caregivers and 156 brief surveys with stakeholders involved in immunization. Our theory of Change for vaccination delivery guided our assessment of ideal implementation milestones and indicators to compare with the actual implementation processes.

RESULTS:

We identified challenges relating to country-wide political unrest, administrative and budgetary delays, shortage of transportation, problems in registration of target populations, and fears about safety of the vaccine. Despite these issues, a number of elements contributed to the successful launch of the MRC. These included: the comprehensive design of the campaign; strong partnerships between immunization authorities in the government system, Alliance partners, and civil society actors; and motivated and skilled health workers at different levels of the health system.

CONCLUSIONS:

The successful implementation of the MRC in spite of numerous contextual and operational challenges demonstrated the adaptive capacity of the national immunization programme and its partners that has positive implications for future introductions of Gavi-supported vaccines.

WEB: 10.1186/s12889-019-7176-4
IMPACT FACTOR: 2.420
CITED HALF-LIFE: 3.90

START COMMENTARY

Sarma et al. conducted a process evaluation of the implementation of the Measles-Rubella Campaign (MRC) using a cross-sectional, mixed-methods design. Areas included in the evaluation were selected based on high and low performance on EPI coverage. Authors found the ability to adapt to challenges at all levels contributed to the success of the MRC. Delays in funding were met with efforts to quickly resolve issues and expedite funding allocation. Communities were able to maintain cold chain during periods of political unrest. Authors also highlighted the vital reliance on volunteers to implement the MRC. Interestingly, Sarma et al. reported an average of 175 children vaccinated to 7 vaccinators (about 25 children per vaccinator) in Rajshahi (high-performing division) and an average of 242 children vaccinated to 4 vaccinators (about 58 children per vaccinator) in Sylhet (low-performing division). It is unclear whether these differences reflect examples of efficiency or evidence of unstainable, under-resourced, and over-worked settings or both. A limitation of the study is that the results may not be representative outside the sampled population, given the deliberate selection of the study population. However, authors demonstrated the ability to achieve high coverage of measles-rubella vaccination in these divisions and reported findings that inspire further study to better understand the implementation of MRC.

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3. [Coverage and factors associated with full immunisation among children aged 12-59 months in Bangladesh: insights from the nationwide cross-sectional demographic and health survey](#)

Sarker AR, Akram R, Ali N, Sultana M.

ABSTRACT

OBJECTIVE:

To estimate the coverage and factors associated with full immunisation coverage among children aged 12-59 months in Bangladesh.

STUDY DESIGN:

The study is cross sectional in design. Secondary dataset from Bangladesh Demographic and Health Survey was used for this analysis. Immunisation status was categorised as 'fully immunised' if the children had received all the eight recommended vaccine doses otherwise 'partially/unimmunised'.

SETTINGS:

Bangladesh.

PARTICIPANT:

Children aged 12-59 months were the study participants. Participants were randomly selected through a two-stage stratified sampling design. A total of 6230 children were eligible for the analysis.

RESULTS:

About 86% of the children (5356 out of 6230) were fully immunised. BCG has the highest coverage rate (97.1%) followed by oral polio vaccine 1 (97%) and pentavalent 1 (96.6%), where the coverage rate was the lowest for measles vaccine (88%). Coverage was higher in urban areas (88.5%) when compared with rural ones (85.1%). Full immunisation coverage was significantly higher among children who lived in the Rangpur division (adjusted OR (AOR)=3.46; 95% CI 2.45 to 4.88, p<0.001), were 48-59 months old (AOR=1.32; 95% CI 1.06 to 1.64, p=0.013), lived in a medium size family (AOR=1.56; 95% CI 1.32 to 1.86, p<0.001), had parents with a higher level of education (AOR=1.96; 95% CI 1.21 to 3.17, p=0.006 and AOR=1.55; 95% CI 1.05 to 2.29, p=0.026) and belonged to the richest families (AOR=2.2; 95% CI 1.5 to 3.21, p<0.001). The likelihood of being partially or unimmunised was higher among children who had the father as their sole healthcare decision-maker (AOR=0.69; 95% CI 0.51 to 0.92, p<0.012).

CONCLUSIONS:

There were significant variations of child immunisation coverage across socioeconomic and demographic factors. These findings will inform innovative approaches for immunisation programmes, and the introduction of relevant policies, including regular monitoring and evaluation of immunisation coverage-particularly for low-performing regions, so that the broader benefit of immunisation programmes can be achieved in all strata of the society.

START COMMENTARY

Sarker et al. graphically represented vaccination coverage by antigen in Figure 1, showing that antigens required later in life have lower coverage than those required earlier in life (also reflected in Figure 2). Limitations to this study include the potential for recall bias from mother's report of vaccination status when immunization cards were not available. Variables selected for analysis were based on previous studies; it was possible important variables were not captured in this cross-sectional, secondary data analysis. However, the Demographic and Health Survey is a nationally representative survey and authors were able to identify potential areas to inform future intervention.

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4. [The impact of maternal health care utilisation on routine immunisation coverage of children in Nigeria: a cross-sectional study](#)

Anichukwu OI, Asamoah BO.

ABSTRACT

OBJECTIVE:

To examine the impact of maternal healthcare (MHC) utilisation on routine immunisation coverage of children in Nigeria.

DESIGN:

Individual level cross-sectional study using bivariate and multivariable logistic regression analyses to examine the association between MHC utilisation and routine immunisation coverage of children.

SETTING:

Nigeria Demographic and Health Survey 2013.

PARTICIPANTS:

5506 women aged 15-49 years with children aged 12-23 months born in the 5 years preceding the survey.

PRIMARY OUTCOME MEASURES:

Fully immunised children and not fully immunised children.

RESULTS:

The percentage of children fully immunised with basic routine childhood vaccines by the age of 12 months was 25.8%. Antenatal care (ANC) attendance irrespective of the number of visits (adjusted OR (AOR)1-3 visits 2.4, 95% CI 1.79 to 3.27; AOR4-7 visits 3.2, 95% CI 2.52 to 4.13; AOR≥ 8 visits 3.5, 95% CI 2.64 to 4.50), skilled birth attendance (SBA) (AOR 1.9, 95% CI 1.65 to 2.35); and maternal postnatal care (PNC) (AOR 1.7, 95% CI 1.46 to 2.06) had positive effects on the child being fully immunised after adjusting for covariates (except for each other, ie, ANC, SBA and PNC). Further analyses (adjusting stepwise for each MHC service) showed a mediation effect that led to the effect of PNC not being significant.

CONCLUSIONS:

The percentage of fully immunised children in Nigeria was very low. ANC attendance, SBA and maternal PNC attendance had positive impact on the child being fully immunised. The findings suggest that strategies aimed at maximising MHC utilisation in Nigeria could be effective in achieving the national coverage target of at least 80% for routine immunisation of children.

START COMMENTARY

Anichukwu and Asamoah used the 2013 Nigeria Demographic and Health Survey to conduct their analysis. Authors found antenatal care attendance was associated with full immunization (Table 3). Limitations of this study include the potential for interviewer bias and recall bias of vaccination status, residual confounding, and other factors, such as vaccine stockouts, could influence the association between maternal healthcare utilization and vaccination coverage.

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5. Assessing the quality and accuracy of national immunization program reported target population estimates from 2000 to 2016

Stashko LA, Gacic-Dobo M, Dumolard LB, Danovaro-Holliday MC

ABSTRACT

BACKGROUND:

A common means of vaccination coverage measurement is the administrative method, done by dividing the aggregated number of doses administered over a set period (numerator) by the target population (denominator). To assess the quality of national target populations, we defined nine potential denominator data inconsistencies or flags that would warrant further exploration and examination of data reported by Member States to the World Health Organization (WHO) and UNICEF between 2000 and 2016.

METHODS AND FINDINGS:

We used the denominator reported to calculate national coverage for BCG, a tuberculosis vaccine, and for the third dose of diphtheria-tetanus-pertussis-containing (DTP3) vaccines, usually live births (LB) and surviving infants (SI), respectively. Out of 2,565 possible reporting events (data points for countries using administrative coverage with the vaccine in the schedule and year) for BCG and 2,939 possible reporting events for DTP3, 194 and 274 reporting events were missing, respectively. Reported coverage exceeding 100% was seen in 11% of all reporting events for BCG and in 6% for DTP3. Of all year-to-year percent differences in reported denominators, 12% and 11% exceeded 10% for reported LB and SI, respectively. The implied infant mortality rate, based on the country's reported LB and SI, would be negative in 9% of all reporting events i.e., the country reported more SI than LB for the same year. Overall, reported LB and SI tended to be lower than the UN Population Division 2017 estimates, which would lead to overestimation of coverage, but this difference seems to be decreasing over time. Other inconsistencies were identified using the nine proposed criteria.

CONCLUSIONS:

Applying a set of criteria to assess reported target populations used to estimate administrative vaccination coverage can flag potential quality issues related to the national denominators and may be useful to help monitor ongoing efforts to improve the quality of vaccination coverage estimates.

START COMMENTARY

Vaccination coverage estimates are vital to the planning and implementation of vaccination programs, but administrative vaccination coverage estimates, a widely used method for estimating vaccination coverage, can be inaccurate. The criteria Stashko et al. used to assess national target population estimates (i.e., the denominator of vaccine coverage estimates) were based on the World Health Organization (WHO) working draft of the manual "Assessing and Improving the Accuracy of Target Population Estimates for Immunization Coverage" and the nine indicators or flags were outlined in the Methods section. Stashko et al. summarized the countries with four or more denominator flags in Table 2, bolding countries that appear more than once during the four years of assessment (2001, 2006, 2011, 2016). It is important to note that flags indicate further inquiry is needed, rather than true inaccuracy of estimates. As authors have noted, true number of live births (LB) and surviving infants (SI) are unknown; the United Nations Population Division estimates (UNPD) were considered the "gold standard," but could be less accurate than reported LB and SI. Additionally, a country's population size impacted the likelihood of being flagged (e.g., smaller LB and SI are prone to larger percent differences) and it was possible that some reporting events that should have been excluded based on the exclusion criteria were included in the analysis, limitations of the study. The authors suggested using data triangulation to ensure more accurate estimates of vaccination coverage. In sum, Stashko et al. presented a valuable analysis that provides countries with an analytic framework to investigate potential data inconsistencies and inaccuracies in vaccine target population estimates. Using this framework can help minimize potential negative outcomes resulting from using inaccurate vaccine coverage estimates and improve future planning and implementation of vaccination programs as countries strive to meet the Decade of Vaccines goals.

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6. Potential use of microarray patches for vaccine delivery in low- and middle- income countries

Peyraud N, Zehrung D, Jarrahian C, Frivold C, Orubu T, Giersing B.

ABSTRACT

Microarray patches (MAPs), also referred to as microneedle patches, are a novel methodology that have the potential to overcome barriers to vaccine delivery in low- and middle-income countries (LMICs), and transform the way that vaccines are delivered within immunization programs. The World Health Organization's Initiative for Vaccine Research and its partners are working to understand how MAPs could ease vaccine delivery and increase equitable access to vaccines in LMICs. Global stakeholders have been engaged to evaluate technical, economic, and programmatic challenges; to validate assumptions where possible; and to propose areas of focus to facilitate future vaccine-MAP product development. This report summarizes those learnings.

WEB: 10.1016/j.vaccine.2019.03.035
IMPACT FACTOR: 3.285
CITED HALF-LIFE: 5.50

START COMMENTARY

Peyraud et al. presented considerations for an exciting technology with potential to overcome common vaccine delivery barriers in low- and middle-income countries. For a brief description of the solid coated and dissolving microarray patch (MAP), refer to Figure 1. Table 1 summarizes the development status of MAP vaccines by antigen, with seasonal influenza most advanced in the clinical phase. Inactivated polio vaccine and measles-rubella vaccine are the furthest in preclinical development. Table 2 summarizes how MAP could overcome challenge sin current vaccine delivery. Authors emphasized the need to create and articulate a strong value proposition to ensure investment in the development of this novel technology. The Vaccine Innovation Prioritization Strategy (VIPS) is an initiative created by the World Health Organization, Gavi, the Bill & Melinda Gates Foundation, PATH, and the United Nations Children's Fund to prioritize innovative technologies, such as MAPs, to improve equity in vaccine delivery.

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7. [A multilevel analysis of the determinants of missed opportunities for vaccination among children attending primary healthcare facilities in Kano, Nigeria: Findings from the pre-implementation phase of a collaborative quality improvement programme](#)

Adamu AA, Uthman OA, Gadanya MA, Adetokunboh OO, Wiysonge CS.

ABSTRACT

BACKGROUND:

We aimed to determine the factors that are responsible for missed opportunities for vaccination (MOV) among children aged 0-23 months attending primary health care (PHC) facilities in Nassarawa, Kano State, Nigeria.

METHODS:

This cross-sectional study was conducted in the pre-implementation phase of a quality improvement programme. One-stage cluster sampling technique was employed. Data were collected from caregivers of children aged 0-23 months in ten randomly selected PHC facilities in Nassarawa Local Government Area of Kano State. Semi-structured, interviewer administered questionnaires were used. Frequencies and percentages were used to summarize the data. Multilevel logistic regression model with fixed effect and random effect component was fitted to obtain measures of association and variation respectively.

RESULTS:

Caregivers of 675 children responded. Among these children, the prevalence of MOV (for at least one antigen) was 36.15%. MOV (for individual antigens) was highest for inactivated polio vaccine followed by measles vaccine. The random effect model yielded an intraclass correlation coefficient of 9.60% for the empty model. The fixed effect model revealed that MOV was more likely among children that were accompanying a caregiver to the health facility (OR = 2.86, 95%CrI: 1.28 to 5.80) compared to those that were visiting the health facility for medical consultation. Failure to receive vaccination on the day of health facility visit (OR = 2.32, 95%CrI: 1.12 to 4.12) and visiting a clinic with three or more vaccinators (OR = 12.91, 95%CrI: 4.82 to 27.14) increased the likelihood of MOV.

CONCLUSION:

The study identified important local factors that are responsible for MOV which can be addressed in the QI programme.

START COMMENTARY

Adamu et al. accounted for the random effects of healthcare facility on missed opportunities for vaccination (MOV) as demonstrated in Table 5. Limitations of the study include the cross-sectional nature limits causal inference and the potential for social desirability bias among exit interviewees. Strengths of this study were the consideration of clustering by including random effects into their model and assessing vaccination status by home-based records (yielding more accurate data compared to maternal recall, though results may not be applicable to populations without home-based records). With a MOV prevalence of 36.15%, Adamu et al. demonstrated a potential area of intervention. Based on these results, the authors outlined possible implications to improve programming, policy, and research, including expanding vaccination services, exploring policy for vaccination in the second year in life, and conducting further study using the Evidence Population Intervention Comparison Outing (EPICOT+) framework.

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8. [Opportunities to improve vaccination coverage in a country with a fledgling health system: Findings from an assessment of missed opportunities for vaccination among health center attendees-Timor Leste, 2016](#)

Li AJ, Peiris TSR, Sanderson C, Lochlainn LN, Mausiry M, da Silva RBJBM, et al.

ABSTRACT

INTRODUCTION:

Since its independence in 2002, Timor Leste has made significant strides in improving childhood vaccination coverage. However, coverage is still below national targets, and children continue to have missed opportunities for vaccination (MOV), when eligible children have contact with the health system but are not vaccinated. Timor Leste implemented the updated World Health Organization methodology for assessing MOV in 2016.

METHODS:

The MOV data collection included quantitative (caregiver exit interviews and health worker knowledge, attitudes, practices surveys (KAP)) and qualitative arms (focus group discussions (FGDs) with caregivers and health workers and in-depth interviews (IDIs) with health administrators). During a four-day period, health workers and caregivers with children <24 months of age attending the selected eight facilities in Dili Municipality were invited to participate. The researchers calculated the proportion of MOV and timeliness of vaccine doses among children with documented vaccination histories (i.e., from a home-based record or facility register) and thematically analyzed the qualitative data.

RESULTS:

Researchers conducted 365 caregiver exit interviews, 169 health worker KAP surveys, 4 FGDs with caregivers, 2 FGDs with health workers, and 2 IDIs with health administrators. Among eligible children with documented vaccination histories (n = 199), 41% missed an opportunity for vaccination. One-third of health workers (33%) believed their knowledge of immunization practices to be insufficient. Qualitative results showed vaccines were not available at all selected health facilities, and some facilities reported problems with their cold chain equipment.

CONCLUSION:

This study demonstrates that many children in Timor Leste miss opportunities for vaccination during health service encounters. Potential interventions to reduce MOV include training of health workers,

improving availability of vaccines at more health facilities, and replacing unusable cold chain equipment. Timor Leste should continue to scale up successful MOV interventions beyond Dili Municipality to improve vaccination coverage nationally and strengthen the health system overall.

START COMMENTARY

Using the World Health Organization (WHO) *Planning Guide to Reduce Missed Opportunities for Vaccination (MOV)* and *Methodology for the Assessment of Missed Opportunities for Vaccination*, Li et al. conducted a study of missed opportunities for vaccination in the Dili Municipality of Timor Leste. Li et al. created an eligibility tree to identify children eligible for vaccines (see Figure 1) and additionally document whether an opportunity to vaccine was missed. A summary of results were presented in Table 3. Authors also assessed timeliness of vaccines administered in Table 4. Study limitations include sub-optimal survey design (e.g., responses choices were unclear, only single-response was available where multiple-responses may be more appropriate, etc.), potential for social desirability bias, and the exclusion of children without vaccination documentation to ensure accurate vaccination status data may result in an underestimation of MOV. Based on study results, authors reported potential areas of intervention, including additional trainings of healthcare workers, including MOV in checklists, and expansion of clinic hours.

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9. [Providing mothers with mobile phone message reminders increases childhood immunization and vitamin A supplementation coverage in Côte d'Ivoire: A randomized controlled trial](#)

Dissieka R, Soohoo M, Janmohamed A, Doledec D.

ABSTRACT

We conducted a randomized controlled trial to assess the effect of providing mothers with mobile voice or text (SMS) reminder messages on health facility attendance at five infant immunization and vitamin A supplementation (VAS) visits. The study was conducted at 29 health facilities in Korhogo district. Mothers were randomized to receive a voice or text reminder message two days prior to each scheduled visit and two additional reminders for missed doses (n=798; intervention group), or no phone reminder messages (n=798; control group). Infants in the intervention group were 2.85 (95% CI: 1.85-4.37), 2.80 (95% CI: 1.88-4.17), 2.68 (95% CI: 1.84-3.91), and 4.52 (95% CI: 2.84-7.20) times more likely to receive pentavalent 1-3 and MMR/yellow fever doses, respectively, and 5.67 (95% CI: 3.48-9.23) times more likely to receive VAS, as compared to the control group. In the reminder group, 58.3% of infants completed all five visits, compared to 35.7% in the control group (P<0.001). Providing mothers mobile phone message reminders is a potentially effective strategy for improving immunization and VAS coverage in Cote d'Ivoire.

START COMMENTARY

This study followed a pilot study conducted in Korhogo district that only used short message service (SMS) and found no impact of mobile phone reminders on improving facility attendance. In this study, mothers or caregivers in the intervention group were given a choice of SMS or voice reminder messages. The majority of mothers opted for voice messages (84.6%, n=675), perhaps due to comfort of oral communication over test messaging or illiteracy issues according to the Dissieka et al. While participants were randomized to intervention and control groups based on rural, semi-urban, urban settings of the health facilities, it was unclear whether balance was achieved at the health facility-level. This could have study bias implications as 19 of the 29 health facilities

participated in a pilot study, which could have primed mothers and caregivers to the importance of vaccination and vitamin A supplementation (VAS). Other limitations to the study include potential selection bias in sampling mothers visiting health facilities for their child's Bacille Calmette-Guérin vaccination; these mothers may have different health-seeking behaviors compared to mothers not sampled. Furthermore, results may not be generalizable among populations with no access to mobile phones and service. Dissieka et al. highlighted various challenges to successful vaccination and VAS visits, but showed a promising intervention to improve health visit attendance. Further investigation into exploring visual image reminders, understanding reasons for non-attendance despite reminders, and assessing the population impact of scaling up the intervention are worthwhile.

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10. [Towards a further understanding of measles vaccine hesitancy in Khartoum state, Sudan: A qualitative study](#)

Sabahelzain MM, Moukhyer M, Dubé E, Hardan A, van den Borne B, Bosma H.

ABSTRACT

BACKGROUND:

Vaccine hesitancy is one of the contributors to low vaccination coverage in both developed and developing countries. Sudan is one of the countries that suffers from low measles vaccine coverage and from measles outbreaks. In order to facilitate the future development of interventions, this study aimed at exploring the opinions of Expanded Program on Immunization officers at ministries of health, WHO, UNICEF and vaccine care providers at Khartoum-based primary healthcare centers.

METHODS:

Qualitative data were collected using semi-structured interviews during the period January-March 2018. Data (i.e. quotes) were matched to the categories and the sub-categories of a framework that was developed by the WHO-SAGE Working Group called "Determinants of Vaccine Hesitancy Matrix".

FINDINGS:

The interviews were conducted with 14 participants. The majority of participants confirmed the existence of measles vaccine hesitancy in Khartoum state. They further identified various determinants that were grouped into three domains including contextual, groups and vaccination influences. The main contextual determinant as reported is the presence of people who can be qualified as "anti-vaccination". They mostly belong to particular religious and ethnic groups. Parents' beliefs about prevention and treatment from measles are the main determinants of the group influences. Attitude of the vaccine providers, measles vaccine schedule and its mode of delivery were the main vaccine related determinants.

CONCLUSION:

Measles vaccine hesitancy in Sudan appears complex and highly specific to local circumstances. To better understand the magnitude and the context-specific causes of measles vaccine hesitancy and to develop adapted strategies to address them, there is clearly a further need to investigate measles vaccine hesitancy among parents.

WEB: [10.1371/journal.pone.0213882](#)
IMPACT FACTOR: 2.766

CITED HALF-LIFE: 2.70

START COMMENTARY

Sabahelzain et al. conducted a cross-sectional, qualitative study via semi-structured interviews to assess measles vaccine hesitancy in Sudan. The authors used the World Health Organization-Strategic Advisory Group of Experts (WHO-SAGE) "Determinants of Vaccine Hesitancy Matrix" framework. Table 1 summarizes the 14 interview participants. Sabahelzain et al. provided a nuanced discussion about specific religious groups, specifically Ansar Al-Sunna, that were associated with "anti-vaccination"; however, authors noted that members of religious groups were not well-defined and so further study is needed to determine a population of interest for future intervention. Interview participants also discussed forms of passive vaccine hesitancy arising from being turned away because of open vial policies or forgetting to return for vaccine doses at 9 and 18 months of age. This study was limited in the small, convenient sampling of interview participants. While this study revealed complex opinions on vaccine hesitancy, further study, especially among parents and guardians of children, is warranted.

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Appendix

The literature search for the August 2019 Vaccine Delivery Research Digest was conducted on July 17, 2019. We searched English language articles indexed by the US National Library of Medicine and published between June 15, 2019 and July 14, 2019. The search resulted in 235 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]) ("2019/06/15"[PDAT] : "2019/07/14"[PDAT]))