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VACCINE DELIVERY RESEARCH DIGEST

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

REPORT TO THE BILL & MELINDA GATES FOUNDATION

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1. INTEGRATING NEGLECTED TROPICAL DISEASE AND IMMUNIZATION PROGRAMS: THE EXPERIENCES OF THE TANZANIAN MINISTRY OF HEALTH.

Mwingira U, Means AR, Chikawe M, Kilembe B, Lyimo D, et al.

Am J Trop Med Hyg. 2016 May 31. [Epub ahead of print]

PMID: 27246449

ABSTRACT

Global health practitioners are increasingly advocating for the integration of community-based health-care platforms as a strategy for increasing the coverage of programs, encouraging program efficiency, and promoting universal health-care goals. To leverage the strengths of compatible programs and avoid geographic and temporal duplications in efforts, the Tanzanian Ministry of Health and Social Welfare coordinated immunization and neglected tropical disease programs for the first time in 2014. Specifically, a measles and rubella supplementary vaccine campaign, mass drug administration (MDA) of ivermectin and albendazole, and Vitamin A were provisionally integrated into a shared community-based delivery platform. Over 21 million people were targeted by the integrated campaign, with the immunization program and MDA program reaching 97% and 93% of targeted individuals, respectively. The purpose of this short report is to share the Tanzanian experience of launching and managing this integrated campaign with key stakeholders.

WEB: http://dx.doi.org/10.4269/ajtmh.15-0724

IMPACT FACTOR: 2.70

CITED HALF-LIFE: 9.80

UW EDITORIAL COMMENT: The following activities were coordinated between vaccination and MDA programs: "planning exercises, community sensitization and media campaigns, co-distribution of drugs and vaccines, and monitoring and evaluation." Mobile and stationary health posts, supervised by council members, were established to distribute both drugs and deliver vaccines, which were staffed by integrated teams of drug distributors, community health workers delivering vaccines and recording data, and a community mobilizer.

Authors attribute the improvements in coverage observed with integrated campaigns, compared with previous vertical campaigns, to less time being required of community members to deliver the integrated service activities, health workers perceiving that incentives were associated with a single event, and the linking of MDA with immunizations, which already had high demand in the communities. Authors caution that costs may be higher with the integrated campaign than vertical campaigns. Whereas the budgeted cost of implementing the programs separately in prior years was about $6 million USD, the cost of the integrated program was just over $7 million USD, although some of the expenditures in the integrated program were "start-up costs," which may be eliminated in future years.

2. COVERAGE MODELS TO DETERMINE OUTREACH VACCINATION CENTER LOCATIONS IN LOW AND MIDDLE INCOME COUNTRIES.

Lim J, Claypool E, Norman BA, Rajgopal J.

Oper Res Health Care. 2016 Jun;9:40-48.

PMID: 27335770

ABSTRACT

The Expanded Programme on Immunization (EPI) was established in 1974 to ensure that children all around the world benefit from life-saving vaccines. However, in many low and middle income countries, it is extremely difficult to vaccinate the entire population with the standard regimen of vaccines. One important reason for this is geographically dispersed or nomadic populations. To improve vaccination rates, these countries typically use outreach, where health workers take vaccines to remote locations. Outreach is the last, critical link in the vaccine supply chain, and the locations selected to offer outreach directly impact the number of additional children that can be vaccinated. This research presents four quantitative models that can be used to optimize the selection of outreach locations, in order to maximize the number of residents that can be reached; each model addresses a different type of coverage possibility. The models are analyzed and contrasted using an example with inputs generated from a subset of data from the state of Bihar in India that was made available to the authors.

WEB: http://dx.doi.org/10.1016/j.orhc.2016.02.003

IMPACT FACTOR: 0.00

CITED HALF-LIFE: 0.00

UW EDITORIAL COMMENT: Authors describe and compare results using the following 4 models that represent different assumptions about vaccination coverage types provided by Immunization Health Centers (IHCs): 1) Binary coverage model, which assumes that those within a certain geographic distance from an IHC are covered and everyone else is not; 2) Variable single coverage model, which assumes that the fraction of the population covered follows a "stepwise" pattern based on geographic distance from the IHC; 3) Variable multiple coverage model, which assumes the coverage fraction follows a stepwise pattern based on geographic distance from IHC, but also that those outside close proximity to an IHC may choose among multiple different IHCs for immunization; and 4) Multiple IHC model, which assumes geographic districts may have multiple IHCs, among which residents of the district choose to visit.

Figure 4 is an example of the different results (outreach locations chosen by the model to maximize coverage), from models for coverage assumption model types 1-3. Figure 5 is a depiction of the results (outreach location for maximization) using coverage assumption model type 4. Authors note that there are "diminishing return(s)" in terms of numbers of people/proportion of the population covered by increasing the number of outreach centers associated with one specific IHC.

3. THE IMPACT OF IMPLEMENTING A DEMAND FORECASTING SYSTEM INTO A LOW-INCOME COUNTRY'S SUPPLY CHAIN.

Mueller LE, Haidari LA, Wateska AR, Phillips RJ, Schmitz MM, et al.

Vaccine. 2016 May 21. [Epub ahead of print]

PMID: 27219341

ABSTRACT

Objective: To evaluate the potential impact and value of applications (e.g. adjusting ordering levels, storage capacity, transportation capacity, distribution frequency) of data from demand forecasting systems implemented in a lower-income country's vaccine supply chain with different levels of population change to urban areas.

Materials and Methods: Using our software, HERMES, we generated a detailed discrete event simulation model of Niger's entire vaccine supply chain, including every refrigerator, freezer, transport, personnel, vaccine, cost, and location. We represented the introduction of a demand forecasting system to adjust vaccine ordering that could be implemented with increasing delivery frequencies and/or additions of cold chain equipment (storage and/or transportation) across the supply chain during varying degrees of population movement.

Results: Implementing demand forecasting system with increased storage and transport frequency increased the number of successfully administered vaccine doses and lowered the logistics cost per dose up to 34%. Implementing demand forecasting system without storage/transport increases actually decreased vaccine availability in certain circumstances.

Discussion: The potential maximum gains of a demand forecasting system may only be realized if the system is implemented to both augment the supply chain cold storage and transportation. Implementation may have some impact but, in certain circumstances, may hurt delivery. Therefore, implementation of demand forecasting systems with additional storage and transport may be the better approach. Significant decreases in the logistics cost per dose with more administered vaccines support investment in these forecasting systems.

Conclusion: Demand forecasting systems have the potential to greatly improve vaccine demand fulfilment, and decrease logistics cost/dose when implemented with storage and transportation increases. Simulation modeling can demonstrate the potential health and economic benefits of supply chain improvements.

WEB: http://dx.doi.org/10.1016/j.vaccine.2016.05.027

IMPACT FACTOR: 3.62

CITED HALF-LIFE: 5.50

UW EDITORIAL COMMENT: Authors estimate how using demand forecasting and specific "add-ons," or additional information and adjustments to the supply chain, influence outcomes, based on adjusting the ordering quantities of vaccines, adjusting storage capacity, transportation capacity, transportation frequency, or a combination, versus using census estimates alone to determine ordering quantities. They estimate doses missed, availability, and logistics costs of the forecasting system to assess which components/data "add-ons" provide the most additional value and availability under assumptions 10%, 30%, or 50% "redistribution" of the target population from rural to urban districts served by Immunization Health Centers.

Demand forecasting provided the most value when used to adjust ordering quantities, increase storage capacity and increase transportation frequencies, which resulted in greater than 99% vaccine availability and a 34% decrease in costs. Compared with baseline, availability increased from 69% to 100% when demand forecasting was implemented to increase storage and transportation frequency, assuming no relocation to urban centers. Under the assumption of 50% "relocation", availability increased from 59% to 100% with demand forecasting system and increases in storage and transport frequency as needed. Authors concluded that if only a single adjustment to the supply chain could be made with demand forecasting, increasing transportation frequency resulted in the highest vaccine availabilities with the lowest cost. Authors explain that the decreased availability of vaccines in scenarios with introduction of a forecasting system used only to adjust ordering without changing storage or transport, compared to systems where forecasting wasn't used to adjust ordering, was due to constraints in the system in transport and storage that caused "bottlenecks" in the system.

4. IMPLEMENTATION OF COORDINATED GLOBAL SEROTYPE 2 ORAL POLIOVIRUS VACCINE CESSATION: RISKS OF POTENTIAL NON-SYNCHRONOUS CESSATION.

Duintjer Tebbens RJ, Hampton LM, Thompson KM.

BMC Infect Dis. 2016 May 26;16(1):231.

PMID: 27230071

ABSTRACT

Background: The endgame for polio eradication involves coordinated global cessation of oral poliovirus vaccine (OPV) with cessation of serotype 2 OPV (OPV2 cessation) implemented in late April and early May 2016 and cessation of serotypes 1 and 3 OPV (OPV13 cessation) currently planned for after 2018. The logistics associated with globally switching all use of trivalent OPV (tOPV) to bivalent OPV (bOPV) represent a significant undertaking, which may cause some complications, including delays that lead to different timing of the switch across shared borders.

Methods: Building on an integrated global model for long-term poliovirus risk management, we consider the expected vulnerability of different populations to transmission of OPV2-related polioviruses as a function of time following the switch. We explore the relationship between the net reproduction number (Rn) of OPV2 at the time of the switch and the time until OPV2-related viruses imported from countries still using OPV2 can establish transmission. We also analyze some specific situations modeled after populations at high potential risk of circulating serotype 2 vaccine-derived poliovirus (cVDPV2) outbreaks in the event of a non-synchronous switch.

Results: Well-implemented tOPV immunization activities prior to the tOPV to bOPV switch (i.e., tOPV intensification sufficient to prevent the creation of indigenous cVDPV2 outbreaks) lead to sufficient population immunity to transmission to cause die-out of any imported OPV2-related viruses for over 6 months after the switch in all populations in the global model. Higher R_n of OPV2 at the time of the switch reduces the time until imported OPV2-related viruses can establish transmission and increases the time during which indigenous OPV2-related viruses circulate. Modeling specific connected populations suggests a relatively low vulnerability to importations of OPV2-related viruses that could establish transmission in the context of a non-synchronous switch from tOPV to bOPV, unless the gap between switch times becomes very long (>6 months) or a high risk of indigenous cVDPV2s already exists in the importing and/or the exporting population.

Conclusions: Short national discrepancies in the timing of the tOPV to bOPV switch will likely not significantly increase cVDPV2 risks due to the insurance provided by tOPV intensification efforts, although the goal to coordinate national switches within the globally agreed April 17-May 1, 2016 time window minimized the risks associated with cross-border importations.

WEB: http://dx.doi.org/10.1186/s12879-016-1536-9

IMPACT FACTOR: 2.61

CITED HALF-LIFE: 3.80

UW EDITORIAL COMMENT: Authors use the "mixing-adjusted net reproduction number", R_n, which takes into account the different immunity levels of individuals "mixed" together in a population, as a key indicator of vulnerability to circulating poliovirus strains. R_n is calculated as basic reproductive number (R_0) of a strain, multiplied by one minus proportion of the population effectively immune to transmission (EIPM), based on the mixing in the population of immunity states and ages.

Figure 1 shows the percentiles from the distribution of R_n values for subpopulations using only OPV as of 2013, in time since OPV2 cessation. Figure 2 shows results of the same analysis, but without tOPV intensification, and indicates that without intensification, time until OPV2-related virus establishes circulation is shorter. Figures 1 and 2 demonstrate that the extent to which cVDPV2 outbreak risk is associated with non-synchronous switch depends on how much time there is between national switch times. Figure 3 demonstrates that the higher the tOPV-induced population immunity to serotype 2 at the time of the switch, the longer until OPV2-related virus can establish circulation. Figure 4 shows examples of non-synchronous switch dynamics in "realistic settings" similar to India, northern Pakistan and Afghanistan, Ukraine (assuming IPV since 2005), and Ukraine (assuming no IPV until 2017).

5. THE MOBILE SOLUTIONS FOR IMMUNIZATION (M-SIMU) TRIAL: A PROTOCOL FOR A CLUSTER RANDOMIZED CONTROLLED TRIAL THAT ASSESSES THE IMPACT OF MOBILE PHONE DELIVERED REMINDERS AND TRAVEL SUBSIDIES TO IMPROVE CHILDHOOD IMMUNIZATION COVERAGE RATES AND TIMELINESS IN WESTERN KENYA.

Gibson DG, Kagucia EW, Ochieng B, Hariharan N, Obor D, et al.

JMIR Res Protoc. 2016 May 17;5(2):e72.

PMID: 27189422

ABSTRACT

Background: Text message (short message service, SMS) reminders and incentives are two demand-side interventions that have been shown to improve health care–seeking behaviors by targeting participant characteristics such as forgetfulness, lack of knowledge, and transport costs. Applying these interventions to routine pediatric immunizations may improve vaccination coverage and timeliness.

Objective: The Mobile Solutions for Immunization (M-SIMU) trial aims to determine if text message reminders, either with or without mobile phone–based incentives, sent to infant's parents can improve immunization coverage and timeliness of routine pediatric vaccines in rural western Kenya.

Methods: This is a four-arm, cluster, randomized controlled trial. Villages are randomized to one of four study arms prior to enrollment of participants. The study arms are: (1) no intervention (a general health-related text message will be texted to this group at the time of enrollment), (2) text message reminders only, (3) text message reminders and a 75 Kenyan Shilling (KES) incentive, or (4) text message reminders and a KES 200 incentive. Participants assigned to study arms 2-4 will receive two text message reminders; sent 3 days before and one day before the scheduled immunization visit at 6, 10, and 14 weeks for polio and pentavalent (containing diphtheria, tetanus, pertussis, hepatitis B, and Haemophilus influenza type b antigens) type b antigens) vaccines, and at 9 months for measles vaccine. Participants in incentive arms will, in addition to text message reminders as above, receive mobile phone–based incentives after each timely vaccination, where timely is defined as vaccination within 2 weeks of the scheduled date for each of the four routine expanded program immunization (EPI) vaccination visits. Mother-infant pairs will be followed to 12 months of age where the primary outcome, a fully immunized child, will be ascertained. A fully immunized child is defined as a child receiving vaccines for bacille Calmette-Guerin, three doses of pentavalent and polio, and measles by 12 months of age. General estimating equation (GEE) models that account for clustering will be employed for primary outcome analyses.

Results: Enrollment was completed in October 2014. Twelve month follow-up visits to ascertain immunization status from the maternal and child health booklet were completed in February 2016.

Conclusions: This is one of the first studies to examine the effect of text message reminders on immunization coverage and timeliness in a lower income country and is the first study to assess the effect of mobile money-based incentives to improve immunization coverage.

WEB: http://dx.doi.org/10.2196/resprot.5030

IMPACT FACTOR: 3.43

CITED HALF-LIFE: 3.80

UW EDITORIAL COMMENT: One unique feature is that inclusion criteria do not require the mother to have her own phone, but rather enrolled women with access to a shared phone, or provided one to those without access. This population is more broad than many previous mHealth studies, which will allow opportunity for estimating population-level impact. However, the effectiveness estimate should be considered in light of the fact that a phone was provided to the small proportion of people without access. Text messages included reminders about upcoming vaccination and incentives, if applicable, and motivational phrases developed via formative research. The study will evaluate the difference in the proportion of children fully immunized at 12 months, comparing each intervention arm with control. Secondary objectives will evaluate impact on vaccination timeliness, determine whether full vaccination depends on other factors, explore influence on other coverage or health outcomes, and assess cost effectiveness. Enrollment and data collection are complete, but results are not yet available.

6. PERCEPTIONS OF ORAL CHOLERA VACCINE AND REASONS FOR FULL, PARTIAL AND NON-ACCEPTANCE DURING A HUMANITARIAN CRISIS IN SOUTH SUDAN.

Peprah D, Palmer JJ, Rubin GJ, Abubakar A, Costa A, et al.

Vaccine. 2016 Jun 9. [Epub ahead of print]

PMID: 27265459

ABSTRACT

Oral cholera vaccination (OCV) campaigns were conducted from February to April 2014 among internally displaced persons (IDPs) in the midst of a humanitarian crisis in Juba, South Sudan. IDPs were predominantly members of the Nuer ethnic group who had taken refuge in United Nations bases following the eruption of violence in December 2013. The OCV campaigns, which were conducted by United Nations and non-governmental organizations (NGOs) at the request of the Ministry of Health, reached an estimated 85–96% of the target population. As no previous studies on OCV acceptance have been conducted in the context of an on-going humanitarian crisis, semi-structured interviews were completed with 49 IDPs in the months after the campaigns to better understand perceptions of cholera and reasons for full, partial or non-acceptance of the OCV. Heightened fears of disease and political danger contributed to camp residents' perception of cholera as a serious illness and increased trust in United Nations and NGOs providing the vaccine to IDPs. Reasons for partial and non-acceptance of the vaccination included lack of time and fear of side effects, similar to reasons found in OCV campaigns in non-crisis settings. In addition, distrust in national institutions in a context of fears of ethnic persecution was an important reason for hesitancy and refusal. Other reasons included fear of taking the vaccine alongside other medication or with alcohol. The findings highlight the importance of considering the target populations' perceptions of institutions in the delivery of OCV interventions in humanitarian contexts. They also suggest a need for better communication about the vaccine, its side effects and interactions with other substances.

WEB: http://dx.doi.org/10.1016/j.vaccine.2016.05.038

IMPACT FACTOR: 3.62

CITED HALF-LIFE: 5.50

UW EDITORIAL COMMENT: Of note, most perceptions/reported reasons for vaccinating, partially vaccinating or not vaccinating were similar to those often reported in similar populations not in conflict settings or who have not been displaced. However, being in a conflict settings influenced some of the common determinants, such that the way in which these factors operated was different, or the magnitude of their influence on vaccination perceptions was affected. Authors note that while in many contexts, institutional mistrust is a key reason for vaccine hesitancy, in this context, trust in some institutions such as NGOs and the UN was a facilitator of vaccine acceptance, while mistrust in other institutions, such as the government, was a reason for hesitancy. Factors associated with hesitancy/barriers in settings without conflict/displacement, such as alcohol abuse, can be influenced by conflict/displacement. For instance, in general, experiencing conflict and displacement can influence alcohol use and abuse, as a coping mechanism for trauma and upheaval, and because substance use can be a strategy for passing time when regular income-generation or daily living activities are limited. And in this setting, heavy alcohol use was cited as a factor that influenced vaccine hesitancy.

7. THE EFFECT OF MASS VACCINATION CAMPAIGNS AGAINST POLIO ON THE UTILIZATION OF ROUTINE IMMUNIZATION SERVICES: A REGRESSION DISCONTINUITY DESIGN.

Helleringer S, Asuming PO, Abdelwahab J.

Vaccine. 2016 Jun 14. [Epub ahead of print]

PMID: 27269060

ABSTRACT

Background: In most low and middle-income countries (LMIC), vaccines are primarily distributed by routine immunization services (RI) at health facilities. Additional opportunities for vaccination are also provided through mass vaccination campaigns, conducted periodically as part of disease-specific initiatives. It is unclear whether these campaigns are detrimental to RI services, or whether they may stimulate

the utilization of RI.

Methods: Unobserved confounders and reverse causality have limited existing evaluations of the effects of mass vaccination campaigns on RI services. We explored the use of a regression discontinuity design (RDD) to measure these effects more precisely. This is a quasi-experimental method, which exploits random variations in birth dates to identify the causal effects of vaccination campaigns. We applied RDD to survey data on a nationwide vaccination campaign against Polio conducted in Bangladesh.

Results: We compared systematically the children born immediately before vs. after the vaccination campaign. These two groups had similar background characteristics, but differed by their exposure to the vaccination campaign. Contrary to previous studies, exposure to the campaign had positive effects on RI utilization. Children exposed to the campaign received between 0.296 and 0.469 additional doses of DPT vaccine by age 4 months than unexposed children.

Conclusions: RDD constitutes a promising tool to assess the effects of mass vaccination campaigns on RI services. It could be tested in additional settings, using larger and more precise datasets. It could also be extended to measure the effects of other disease-specific interventions on the functioning of health systems, in particular those that occur at a discrete point in time and/or include age-related eligibility criteria.

WEB: http://dx.doi.org/10.1016/j.vaccine.2016.05.037

IMPACT FACTOR: 3.62

CITED HALF-LIFE: 5.50

UW EDITORIAL COMMENT: The authors' basic assumption is that exposure to supplementary immunization activities (SIA) depends completely on when a given newborn is born (before vs. after SIA), which is not modifiable, is thus dependent on random variation in birth date; therefore, newborns exposed or unexposed to SIA should be similar in the distribution of their other characteristics. Authors state that comparing the routine immunization outcomes between pre-SIA and post-SIA groups allows for an unbiased comparison between groups differing only in timing of exposure to SIA and thus "emulates" an RCT. Thus any "discontinuity" in RI outcomes should be attributed to "discontinuity" in birth cohort exposure to SIA.

Fig. 2. Reports the SIA participation and RI outcomes in groups defined by when SIA occurred relative to their birth. Table 2 reports the estimates of the effects of SIA on RI outcomes, using a variety of exploratory model specifications. Point estimates of effect using the different modeling specifications are fairly similar, but confidence intervals vary widely. In general, Table 2 indicates that SIAs were associated with a difference of between 21% and 35% in the proportion of individuals reporting participation in SIA (estimates statistically significant in most model specifications); an additional quarter to a half a hose of DPT received (estimates statistically significant from most model specifications), and approximately 10%-22% difference in proportion with recommended EPI vaccines (estimates statistically significant from less than half the model specifications). Authors note that small sample sizes in their Bangladesh dataset led to imprecision around estimates of effect, and recommend further application of this model with larger datasets.

8. MOTHERS' WILLINGNESS TO PAY FOR HPV VACCINES IN ANAMBRA STATE, NIGERIA: A CROSS SECTIONAL CONTINGENT VALUATION STUDY.

Umeh IB, Nduka SO, Ekwunife OI.

Cost Eff Resour Alloc. 2016;14:8.

PMID: 27274335

ABSTRACT

Background: Human papilloma virus (HPV) vaccination in Nigeria will require substantial financing due to high cost of HPV vaccine and inexistence of structures to support adolescent vaccination. Alternative sources are needed to sustain the government funded HPV vaccination programme. This study assessed Nigerian mothers' willingness to- pay (WTP) for HPV vaccine. We also compared the difference between the average WTP and estimated costs of vaccinating a pre-adolescent girl (CVG).

Methods: We conducted a quantitative, cross-sectional, survey-based study in which 50 questionnaires were distributed to each of 10 secondary schools located in two rural and one urban city in Anambra state. The questionnaires were then randomly distributed to girls aged 9–12 years of age to give to their mothers. Contingent valuation approach using the payment card technique was used to estimate the average maximum WTP among the survey participants. Correlates of WTP for HPV vaccination were obtained using multivariate logistic regression. Estimated CVG was obtained by adapting cost of HPV vaccine delivery in Tanzania to the Nigerian setting.

Results: A total of 438 questionnaires (88 %) were returned. The average WTP was US$ 11.68. This is opposed to estimated delivery cost of US$ 18.16 and US$ 19.26 for urban and rural populations respectively at vaccine price offered by the Vaccine Alliance (Gavi) and US$ 35.16 and US$ 36.26 for urban and rural populations respectively at the lowest obtainable public sector vaccine price. Demand for HPV vaccine was deemed high (91.6 %) and was significantly associated with respondents previously diagnosed of HPV infection.

Conclusion: Demand for HPV vaccine was high although short of estimated CVG. High demand for vaccine should be capitalized upon to increase vaccine uptake. Education on cervical cancer and provider-initiated vaccination should be promoted to increase vaccine uptake. Co-payment could be a feasible financing strategy in the event of national HPV vaccination.

WEB: http://dx.doi.org/10.1186/s12962-016-0057-0

IMPACT FACTOR: 0.00

CITED HALF-LIFE: 0.00

UW EDITORIAL COMMENT: Authors report that only a small proportion of respondents had no formal education, but the survey was self-administered, and thus it is expected that only those with adequate education to read or write would be able to participate in the survey, and thus participants may not be representative of the larger population from which the sample was derived. The methods for how the teachers "randomly" selected the students for survey distribution aren't described, and it is possible students selected don't represent the larger population of students/families in that community.

It should be noted that willingness to pay was calculated among those who accepted vaccination, but approximately 7.5% did not accept vaccination. Authors note that before the survey, only about 19% of respondents had ever heard of HPV and even fewer (3.4%) had comprehensive or accurate knowledge of infection or its consequences. Only urban residence and having previously experienced HPV infection was associated with a higher willingness to pay, and the predictive model for willingness to pay based on socio-demographic, knowledge and awareness factors performed poorly. Authors report "high demand" for HPV vaccine, and recommend this is "capitalized upon" to address coverage. However, it should be noted that only a small proportion of respondents had ever heard of HPV and/or cervical cancer before participating in the survey, and thus their reported acceptance of the vaccine may have been influenced by survey participation.

9. IMPACT OF PERFORMANCE-BASED FINANCING IN A LOW-RESOURCE SETTING: A DECADE OF EXPERIENCE IN CAMBODIA.

Van de Poel E, Flores G, Ir P, O'Donnell O.

Health Econ. 2016 Jun;25(6):688-705. Epub 2015 Jul 30.

PMID: 26224021

ABSTRACT

This paper exploits the geographic expansion of performance-based financing (PBF) in Cambodia over a decade to estimate its effect on the utilization of maternal and child health services. PBF is estimated to raise the proportion of births occurring in incentivized public health facilities by 7.5 percentage points (25%). A substantial part of this effect arises from switching the location of institutional births from private to public facilities; there is no significant impact on deliveries supervised by a skilled birth attendant, nor is there any significant effect on neonatal mortality, antenatal care and vaccination rates. The impact on births in public facilities is much greater if PBF is accompanied by maternity vouchers that cover user fees, but there is no significant effect among the poorest women. Heterogeneous effects across schemes differing in design suggest that maintaining management authority within a health district while giving explicit service targets to facilities is more effective in raising utilization than contracting management to a non-governmental organization while denying it full autonomy and leaving financial penalties vague.

WEB: http://dx.doi.org/ 10.1002/hec.3219

IMPACT FACTOR: 2.23

CITED HALF-LIFE: 2.70

UW EDITORIAL COMMENT: In general, this study design could be vulnerable to bias due to differences between birth cohorts and differences between districts in the distribution of factors besides PBF schemes that might also influence outcomes. However, authors used multivariable models that adjusted for a range of potential confounders, and their primary test was a difference in the change over time in PBF "treated" vs. "untreated" districts. These methods would help alleviate potential bias arising from potential differences in baseline between districts and from differences in the distribution of other factors that likely influenced changes in health indicators over time. However, it should be noted that without randomization to intervention, there were still likely differences between districts that did and did not receive PBF or between those that received different schemes.

Authors hypothesize that one reason incentives failed to influence vaccination rates is that during this period, substantial efforts were already being made by the Extended Programme on Immunization to improve coverage, via large outreach activities and campaigns, and as such there may have been little marginal or incremental benefit that could occur on top of this from PBF.

Table 1 describes the different PBF schemes introduced in each district between 1999 and 2010, and describes the management responsibility, district incentives, and facility and staff incentives provided in each scheme.

10. SEROEPIDEMIOLOGY: AN UNDERUSED TOOL FOR DESIGNING AND MONITORING VACCINATION PROGRAMS IN LOW AND MIDDLE-INCOME COUNTRIES.

Cutts FT, Hanson M.

Trop Med Int Health. 2016 Jun 14. [Epub ahead of print]

PMID: 27300255

ABSTRACT

Seroepidemiology, the use of data on the prevalence of bio-markers of infection or vaccination, is a potentially powerful tool to understand the epidemiology of infection before vaccination and to monitor the effectiveness of vaccination programmes. Global and national burden of disease estimates for hepatitis B and rubella are based almost exclusively on serological data. Seroepidemiology has helped in the design of measles, poliomyelitis and rubella elimination programmes, by informing estimates of the required population immunity thresholds for elimination. It contributes to monitoring of these programmes by identifying population immunity gaps and evaluating the effectiveness of vaccination campaigns. Seroepidemiological data have also helped to identify contributing factors to resurgences of diphtheria, Haemophilus Influenzae type B and pertussis. When there is no confounding by antibodies induced by natural infection (as is the case for tetanus and hepatitis B vaccines), seroprevalence data provide a composite picture of vaccination coverage and effectiveness, although they cannot reliably indicate the number of doses of vaccine received. Despite these potential uses, technological, time and cost constraints have limited the widespread application of this tool in low-income countries. The use of venous blood samples makes it difficult to obtain high participation rates in surveys, but the performance of assays based on less invasive samples such as dried blood spots or oral fluid has varied greatly. Waning antibody levels after vaccination may mean that seroprevalence underestimates immunity. This, together with variation in assay sensitivity and specificity and the common need to take account of antibody induced by natural infection, means that relatively sophisticated statistical analysis of data is required. Nonetheless, advances in assays on minimally invasive samples may enhance the feasibility of including serology in large survey programmes in low-income countries. In this paper, we review the potential uses of seroepidemiology to improve vaccination policymaking and programme monitoring and discuss what is needed to broaden the use of this tool in low- and middle-income countries

WEB: http://dx.doi.org/10.1111/tmi.12737

IMPACT FACTOR: 2.33

CITED HALF-LIFE: 2.90

UW EDITORIAL COMMENT: Authors list the following potential uses of seroepidemiological data: 1) Pre-vaccination: estimate burden of disease, estimate herd immunity threshold; 2) Post-introduction: determine which age groups to include in campaigns, determine duration of immunity and need for and timing of boosters, monitoring progress and identifying gaps in immunity, investigating causes of resurgence, evaluating impact of campaigns, and estimating coverage.

Authors state that primary limitations to expanded use in low-resource settings include limited "access to high-quality laboratories and appropriate assays, and logistical, communication, time and resource challenges in conducting surveys that are representative of the populations of interest and have adequate participation rates, especially if venous blood samples are required." However, authors point out that these barriers can be alleviated by the development and expanded use of assays that require less invasive specimen collection procedures, and by continuing to build and expand field and laboratory capacity in low-resource settings, though such infrastructure and health resource capacity developments require substantial resource inputs. They also recommend using gold standard assays on only a subsample of the population, and supplementing with less invasive/complex/expensive methods and/or using statistically rigorous sampling strategies so that samples can be used to generalize to larger populations.

Table 1 provides an overview of potential uses of seroepidemiological data; requirements; and examples of vaccine-preventable diseases where it could be used.

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]) AND ("2016/5/15"[PDAT] : "2016/06/14"[PDAT]))

* On June 1, 2016, this search of English language articles published between May 15, 2016 and June 14, 2016 and indexed by the US National Library of Medicine resulted in 235 unique manuscripts.