Operations Research on Improving Paper-based Information Systems for Child Health: Request for Application

Application Deadlines:  
Concept Note: March 9, 2015  
Full Proposal: June 26, 2015 (by invitation)

Overview

Introduction

Guided by the belief that every life has equal value, the Bill & Melinda Gates Foundation works to help all people lead healthy, productive lives. In developing countries, it focuses on improving people’s health and giving them the chance to lift themselves out of hunger and extreme poverty.

People who live in countries with strong primary health care systems are healthier overall. For the poorest people, the primary care system is the main source of healthcare, including treatment, prevention, health promotion, and other essential services. Country primary health care systems are foundational to many of our aims, and they urgently need improvement. Unless we coordinate help to strengthen entire country health systems, we cannot achieve our ambitious global health and development goals.

One of the core components of a high-functioning health system is its information system. In seeking to improve the quality, availability, and use of health information, we invest in initiatives to improve the collection and analysis of health-related data and to measure the progress of these initiatives. Our current vision is to enable stakeholders at all levels of the health system to have the data they need – and the ability to analyze, interpret and use that data – to make evidence-based decisions. In doing so, we ensure that health sector resources are allocated and managed to improve health outcomes more efficiently and effectively through stronger institutions and enhanced local capacity.

With this proposed funding, we seek to better understand one important and often overlooked component of in-country health information systems: the paper systems used to capture and report health data. Paper systems are crucial for data collection and use in low-infrastructure settings and in health facilities within better-resourced health systems where paper is still the most cost-efficient solution (e.g., rural, low-volume health facilities).

The impact of paper data tools upon program effectiveness and efficiency is largely unknown. Through this RFP we intend to fund operations research to better understand the impact of improvements to paper data systems to intermediate measures like data accuracy and use, and ultimately, to outcomes related to child health: coverage of health interventions and drop-out rate. One applicant will be selected to conduct an experimental or quasi-experimental study of interventions to paper-based data tools in at least 3 countries.

Background

Overall, a well-functioning health information system requires a coordinated mechanism to collect, process, report, and use health information to influence decision-making and action. Informed decision-making at all levels of a health system requires reliable data. Decisions informed by evidence contribute to more efficient resource allocation and to better outcomes. Especially at lower levels (closer to service delivery and data collection), information systems need to be simple and sustainable and must not overburden staff or be too costly to operate. In an ideal system, health workers are empowered to use the routine data they collect and understand the importance of good quality data for improving health. Use of local data for program...
management is essential, in addition to the traditional reporting structures which "extract" local data for performance monitoring at the subnational, national, and global level.

Children are eligible to receive a spectrum of health services, both preventative and curative, including those targeting enteric and diarrheal disease, neglected infectious diseases, vaccination, HIV (screening and prevention of mother-to-child transmission), family planning (for mothers of infants), nutrition, malaria, as well as primary care services (e.g., Integrated Management of Childhood Illness). These services are often delivered using the same platforms, personnel, and points of contact (i.e., visits to the health facility). Data systems for monitoring the services that children need – and tracking the services that they do in fact receive – are a critical piece of the streamlined delivery of high, equitable coverage of child health interventions.

The vast majority of lower income countries still rely heavily upon paper tools for recording and monitoring child health information. Paper systems are often the most cost-efficient, and are frequently the only feasible current solution in areas with limited resources and infrastructure. Absent enabling infrastructure for digital systems (computers, electricity, mobile phone coverage), paper systems can fulfill all of the necessary functions of a well-performing health information system.

The suite of paper tools typically includes, but is not limited to, clinical registers or register books; child- or family-based health records, consultation notes or medical charts; home-based child health records (health “cards” or booklets or immunization cards); tally sheets; tickler boxes or systems; reporting forms or registers; and logistics management tools (e.g., stock control cards). For examples of these tools, see Appendix A. In the context of dynamic health systems which are constantly adjusting to a variety of shocks – introduction of new health interventions (e.g., new vaccines and treatments), changes in the target population (e.g., providing services to adolescents in addition to the traditional population of young children), growing and often mobile populations, funding constraints, etc. – paper recording tools are a crucial element in countries’ ability to cope and maintain fragile, strained health delivery systems. Paper data tools serve a range of purposes for several types of users, including parents, health workers, program managers, and public health officials.

<table>
<thead>
<tr>
<th>Use Cases for Health Data Tools (non-exhaustive)</th>
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<tr>
<td><strong>Clinical Care:</strong></td>
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<tr>
<td>- Minimizing missed opportunities for integrated service delivery</td>
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<td>- Coordinating care across multiple providers</td>
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<td>- Tracking defaulters for adherence</td>
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<td>- Identifying geographic/demographic “pockets of neglect”</td>
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<td>- Providing patients with a linked unique ID</td>
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<td><strong>Supply Chain:</strong></td>
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<td>- Monitoring and forecasting supply chain needs (commodities, transport, storage, etc.)</td>
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<tr>
<td>- Forecasting demand and availability of commodities</td>
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<td>- Ensuring potency and safety of pharmaceutical products (e.g., monitoring temperature exposure of sensitive vaccines)</td>
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<td><strong>Supportive Supervision:</strong></td>
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<td>- Forecasting workload requirements</td>
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<td>- Forecasting staff availability</td>
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<td>- Assessing quality of service provided; facilitating continuous improvement</td>
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<td>- Identifying grassroots best practices for dissemination</td>
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<td>- Identifying struggling facilities for additional oversight</td>
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<td><strong>Public Health/Monitoring:</strong></td>
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<td>- Undertaking disease surveillance</td>
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<td>- Assessing coverage of health interventions</td>
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<td>- Assessing program performance to inform resource allocation, incentives, and policy</td>
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<td><strong>Health Education:</strong></td>
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<td>- Providing appropriate health education messaging to caregivers and to individuals to empower</td>
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However, despite the importance of paper-based health information systems, evidence of their role and impact on broader health system performance is lacking. Problems with paper data tools are anecdotally well-known, but little-studied. These issues affect not only health workers and public health officials, but also parents and caregivers, who may not understand the information provided in text-heavy or complicated health records, or who might be affected by increased wait time and diminished quality of care because of inefficient systems. The Gates Foundation believes the consequence of the inefficiencies, poor quality, and inaccuracy of paper data systems to be that fewer children receive life-saving health interventions.

Some examples of the most well-known limitations to current paper-based health data tools (in no particular order) include:

**Health Worker**
- Time burden to fill in paper tools by hand; difficulty understanding where to add new information
- Underutilization of paper tools that are poorly integrated into workflow, not perceived as useful, or are cumbersome
- Time burden and inaccuracy in reporting; data are difficult to aggregate manually
- Time burden and inaccuracy in identifying and tracking children eligible or overdue for services
- Inconsistency in which data source is used for reporting; discrepancies between data gleaned from various sources (e.g., tally sheet as compared to register book)
- Difficulty reading or interpreting handwritten data
- Inconsistencies in the way that data elements (e.g., dates, names) are recorded
- Difficulty finding an individual’s health record; poor organization of register systems, files, etc., and lack of a unique identifier (e.g., national identification number); identity is difficult to ascertain
- Redundancy of indicators and poor integration among various data tools; missed opportunities for more efficient collection and validation across different indicator types
- Unsuitably designed tools which get in the way of performing clinical duties (e.g., heavy register books are extremely cumbersome to bring to communities when performing outreach activities)
- Storage and archiving burden for bulky paper records

**Family**
- Records not retained or routinely brought to health facilities; families do not recognize the importance of home-based health records;
- Poor durability of home-based records means that they are easily destroyed
- Text-heavy forms and records may be difficult for low-literacy populations to comprehend; difficulty locating, reading, or using health information
- Outdated versions of home-based health records might not adequately reflect full complement of services available to the child
- Difficulty digesting complex information presented in unfamiliar formats (e.g., growth charts, tables)

**Public Health Officials and Surveyors**
- Difficulty reading or interpreting handwritten data
- Inconsistencies in the way that data elements (e.g., dates, names) are recorded
- Unavailability of home-based records during house-to-house data collection means relying upon recall to assess coverage of interventions
- Time burden in collecting, collating, interpreting, and reporting data
- Inconsistency in which data source is used for reporting; discrepancies between data gleaned from various sources (e.g., tally sheet as compared to register book)
- Inaccuracy, incompleteness, and lack of timeliness of data reporting challenge evidence-driven decision making
- Inconsistent data capture due to unsystematic deployment of multiple versions of the same tool

Additionally, but not specific to paper-based data systems, human capacity issues exist from the frontline to
At the national level, health workers may not understand why they are collecting the data, and rarely see the benefits of the data that they collect and report. Instead, data collection is frequently seen only as an activity that draws them away from clinical care. Skills for turning raw data into useful information that can improve the services delivered – and can make the health worker’s job easier – are often not emphasized. Furthermore, when there are no real or perceived effects of reporting data (for instance, no matter what stock count is reported, the facility receives the same allotment the following month), data collection, management, and reporting are frequently deprioritized and can be regarded with resentment. At higher levels, supervisors are not motivated to monitor for reporting accuracy and timeliness; bad data gets passed through the system. There are weak feedback loops and supportive supervision for all levels, which prevent evidence-based decision-making, and there is a lack of peer exchange at various levels to learn what is working and what is not. National-level leadership is often weak in the data space, with a few dedicated information officers whose skills may be in evaluation or IT, but rarely in holistically thinking about data systems. In fact, few training programs exist to prepare individuals for national-level leadership in data systems. Data collection and analysis aren’t universally taught in the same way across training programs – some neglect it altogether. Finally, even if the right people are in the right place, with the right skills and motivated, a lack of infrastructure can create further barriers. For instance, supply chains for data tools are often not integrated with supply chains for other commodities, and stock outs of data tools often hamper data collection.

**Goal**

In the context of the importance of paper health information systems, and in light of the lack of evidence of their direct impact, we seek to better understand how improvements to the paper data systems might affect program effectiveness and efficiency.

The purpose of this investment is two-fold:

(i) to determine the impact of current paper recording tools on health system performance, and

(ii) to test interventions to improve upon these data systems.

Interventions to paper data recording systems have, to date, generally been opportunistic and sensitive to external forces (e.g., funding availability), and have not been systematically tested and evaluated. The purpose of this investment is to document the impact of the design and use of paper tools, in order to inform future directions for improving upon these systems and to evaluate the impact of these interventions. The long-range outcome of this implementation research is to improve the ways that paper data tools support health programs in low income countries. While preparation for translation to digital health information systems is generally of interest, it is explicitly not the focus of this endeavor. We seek to better understand and to optimize paper data systems *per se*, and considerations of digital linkages should be secondary to the major aims of this body of work.

We hypothesize that improvements to the paper data collection system can improve data quality and data use, thereby enhancing program effectiveness and efficiency. We seek to test this hypothesis, and to build the knowledge base around what impact might be achieved through interventions to paper health information systems. If impact is demonstrated, we will ultimately seek to develop best practices and a road map for bringing promising interventions to scale in countries.

**Figure 1:** Hypothesized pathway from improved paper data systems to improved health outcomes
Scope and Approach

Proposed work streams for this initiative include:

1. **Observe and characterize the role of paper data tools** in the field in several country immunization programs, and identify the potential magnitude of losses to efficiency, accuracy, and use of health information attributable to poorly designed paper tools and systems for monitoring and evaluating child health. This includes workflow, training, and other process/operational considerations related to the tools themselves. Losses might include inefficiencies (time, resources, decreased cost effectiveness), missed opportunities for delivery of health services (decreased coverage), wasted time, effort, and money, inaccuracies in data collection or use, overload on health workers and caregivers, and missing or poor quality data. Paper tools of particular interest include clinical registers or register systems and home-based child health records, however, assessment is not limited to these (see Appendix A for examples, and Appendix B for further detail on uses and challenges with these tools). **Participate in the development of metrics for assessing the impact on health systems** of paper tools and paper-based health information systems. Qualitative characterization of the service delivery workflow is expected, through both interview/focus group and direct observation, including the role the register, home-based records, and other paper tools play, who uses each of the tools and how, as well as characterization of how health workers and/or parents perceive the utility of the tools. Additionally, development of a set of quantitative indicators of data accuracy (e.g., number of discrepancies between register and reports; number of home-based records lacking a date for one or more intervention), efficiency (e.g., through time-motion studies), use (e.g., percent of facilities using registers to identify defaulters; retention of home-based records), and acceptability (to health workers and to families) are expected to be developed and refined in collaboration with the Foundation.

2. **Identify and test promising interventions to improve these tools, the data-capture system of which they are a part, and/or the training and incentives for health workers who use the tools.** Use existing evidence, examples from previous implementations, user-centered design or other approaches to propose changes to paper-based systems (people, products, processes, and policies) in small geographic areas (e.g., several districts in several countries). Select promising interventions on the basis of feasibility, expected impact, scalability, alignment with other health system priorities, flexibility to accommodate future programmatic needs (e.g., new vaccine introductions, preparation for transition to digital health information systems), and estimated cost effectiveness. Interventions should target improved routine data use for local program management and decision-making, and should be planned with suitablity for use at national or multi-national scale in mind. Use experimental or quasi-experimental methods as well as qualitative assessment to determine the impact of these interventions to intermediate outcomes (data quality, data use, and efficiency) and impacts (coverage of immunization and other health interventions, drop-out rate).

**Expected Outputs/Deliverables:**

The full set of deliverables will be iteratively refined with the successful applicant.

- Characterization of how paper health immunization systems are used in at least three countries, prioritizing clinical registers and home-based child health records. Development of metrics for measuring program efficiency and data use.
- Development of a protocol for evaluating the impact of the design and use of paper-based data tools/systems on program efficiency and outcomes using experimental or quasi-experimental methods.
- Completion of an experimental or quasi-experimental study (including a counterfactual) in at least 3 countries at subnational/district level to evaluate impact of interventions to paper-based data systems.

**Additional Considerations:**

Not only the products/tools themselves, but also the human ecosystem in which these tools are employed, contribute to the success or failure of data systems. We believe that the fundamental issues with improving
data systems are, at heart, human issues – the questions at the crux of this investigation are operational questions rather than simply questions about the tools themselves. Successful proposals will address considerations about the people, processes, and practices which constitute a health information system, as well as the paper tools themselves. Considerations include optimized workflows to support efficient paper-based data collection for immunization in a dynamic system and what training and incentives best support paper systems to prepare for success. We approach this investment with full recognition that changing health information management systems in countries can be difficult and painstaking, both in terms of the logistics and mechanisms for doing so, and in terms of the vested interests in countries keeping systems static as they are. Politics, issues of ownership and “turf,” prioritization of data quality as a pressing issue for attention, concerns related to retroactive data entry, training and costs may all be barriers. Successful proposals will address these and other potential barriers in both their characterization of health information systems and in their consideration of interventions to be tested.

We anticipate that operations research in 3 or more countries will be needed, and that the project should last no more than 36 months (12 months for planning and 24 months for implementation). Geographies of interest include sub-Saharan Africa and other GAVI-eligible nations; compelling rationale for country selection should be presented in the proposal. Geographic, linguistic, cultural, and health system diversity (including maturity level of the health information system) should also be considered when choosing target geographies. Work on this initiative would be expected to begin in Q3 or Q4, 2015.

We do not expect that one single organization will necessarily have the relevant expertise to conduct every part of this scope of work; building a coalition or consortium is encouraged, and subcontracting for portions of this body of work will be considered. We envision expertise in implementation, protocol/research design, advocacy and policy change, information and user-centered design, and communication, are likely to be employed. Successful proposals will honestly assess the capacity of the applicant organization(s) to undertake the full spectrum of activities proposed, and will provide rationale for subcontracting/sub-granting as needed.

**Rules & Guidelines**

**Evaluation Criteria**

Submissions from government, nongovernmental, bi- and multi-lateral, academic, nonprofit, and for-profit organizations from any country will be accepted. For-profit organizations should clearly outline the charitable purpose of the proposed activities. Applications from individuals unaffiliated with an organization will not be considered. Submission from consortia and coalitions of organizations are encouraged, and subcontracting/sub-granting will be considered.

Submissions received by the deadline will be evaluated on criteria that include:

- Capabilities
- Relevant experience in the methodology proposed
- Relevant experience, or strategy for obtaining relevant experience, to implement identified interventions (e.g. field expertise, training expertise, design expertise, etc.)
- Strength and coherence of study design and implementation plan
- Reputation
- Rationale for subcontracting portions of this scope of work (as applicable), and selection criteria for subcontractors
- Organization’s understanding of the Foundation’s mission, structure, and priorities related to improving routine health information systems in country
- Costs of the services
- Additional evaluation criteria the Foundation considers relevant to the specific services in question

The relative weighting and priority of these criteria will be at the Foundation’s discretion.
Successful submissions will:
- Closely align with the goals of the foundation’s Vaccine Delivery and Integrated Delivery strategies;
- Clearly propose a project with the potential to substantially expand the global health community’s understanding of the role of paper tools in monitoring child health data and how inefficiencies and poor immunization program performance might be addressed through interventions to the paper data collection system;
- Have a project duration of no more than 36 months;
- Have a reasonable, well-justified estimated budget for completing the proposed scope of work.

**Timeline for Applications**

January 26, 2015: Request announced.
February 20, 2015 – 2:00pm (PST): Deadline for clarifying questions for Concept Notes.
March 9, 2015 – 2:00pm (PST): Deadline for submitting Concept Notes.
May 1, 2015: Finalists notified; full proposals requested.
June 26, 2015 – 2:00pm (PST): Deadline for submitting proposals (by invitation).
August 1, 2015 (anticipated): Award announced.

**How to Apply**

**Response Requirements**

Applications for this funding opportunity will be received in two phases: a Concept Note and a full Proposal.

1. To express interest in applying, please submit a **Concept Note** on the template provided by March 9, 2015. Concept notes should not exceed 2500 words (approximately 5 pages, single spaced) in length. Other attachments will not be reviewed. The Concept Note should include:
   - Overview of the proposed project, including proposed geographies and a description of proposed methodology
   - A description of your organization or consortium’s competitive advantage, including examples of relevant experience

2. Following submission of the concept notes, **up to 4 applicants will be selected to submit a full proposal**. Full proposals will be accepted by invitation only. The proposal will include the components listed below.
   - **Proposal narrative** describing the proposed project (up to 12 pages, single spaced, using template and guidelines to be provided). This narrative should include:
     - 4-5 pages detailing methodology you would use to conduct this investigation, including why this approach is desirable, as compared to other possible approaches.
     - ~1 page describing proposed geographies for conducting the study, including rationale
     - 2-3 pages describing potential indicators, data sources, and methodology for controlling for confounding factors
     - 1-2 pages describing your competitive advantage for this grant, including your organization’s unique capabilities relevant to this proposal, any experience working with the Foundation, and relevant experience on projects related to this proposal, including dates of service and any publications or policy change that have resulted from that work.
     - 1-2 pages detailing which portions of this body of work you would conduct yourself (including your capacity to complete these), and which portions you would subcontract to partners. Provide details about the organization or type of organization you would subcontract to, and a brief description of selection criteria.
- **Budget** for the proposed activities (using template and guidelines provided);
- **Budget Narrative** describing the proposed activities;
- Most recent organizational **financial statements** (audited, if available);
- **Biographical information** or resume for key project staff, highlighting relevant experience, role on the project, percentage of time dedicated to the program, or brief position descriptions for new roles to be created for the purposes of this project;
- **Proposed project timeline**, including relevant milestones and deliverables.

### Help Contact(s)

Foundation staff will be able to provide clarification on this RFP until 2:00 pm US Pacific Standard Time on February 20. Please submit questions to papertoolsRFP@gatesfoundation.org.

### More Information

#### Key Terms & Conditions

**A. Disclosure Notice**

To help the foundation with its review of RFP responses, the foundation may disclose proposals, documents, communications, and associated materials submitted to the foundation in response to this RFP (collectively, “Submission Materials”) to its employees, contingent workers, consultants, independent subject matter experts, and potential co-funders. Please carefully consider the information included in the Submission Materials. If you (the “Applicant”) have any doubts about the wisdom of disclosure of confidential or proprietary information, the foundation recommends you consult with your legal counsel and take any steps you deem necessary to protect your intellectual property. You may wish to consider whether such information is critical for evaluating the submission or if more general, non-confidential information may be adequate as an alternative for these purposes.

Notwithstanding the Applicants characterization of any information as being confidential, the foundation the foundation is under no obligation to treat such information as confidential.

**B. Disclaimer**

This RFP is not an offer to contract or award grant funds. The foundation assumes no responsibility for the Applicants cost to respond to this RFP. All responses generated by this RFP become the property of the foundation.

**C. Release and Verification**

In exchange for the opportunity to be awarded a grant or contract, the Applicant agrees that the foundation may, in its sole discretion: (1) amend or cancel the RFP, in whole or in part, at any time; (2) extend the deadline for submitting responses; (3) determine whether a response does or does not substantially comply with the requirements of the RFP; (4) waive any minor irregularity, informality or nonconformance with the provisions or procedures of the RFP; (5) issue multiple awards; (6) share responses generated by this RFP with foundation staff, consultants, contingent workers, subject matter experts, and potential co-funders; and (7) copy the responses.

Applicant agrees not to bring a legal challenge of any kind against the foundation relating to the foundation’s selection and award of a grant or contract arising from this RFP.

Applicant represents that it has responded to the RFP with complete honesty and accuracy. If facts provided in Applicant’s response change, Applicant will supplement its response in writing with any deletions, additions or changes within ten days of the changes. Applicant will do this, as necessary, throughout the selection
process. Applicant understands that any material misrepresentation, including omissions, may disqualify it from consideration for a grant or contract award.

By responding to this RFP, you are representing: (i) that you have authority to bind the named Applicant to the terms and conditions set forth above, without amendment; and (ii) that you agree to be bound by them.

D. Global Access and Intellectual Property

Intellectual property (IP) rights and the management of IP rights are likely to play an important role in achieving the goals of this project. To this end, the foundation requires that, even at this stage, all applicants seriously consider their willingness to submit a response in compliance with the foundation’s response requirements, a portion of which may ask for certain information and intentions regarding intellectual property concerns and Global Access. Specifically, the foundation requires that;

You will conduct and manage the Project and the Funded Developments in a manner that ensures Global Access. Your Global Access commitments will survive the term of the Agreement. “Funded Developments” means the products, services, processes, technologies, materials, software, data, other innovations, and intellectual property resulting from the Project (including modifications, improvements, and further developments to Background Technology). “Background Technology” means any and all products, services, processes, technologies, materials, software, data, or other innovations, and intellectual property created by You or a third party prior to or outside of the Project used as part of the Project. “Global Access” means: (a) the knowledge and information gained from the Project will be promptly and broadly disseminated; and (b) the Funded Developments will be made available and accessible at an affordable price (i) to people most in need within developing countries, or (ii) in support of the U.S. educational system and public libraries, as applicable to the Project.

The foundation will be selecting applicants based on the conclusion that their technologies and expertise will be most appropriate for the success of this RFP.

As part of the foundation’s review and evaluation of each response, the foundation will conduct due diligence with respect to each applicant’s ability and commitment to manage intellectual property in a manner consistent with the stated scientific and charitable goals of the foundation. Due diligence activities may include inquiry into an applicant’s:

1) Freedom to operate (FTO) and ability to freely use and acquire needed background technology;
2) Commitment to promote the utilization, commercialization and availability of Funded Developments for public benefit

The foundation encourages you to include this information in your response.

About the Bill & Melinda Gates Foundation
Guided by the belief that every life has equal value, the Bill & Melinda Gates Foundation works to help all people lead healthy, productive lives. We work with partner organizations worldwide to tackle critical problems in four program areas. Our Global Development Division works to help the world’s poorest people lift themselves out of hunger and poverty. Our Global Health Division aims to harness advances in science and technology to save lives in developing countries. Our United States Division works to improve U.S. high school and postsecondary education and support vulnerable children and families in Washington State. And our Global Policy & Advocacy Division seeks to build strategic relationships and promote policies that will help advance our work. Our approach to grantmaking emphasizes collaboration, innovation, risk-taking, and, most importantly, results.

To learn more about the foundation's work, visit www.gatesfoundation.org.
Appendix A: Examples of Paper Data Tools

1. Immunization register

2. Consolidated register for child health
3. Multiple registers in a health facility

4. Tally Sheet
5. Reporting form

6. Home-based child health record damaged by water
7. Home-based child health records

8. Challenges with archiving paper forms
### Appendix B: Clinical Registers and Home-Based Records – Uses & Issues

Two of the principal tools of interest to this investigation are clinical registers and home-based child health records. However, we acknowledge that data tools interact as a part of a whole – with the people, processes, policies, and practices, as well as the products (tools) themselves, playing an important role in the success or failure of data systems.

Registers – systems that aggregate health and demographic information at a community-level – are an important tool for recording community-level health information. Accurate data and streamlined systems are critical in the clinical setting, for monitoring and reporting purposes, and to inform programmatic decisions and policymaking. The following is an illustrative list of the wide variety of uses of clinical immunization registers [additional uses may apply to other clinical registers for child health]:

- **Clinical care**: serving as a linked unique identifier, defaulter tracking for adherence, identifying missed opportunities for immunization, tracking and responding to adverse events following immunization, identifying geographic and demographic pockets of neglect.
- **Reporting**: often a principal tool for aggregating data on routine vaccine administration for reporting to district, sub-national, and national level. Can be used in case of adverse events following immunization and for tracking coverage.
- **Supply chain**: forecasting supply chain needs, forecasting availability of products.
- **Performance management**: serving as a tool for training and supportive supervision activities, forecasting staffing and other resource allocation needs.

Rigorous examination of the application and optimal design of clinical registers is scant, and standardization of registers across programs and countries is minimal. Case studies from South Africa, Ghana, Uganda, Uruguay, and Ethiopia across a variety of health and vertical disease programs characterized promising innovations to the archetypal clinical register system (see Appendix C). For instance the simplified registers initiative (a part of the Mobile Technology for Community Health project) in Ghana sought to standardize documentation of maternal health, family planning, child health, outreach, and consulting room care. These register systems, which decreased the overall number of registers to 5, from up to 24, have been enthusiastically accepted in the zones where they have been deployed, and qualitative feedback indicates that the time to record and report health outcomes has decreased. However, rigorous evaluation of the impact of these innovations (in Ghana and in the other geographies assessed) has not been undertaken to date. Countries often use a variety of register formats, frequently developed by vertical disease programs. The number of data points demanded by this set of registers can be staggering. Register systems designed to track the same information across geographies – and even within countries but across programs – often have radically different design, including the format/type and number of data fields.

A second critical paper tool for immunization programs is the home-based child health record. These records are the paper tools given to parents and caregivers by the health system to keep track of their children’s vaccinations and other health interventions. Among other functions, the records allow for coordination of clinical care, serve as a tool to empower caregivers to take charge of their children’s health services, and allow surveyors and other public health professionals to measure coverage of health interventions and to better plan and allocate limited resources. However, all too often, these records are too complicated for caregivers to understand, poorly designed for healthcare workers to record accurate data, forgotten or never distributed, or too flimsy to stand up to repeated use. The Foundation-funded Records for Life contest sought to redesign the child health record to improve accuracy, retention, and use of the card. Focus group findings in three countries (See Appendix D, Appendix E) highlight design-focused interventions to improve the utility of these tools, which were well-received by health workers and families. However, these possible interventions have not been tested for impact in the field, and only several small scale studies (Usman et al, Wamalwa) indicate that improvements to health records can improve health outcomes such as increasing the completion of the infant vaccination series. Further qualitative study of child health records in conjunction with the Records for Life contest highlighted particular design-based changes that might affect the retention, use and accuracy of these tools. These findings are incorporated into forthcoming guidelines regarding home-based records, to be published in late 2014. However, the best types of home-based records and data elements to be included have not been thoroughly evaluated.
Appendix C: Case Studies on Interventions to Improve Clinical Registers

Paper immunization registers and register books are critical components of health information systems (HIS) for immunization programs across the globe. Even as many HIS for immunization programs and other health domains move toward electronic and mobile data collection systems, paper registers continue to be relevant tools in many resource-constrained settings. Registers occupy a particularly unique space in HIS as they serve as an intermediary between individual patient records and aggregate data. For immunization programs, they can be used to track defaulters and to estimate coverage. Registers must meet both the needs of health providers and the needs of administrators and decision-makers.

The Bill & Melinda Gates Foundation’s Vaccine Delivery Team engaged the University of Washington’s Global Health Strategic Analysis and Research Training (START) Program in the Paper Health Registers Project in September 2013. With the hypothesis that sub-optimal paper register systems likely detract from patient care and produce poor data quality, the START team investigated five case studies representing innovations in paper health register systems across various health domains and geographies. An overall summary of the case studies can be found here. The five cases include:

- Ethiopia’s Family Folder (FF) is a non-standard register innovation. Developed in 2008, this folder contains key indicators at the household level and contains individual records for each family member, allowing health extension workers easy access to both individual and aggregate data. Ethiopia Case Study
- Ghana’s Simplified Registers (SR) are a set of five consolidated primary care registers, including maternal and child health and family planning. They were introduced in 2010 as part of the Mobile Technology for Community Health (MoTeCH) initiative. Ghana Case Study
- South Africa’s 3-Tiered Antiretroviral Treatment (ART) Monitoring Strategy gathers a reduced number of monthly and quarterly data elements to track ART services for all patients receiving HIV treatment in South Africa. This strategy was developed by researchers in South Africa in 2004, and includes a paper tier for facilities with fewer patients and less infrastructure, and non-networked and networked electronic tiers for facilities with many patients. South Africa Case Study
- Uganda’s Tuberculosis (TB) and Leprosy Program Registers were updated in 2005 to include a mechanism for monitoring TB/HIV cooperative activities. This link allows patients with TB/HIV co-infection to be monitored by the system more easily. This case study focuses on the TB register (rather than the leprosy register), and particularly emphasizes modifications made to record TB/HIV collaborative activities. Uganda Case Study
- Uruguay’s National Immunization Program Register (SNNI) is a mixed paper and electronic system, in which vaccinators at all public and private vaccination facilities fill out a paper form for each vaccination encounter and submit the form for data entry into an electronic database at the national level. This system was developed in 1987 and is the oldest nominal register in Latin America. Uruguay Case Study

While the case studies represent a variety of health domains, many of the lessons learned are applicable to immunization program registers. The full project resulted in five individual case studies detailing each register innovation and a synthesis of the lessons learned from all five cases. The lessons learned demonstrate innovation in register design, human resource models, policymaking, and implementation strategies. This research demonstrates that many stakeholders – including funders, policymakers, public health officials, and health providers – can be a part of strengthening paper register systems to support evidence-based decision-making for improved patient care and accurate reporting.


Wamalwa, B. A barcoded vaccine card raised vaccination rates to 95% in rural Kenya. http://www.grandchallenges.ca/2014/barcodes-for-family-health-and-nutrition-raise-vaccination-rate-to-95/