Improving Health Programs in Resource-Poor Settings: A Vaccine Program Case Study in Haiti

By

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A Master's Paper submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Public Health in the Public Health Leadership Program.

Chapel Hill

2015

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Abstract

This paper provides an overview regarding initiation, sustainability and improvement of health programs in resource-poor settings, utilizing a specific example of an ongoing vaccine program in Haiti. Continuous Quality Improvement (CQI) is discussed as an effective tool to leverage activities and assets in resource-poor settings. Vaccine programs provide a useful example of cost-effective primary prevention public health programs which are implemented at the community level. The goal of these programs is immunization coverage. Thus, improvement efforts often aim to increase coverage rates in the target population. In the context of resource-poor settings, we review the main approaches and barriers in implementing and improving health programs, and review approaches for CQI as a methodology to carry out such programs. I also discuss limitations of CQI, and explore the important role of leadership in CQI.

Using a vaccine program in Haiti as a case study, examples of CQI methods and barriers are examined and evaluated. This program, which is currently ongoing, has made use of CQI methods in the planning, initiation, and implementation stages. Ongoing evaluation of results is underway to determine if implemented changes are leading to measurable improvements. Additionally, ongoing review will reveal potential barriers or unintended consequences of those changes. In discussing these concepts and the specific applications to this case study conclusions are drawn about how CQI has been used for vaccination programs in resource-poor settings. Also discussed is how these methods may be applied to other types of community health programs in similar settings in order to make the most efficient use of resources to implement system changes and achieve program goals relating to community health improvement.
Introduction

The evolution and utilization of vaccines has substantially impacted public health through the ability to prevent communicable disease and thereby reduce the global disease burden. Vaccines represent early investments in health which protect individuals throughout their lives and prevent morbidity and mortality. Additionally, vaccination represents a unique opportunity as a preventive public health tool which directly saves money, which is particularly useful in resource-poor settings (Ehreth, 2003). Though vaccination efforts and programs are cost-effective, a disparity in coverage rates exists between countries, particularly when national capacity, infrastructure, and wealth are considered. Coverage refers to the amount of a population eligible for an intervention that has actually received it; in this case, coverage may be represented by the number of vaccinated individuals out of the population eligible or in need of vaccinations (WHO, 2009). Closing the gap to attain high coverage rates worldwide would benefit both low-coverage and high-coverage nations (Ehreth, 2003). This may be facilitated through implementation of new vaccination programs and improvement of existing programs. This paper examines the application of vaccination programs in resource-poor countries and how quality improvement efforts can improve coverage and maximize their impact.

Vaccines: An Overview

More than 200 years ago, Edward Jenner discovered the concept of vaccination which ultimately led to the eradication of smallpox, one of the first major historical accomplishments of global public health (UNICEF, 1996). Because vaccines prevent and facilitate lifetime immunity to serious illnesses, they represent an early investment in the health improvement of populations. However, underutilization and decreased attention to the importance of vaccines remains a threat
to global health. Currently, the World Health Organization (WHO) estimates that up to 3 million deaths annually are saved thanks to vaccination (2015a). Alternatively, the WHO estimates that 1.5 million children die each year from diseases which might have been prevented by existing vaccines (2014). Coverage rates vary by country and region, which may be influenced by various underlying determinants including capacity, availability, awareness, and attitudes toward vaccines.

Vaccination and subsequent immunization within the target population constitutes the primary public health approach to protect and control vaccine-preventable infections. This strategy embodies the primary prevention focus of a public health approach and has a greater impact than relying on treatment alone (WHO, 2000). The phenomenon of herd immunity exemplifies the importance of immunization coverage particularly in populations who experience low utilization rates. As the number of immunized individuals increases, unvaccinated individuals also benefit from increased protection as the prevalence and circulation of the infective agents decreases in the population (WHO, 2000). However, each unvaccinated individual poses a threat to the population as they may re-introduce a disease to the population and negatively impact the overall disease burden of the community. Infants and young children are especially susceptible in these situations as they may have not yet been vaccinated and their immune systems are in a developing state.

In addition to health benefits, which are the primary focus of this paper, vaccination is a cost-effective preventive tool which is estimated to save nearly US$ 5 for each dollar spent; additionally, vaccine programs are financially easy to sustain in resource-poor nations (Ehreth, 2003). Eradication of communicable diseases confers global health benefits which subsequently translate to economic benefits. As countries spare expenditures on treatment for related illnesses
and resulting disability from vaccine-preventable illnesses, they also experience gains from a healthier and more productive workforce. The value of prevention is illustrated in examining costs related to a case of measles: not only does prevention confer US $10 of savings per disability-adjusted life year (DALY), but also treating one case of the disease costs 23 times more than vaccinating a child against it (Ehreth, 2003).

Vaccine coverage is a universal challenge for countries across the globe, though reasons for poor coverage may vary between them. Despite vast development and widespread use of vaccines in the past 20 years, resource-poor countries fall behind in coverage rates. Children in resource-poor nations are ten times more likely to die from vaccine-preventable diseases compared to children in more developed nations (Ehreth, 2003).

Especially in resource-poor nations, early investments in health, such as vaccinations, pay out to decrease long-term disease burden and minimize use of scarce resources for treatment of these preventable diseases. Additionally, in countries with low vaccine coverage, low herd immunity confers a higher risk to the population at large, particularly in the youngest and older populations. These groups are high risk as their immune systems are weaker or less developed and they may not have received vaccinations.

Haiti is a prime example of a resource-poor nation currently facing vaccine coverage challenges. In Haiti, vaccination programs did not begin until 1977. Increased coverage was not prevalent until more recent years; as a result much of the population over the age of 40 never received immunizations (Rainey et al., 2012). For example, comparing national coverage statistics for the third dose of the diphtheria, tetanus toxoids and pertussis vaccine (DTP3), Haiti’s population is only covered by 68%, meaning that one-third of those who should be vaccinated are not, while the United States reports a coverage rate of 94% (WHO, 2015b). In
comparison, other neighboring nations to Haiti such as the Dominican Republic and Jamaica currently report coverage rates of 83 and 93%, respectively (WHO, 2015b). In the WHO’s Global Vaccine Action Plan, five of six targets pertaining to global vaccination coverage will not meet goals for 2014-2015 (WHO, 2014). Many nations contributing to these poor coverage rates are resource-poor countries; by targeting improvement efforts on community programs in these areas, global coverage might also improve. In this paper, a case study is presented describing an improvement project to a vaccine program in Haiti in which I participated as part of my MPH practicum; it is examined as a case study to explore the effectiveness of and barriers associated with implementing and improving vaccination programs in resource-poor countries.

**Historical Background: Haiti**

A former French slave colony, the country of Haiti has been stricken with social, political, and economic ailments since its independence in 1804. The Caribbean nation, though less than 700 miles from the industrialized United States, experiences poor health outcomes in large part due to its socio-economic state. Over half of the population lives below the national poverty level and life expectancy at birth is 63 years, a decade less than the 73 years expected in the neighboring Dominican Republic (World Bank, 2015).

In Haiti, vaccine-preventable diseases represent a historic problem. However, the 2010 earthquake exacerbated this problem as the country fell into a state of emergency. A 2009 national survey found high coverage rates for the early-infant vaccines, but also revealed that many children failed to complete the entire vaccination course and initiated or received them later than the recommended age (Rainey et al., 2012). These issues represent critical focus areas for improvement and examining underlying determinants of such adherence barriers could be key to determine successful intervention and improvement strategies.
The 2010 earthquake jolted the country into a state of emergency in which all efforts were focused on reactive problems resulting from the disaster. Ongoing programs and preventive programs fell in importance as health relief efforts and rebuilding were the focus. Before the earthquake, DTP3 coverage rates in 2000 were estimated between 39-79% (PAHO, 2011). The country’s 2007 national vaccine campaign represented its largest effort to date toward immunization coverage and set forth to achieve vaccination coverage for 53% of the population (PAHO, 2011). Prior to the earthquake, the program yielded excellent progress upward toward nearly 80% coverage; since then, a drop resulted from the natural disaster and the nation has been struggling to reach its original coverage goals (PAHO, 2011). While country statistics show positive trends toward improved general health indicators, including a rise in childhood vaccinations from 53% to 62.5% between 2006-2012, continuous improvement toward better health outcomes is still ongoing in Haiti and represents an important public health goal (USAID, 2013).

Though government capacity and infrastructure weaknesses remain barriers to healthcare improvement and service delivery with regard to vaccination, finding creative solutions for existing programs and planning for future programs with these roadblocks in mind may positively affect outcomes and success. It has been estimated that there are nearly 10,000 nongovernmental organizations (NGOs) operating in Haiti, whose population is 10.57 million; that is nearly one NGO per 1000 people, resulting in the country’s pseudonym “a Republic of NGOs” (USIP, 2010; World Bank, 2015). While government capacity between resource-poor countries varies, the presence of NGOs as a source of aid in these nations is a common theme. Knowing best practices to utilize available community resources, including NGOs operating in an area, represents an important consideration in planning and improving community programs.
Goals of This Paper

Planning to utilize scarce resources and allow for continuous improvement is important for new and existing health programs in resource-poor settings. Practitioners may benefit from an examination of lessons learned and key success factors which affect community health programs in other resource-poor settings. In order to address these, this paper will cover the following topics:

1. Examine barriers to implementation and improvement of health programs in resource-poor settings,
2. Review potential approaches for CQI for health programs in resource-poor settings,
3. Explore the role of leadership in CQI for health programs in resource-poor settings,
4. Examine limitations of CQI for health programs in resource-poor settings,
and
5. Present a case study from Haiti to illustrate the topics listed above.

Barriers to Implementation & Improvement

For health programs in resource-poor settings, multiple barriers exist which complicate implementation and improvement efforts, and, in particular, the application of CQI techniques. These factors prevent successful launch of programs and impede continuous improvement, which may result in program failure and further prevent future programs from aiding target communities. For example, when reviewing vaccination programs these barriers include:

- Lack of resources
- Adequacy and availability of evidence-based interventions
• Change resistance
• Sustainability of programs, and
• Other vaccination-specific program barriers.

Resources

The most significant barrier for many programs in resource-poor nations is lack of resources which include financial, government support and reliability, and human resources. The cost to implement and carry out health programs is a significant challenge, specifically in resource-poor settings. In low-income countries, external resources such as government support to provide human resources and program supplies are lacking and unreliable. Resource constraints negatively impact the ability of program practitioners to implement and maintain CQI initiatives (Ramaswamy & Barker, 2013).

Human resource limitations are a significant barrier which impede program implementation and improvement. These limitations include adequacy of resources, attitudes of staff, training, and technical competencies. Resource-poor settings are susceptible to a phenomenon known as brain drain, in which trained practitioners migrate away from resource-poor countries resulting in a shortage of capable individuals to implement and improve such programs (Lofters, 2012). In addition to a shortage of qualified health care workers, staff attitudes can adversely impact the effectiveness of a program. If staff have negative attitudes or don’t seem to care about patients or a program, patient interest in and adherence to the program could be affected and therefore influence overall effectiveness (WHO, 2000). Staff motivation due to poor resources or pay also represents an important barrier to program implementation and improvement. Finally, lack of training and education resources for program staff can impede program success and implementation (Kochhar et al., 2013).
Implementing effective programs can be affected by additional factors including government planning and capacity, availability of data regarding the target population and impacts of an intervention, various factors regarding the target population, health burden on the target population of the disease in question, community outreach strategies, and engagement levels by all stakeholders (WHO, 2005).

Evidence-based interventions

Implementation requires evidence that an intervention works and that it can be sustainable in different populations (WHO, 2005). However, lacking resources to find evidence-based strategies regarding implementation and maintenance can impede on the program’s ability to launch and improve. Without existing research showing lessons learned and best practices, practitioners have few resources to determine the best designs for programs and evidence by which to make program-related decisions (Kochhar et al., 2013). Finding evidence-based interventions and the adaptation of such interventions is discussed further in this paper’s section regarding approaches for CQI.

Change resistance

Embracing change is a critical component of CQI. However, systems naturally evolve over time and thus are change-resistant in nature (Ramaswamy & Barker, 2013). Implementing change and obtaining buy-in is particularly difficult in resource-poor settings where poor financial support exists. Further complications relate to human resources including weak management and poorly trained and de-motivated employees (Ramaswamy & Barker, 2013).

Sustainability

Commitment to a project is prerequisite to allow a program to thrive until improvement efforts are possible. If project funding or enthusiasm diminishes over time, CQI efforts may
never have a chance to be implemented. Particularly in low-resource settings, community health programs often end shortly after initial funding ends (Shedic-Rizkallah & Bone, 1998). Lacking attention to sustainability in early program planning may increase the likelihood of such programs to fail, lose funding, and prevent maintenance and CQI efforts.

**Vaccine-specific program barriers**

Introducing and increasing coverage of vaccines in resource-poor countries faces unique barriers. First, companies have few incentives to develop affordable vaccines for conditions which may only affect resource-poor nations, such as Malaria (Kochhar et al., 2013). Assessment of disease burden within a country may be a prerequisite for program success, though epidemiological methods and infrastructure might be unavailable to accomplish this (Kochhar et al., 2013). Various logistical issues also may impede full program implementation. These include requirements for multi-dose vaccines and associated challenges to maintain the cold chain (or refrigeration requirements for vaccines as well as storage conditions), religious objections based on community and cultural beliefs, and a knowledge base of evidence (Kochhar et al., 2013).

The World Health Organization also outlines specific factors which may impede program implementation and improvement, specifically with regard to immunizations. Many of these are directly applicable to Haiti and other resource-poor settings and therefore should be targeted in program planning and CQI activities. Lack of knowledge in the target population and misperceptions about the program, specifically vaccines, relating to their importance may prevent families from taking part in immunization programs (WHO, 2000). Voodoo-based cultural beliefs are particularly influential in Haiti and may pose a significant barrier to vaccine attitudes in certain areas. Other barriers in relation to the target population include birth order, family size, and family mobility. With each additional child in a family, the probability that the
youngest child is not vaccinated increases. Additionally, requiring families to return on multiple occasions for additional vaccines decreases the likelihood for compliance of multiple vaccines for families with multiple children (WHO, 2000). Family mobility or when families move decreases the likelihood of patients to adhere to a program and complete vaccines (WHO, 2000). Other factors include environmental and logistical barriers such as climate, geography, and healthcare access, socio-economic status which also affects healthcare availability and access, and social and political stability, which particularly affects most low-income countries (WHO, 2000).

**Approaches for CQI**

CQI can be used to identify and target deficient program components, implement changes, and track improvement progress based on various metrics that include health indicators, such as coverage rates, as well time or money saved. CQI in resource-poor settings is an important process as it may improve efficiency and efficacy of programs. Best practices to implement CQI can be derived based on a literature review of articles regarding program implementation and improvement in resource-poor settings. Approaches for CQI can be classified into two categories. First, setting the stage for CQI involves program planning and implementation activities such as securing resources, project initiation, and beginning of planned activities. Second, CQI initiatives can also be implemented during program maintenance, or once a program has completed start up and is in operation.

*Setting the Stage for CQI*

In the planning stages of a project, attention to sustainability is critical to assure the project enters maintenance during which CQI can be implemented. Planning for sustainability focuses on viability of a project for the long-term and takes into account the effective and
efficient use of resources, which is particularly important in resource-poor settings (Shediac-Rizkallah & Bone, 1998). In order to avoid exhaustion of funds prematurely, programs should be integrated within existing community infrastructure and resources secured early (Shediac-Rizkallah & Bone, 1998). Communities may show low trust and support for programs in settings in which prior programs have failed to endure over the long-term; in order to mitigate this and break the cycle of mistrust, early planning for sustainability is critical to encourage community support (Shediac-Rizkallah & Bone, 1998). Sustainability planning eventually permits program evaluation and CQI. The importance of sustainability is especially true for vaccine programs as interventions will be needed over time and for new generations born into the community who will benefit from immunizations (Shediac-Rizkallah & Bone, 1998).

Smith and Mourie outline strategies to prevent implementation failure (1999). Program implementers must recognize that programs require an initial investment of money and time. They should be wary to limit competing priorities and commit to the long haul to avoid implementation failure. Implementation is best accomplished by thinking small and scaling up. For example, using a pilot program and evaluating success might increase probability for program success. Building alliances within the community and at organizational levels as well as planning within an infrastructure also increase success probabilities for a program. Furthermore, integrating any programs or changes to pilot programs into management systems is critical for improvement; this requires buy-in from outside stakeholders and particularly program funders (Smith & Mourier, 1999). Involving all stakeholders in data collection and setting concrete and measurable aims that relate to process improvement may improve participation and allows stakeholders to see concrete examples of improvement (Ramaswamy & Barker, 2013).

Additional measures which may increase probability of implementation success include
collaboration with all stakeholders to identify change ideas and establishing a learning network to share strategies and successes (Ramaswamy & Barker, 2013).

Identifying Opportunities and Implementing CQI

Once a program enters maintenance, evaluating areas for CQI opportunities is the first step in process improvement. The seven quality tools which include flowcharts, cause-effect (fishbone) diagrams, check sheets, histograms, pareto charts, scatter plots, and control charts can be used not only to drive improvement efforts but also to identify areas for improvement by evaluating baseline processes. For example, utilizing a cause-effect diagram, practitioners can pinpoint drivers affecting outcomes and therefore target those for improvement. Interventions should target process improvement and specific outcomes; systems’ strengthening is particularly important for CQI (Ramaswamy & Barker, 2013).

Control charts can be used to monitor program performance and identify special causes for changes in performance. Additionally, these can be used to track progress following a change. For example, using a control chart to document vaccine administration over time may show certain periods in which rates are low. Examining potential causes for this dip and addressing them can be important to improve a system.

In choosing a strategy, practitioners should also consider which intervention(s) will have the most impact based on inputs. An impact effort matrix can be utilized to decide which interventions are selected. Plotting interventions on a matrix which displays the impact versus effort required to implement a solution will aid in prioritizing actions, particularly in resource-poor settings (Andersen, Fagerhaug, & Beltz, 2010). Appendix A portrays an example of this tool. Interventions can be categorized as low impact/low effort, low impact/high effort, high impact/low effort, or high impact/high effort. Depending on the available resources and needs of
a program, practitioners can prioritize changes based on categorizing options. Low impact/high effort options are the least desirable, while high impact/low effort options are optimal.

Utilizing existing research and evidence-based strategies will aid in decision-making for CQI efforts. Systematic literature reviews can facilitate identification of such strategies (Waddington et al., 2012). Critical steps involved in a successful literature review include setting a good question, developing comprehensive search strategies to include both published and unpublished sources to prevent publication bias, screening results to identify relevant articles for inclusion, synthesizing results and evidence, and finally generalizing evidence (Waddington et al., 2012).

Adapting approaches identified from systematic literature reviews and evidence-based models is critical to increase the probability of success for an intervention applied in alternative and unique settings. Because most interventions are context-specific, drawing generalizable conclusions may be difficult and warrants tailored adoption; rather than examining a single study, comparing multiple findings from systematic reviews increases the generalizability of results (Waddington et al., 2012). Utilizing pilot studies can confirm to implementers if they are on track with tailored approaches (Hulscher, Laurant, & Grol, 2003). Although tailoring interventions can assure program success in various contexts, for example with cultural considerations, practitioners should take care to assure core components of evidence-based interventions are not compromised. Practitioners operating within a community often hold the cultural awareness to adapt the intervention, but should assure they have adequate information regarding how such changes to an intervention might affect outcomes (Doyle & Hungerford, 2014). Identifying core components prior to adaptation includes examining core intervention components, which are comprised of supporting theories and should not be changed as these
contribute to effectiveness of the intervention, and core implementation components, which aid in program implementation and thus are open to change, such as human resourcing or funding (Doyle & Hungerford, 2014).

In order for program planners to implement CQI initiatives, implementers and management should anticipate and plan for change resistance in stakeholders. Common reasons for change resistance include misunderstanding and lack of trust, self-interest, and low tolerance for change (Kotter & Schlesinger, 2008). By analyzing these factors, managers can determine the optimal rate by which to implement changes and prepare to address resistance (Kotter & Schlesinger, 2008). Resistance management methods include education, participation, skills training, support, negotiation, and coercion as a last resort (Kotter & Schlesinger, 2008). Addressing change resistance may be particularly important in resource-poor settings where stakeholders are concerned with efficient and effective use of limited resources. Education may be useful to inform stakeholders how change will benefit the program and organization at large.

Finally, process evaluation is critical to describe the implemented intervention and evaluate its effectiveness. Evaluating success allows practitioners to make necessary changes prior to scale up (Hulscher et al., 2003). Studying lessons learned may aid in identifying core components that resulted in the desired changes for the target outcomes and help develop an evidence base for successful CQI interventions (Hulscher et al., 2003). Evaluation and continuous improvement can include one of the core methodologies of CQI, the PDSA framework. The PDSA framework is a model to test and evaluate changes as part of CQI (Ramaswamy & Barker, 2013). By planning a change (P), implementing it (Do), studying it (S), and acting on it (A), which includes making decisions based on the evaluation, practitioners
may ensure changes are appropriate and effective and plan further changes (Ramaswamy & Barker, 2013).

**Role of Leadership in CQI**

Leadership is critical to effectively implement CQI, especially in resource-poor settings. A key leadership role is to define the mission and vision of a project, assist in finding evidence-based interventions, identify sources of resources, spearhead change efforts, and address change resistance. Each of these aspects is discussed in further detail to outline techniques required by leaders to positively affect CQI efforts.

Defining a mission and vision are critical to rally stakeholders around a cause and generate support for program implementation and improvement. Leaders should form a shared vision that motivates team members, is actionable, and achievable (Melum & Sinioris, 1992). Compelling vision statements will set a culture of CQI and instill commitment to excellence and continuous learning and improvement (Melum & Sinioris, 1992). By setting these goals and establishing a culture of CQI as well as leading by example, leaders play an important role to initiate and maintain CQI efforts within a project and organization.

A leader also serves to identify, adopt, and adapt evidence-based interventions based on existing research. Involving important stakeholders and local leaders in program introduction may constitute a key success factor to implementation (Kochhar et al., 2013). Therefore, a program champion or leader has the important role to facilitate input from such stakeholders. Additionally, leaders will be responsible for conducting systematic literature reviews to identify interventions. By collaborating with stakeholders, they may spearhead efforts to adapt these and implement changes in current or new programs.
Leaders also play an important role to advocate for changes and resources for a program. Identifying and securing strategic partnerships will impact the ability of a program to thrive and improve, particularly in a resource-poor setting. Similarly, leaders can spearhead efforts to provide training and education or CQI methods and improvement-related changes to a program.

As discussed before, change resistance is a common barrier to CQI. Therefore, the role of leadership to address change resistance is particularly important to push through change efforts and remediate resistance and stakeholder reactions. Management requires leadership skills to support team members through changes and assure team members are well-informed, educated, and involved in changes (Kotter & Schlesinger, 2008).

Limitations of CQI

CQI may serve as an important tool to increase efficient use of scarce resources and effectiveness of community health programs. However, specific limitations may hamper the successful application of CQI, especially in the context of resource-poor settings. These limitations include sustainability, resources, CQI expertise, adaptability of interventions, and bureaucratic factors.

Without funds and motivation to sustain a program, CQI cannot take place. Sustainability of a program and the likelihood for program discontinuation due to funding changes limits CQI opportunities (Shediac-Rizkallah & Bone, 1998). Program sustainability is largely affected by three major categories: “project design and implementation factors, factors within the organizational setting, and factors in the broader community environment” (Shediac-Rizkallah & Bone, 1998). Project design and implementation factors specifically include project effectiveness, duration (since funders desire evidence of quick results), financing (which encompasses demand or beneficiaries’ willingness to pay for services and supply of program
funds), and project type (Shediac-Rizkallah & Bone, 1998). Preventive programs, such as vaccine programs, are more difficult to sustain than programs with a curative focus due to resource allocation implications (Shediac-Rizkallah & Bone, 1998). A key factor within the organizational setting affecting sustainability is the extent to which a program can be integrated into existing programs and services. This also relates to the necessity of a program champion and leader for the program (Shediac-Rizkallah & Bone, 1998). However, because in resource-poor settings funding for various projects may come from different sources including private donors, NGOs, or government organizations, it may be difficult to incorporate changes within existing programs. Sustainability also is influenced by community environment factors which include economic and political considerations. In disadvantaged communities, competing problems may exist including poverty and unemployment. Additionally, in these communities, ongoing external funding may be necessary to sustain services (Shediac-Rizkallah & Bone, 1998). These factors are particularly exacerbated in resource-poor settings.

As previously discussed, resource limitations present a significant barrier to program improvement. Without adequate personnel or training programs, improvement may not be possible. Additionally, inability to access information regarding evidence-based strategies and mechanisms by which to best adapt these programs to context-specific programs further complicates the effectiveness of improvement. With limited access to publications and databases to identify evidence-based strategies due to resource-poor settings, programs may replicate errors of failed efforts. Similarly practitioners will be unable to access documentation of success factors to use in their programs.

Lack of formal training in CQI by program leaders or stakeholders also will affect the process of improvement. Without a basis of knowledge on CQI principles, changes may be
misguided or result in wasted efforts. Particularly in resource-poor settings, training resources may not be available to program teams and therefore utilization of CQI tools and principles are limited.

The ability to adapt and tailor evidence-based solutions may also pose a limitation to CQI. Specifically, if practitioners are unaware of local cultural considerations, they will not have adequate knowledge to design program adaptations (Doyle & Hungerford, 2014). Identifying core components of an intervention and assuring integrity of these in application is critical and if compromised or adapted, their effectiveness may decrease (Doyle & Hungerford, 2014). This suggests that it may be difficult to adequately adapt some interventions to contextual needs without compromising intended impacts of the intervention.

Finally, bureaucratic limitations may exist due to the nature of funding and oversight particularly in resource-poor settings. Because external parties are often funders of community programs, these sponsors could have undue influence over how a program functions. Policies and scope limitations of funding organizations may affect CQI acceptance at the program level and limit flexibility. The experimental processes associated with CQI may be scrutinized unfairly or too rigidly by external funders if quick improvements are not evident in short time frames and may lead to premature funding cuts.

**Case Study: “Program Implementation and Strengthening: Community Childhood Immunizations in Haiti”**

The “Program Implementation and Strengthening: Community Childhood Immunizations in Haiti” project aimed to identify and address barriers to implementation and success of a community vaccine program in a resource-poor setting within a developing nation. The project took place at a local community clinic in Croix-des-Bouquets, Haiti which was recruited as a
center under the national vaccine program. Each clinic within the vaccine program, as mandated by the Haitian Ministries of Health (MOH), aims to achieve 98% vaccine coverage within its assigned geographic zones. An evaluation of this Haitian clinic vaccine program through the examination of its processes and components facilitated identification of specific barriers to implementation and improvement. My role in this project was part of an MPH practicum and serves to illustrate key points of this paper.

Background Overview

Clinique Saint Esprit in Croix des Bouquets, Haiti, joined a government-led vaccine program under the direction of the non-profit clinic’s Medical Director. The clinic was assigned a surrounding geographic area for which it is responsible to vaccinate approximately 5,000 children. The clinic implemented the vaccine program in pilot zones with intent to scale up and obtain 98% coverage for its assigned 10 zones by the end of the first year; this coverage goal is a key outcome measure targeted by the program. The program utilizes in-clinic vaccination days to which community members bring children as well as outreach activities by Community Health Workers (CHW) to administer vaccines in the community and facilitate mass vaccination events.

Barriers to Implementation and Improvement

As discussed earlier, key barriers to implementation and improvement involve lacking resources, availability of evidence-based interventions, change resistance, program sustainability and other vaccine-specific program barriers which may include cultural beliefs. CQI efforts are limited by the above listed factors as well as lacking trained practitioners and leaders to spearhead improvement efforts. Barriers to program success can be categorized into implementation and maintenance. Implementation barriers refer to items which prevented and
complicated planning and scale up for the program. Maintenance barriers to success affect the ability of the program to enter and function in stable process and continuously improve.

Implementation barriers to the vaccine program were resource-driven. CHWs were not utilized during program implementation because government payments to these employees ceased, so they refused to work. Until government stipends are re-issued, CHWs will not participate in the program. The clinic was also unable to hire additional staff dedicated to the vaccine program, so already sparse human resources were stretched thin to cover the additional program. Finally, as a result of the inability to utilize CHWs, the program approach was compromised. Clinic nurses and the program director had to spend time away from the clinic to perform outreach activities which should have been delegated to CHWs.

Ongoing barriers for the program to achieve maintenance and continuously improve include financial constraints, human resource constraints, and government resources. As a non-profit organization, financial resources are limited and the program must try to work within its current limited budget. This impacts the ability of the program to hire staff or pay CHWs to aid with vaccine program work. Related to this is the unreliable nature of government support. Though a government program, external funders originally were assisting the Haitian government to implement the program. Once the funding responsibilities were transferred to the Haitian government, CHW stipends ceased. Additionally, though the government provides vaccines to the clinic, resupply is unreliable and the clinic may not receive necessary supplies when needed.

Approaches to CQI

The goal of the “Program Implementation and Strengthening: Community Childhood Immunizations in Haiti” project involved not only examining and identifying barriers to program
success, but also to identify areas for improvement and implementation of changes. Various CQI tools were used to plan and facilitate improvement in this project. For example by observing program processes, flow diagrams of both clinic and outreach processes were constructed to identify and evaluate delays and inefficiencies (see Appendix B). A fishbone diagram, which is another quality tool to display drivers and sub causes of an outcome, was also constructed to note which factors affect the program coverage goals (see Appendix C). After identifying which drivers were within the realm of control of the program, improvement efforts were focused on those process areas. The following targets for improvement were determined:

1. Create electronic forms to take the place of manual data entry
2. Increase patient follow up
3. Identify potential outside funding partnerships to support CHW activities.

The program’s paper log of patients and vaccines as well as the monthly report were transformed into electronic forms. As part of the program processes, monthly reports are manually tallied and the paper patient log is not user friendly and therefore time consuming during clinic to locate and update records within the log. Electronic formatting will allow quicker location of patients within the log to encourage a steady flow during clinic. Additionally, the log can alternatively be utilized as a forecasting and analysis tool since electronic data can be filtered and output to reports. The monthly reports were created into automated interactive spreadsheets which will reduce manual data entry and work as well as decrease room for error in tallying monthly totals. As part of sustainability planning, the clinic will need to plan for computer maintenance and repairs to permit continued electronic record keeping. By planning for these barriers early on, the program might mitigate future challenges common to resource-poor settings which are associated with this change.
The program will also attempt to increase the frequency of patient follow up via phone calls for patients who have not returned to the clinic for vaccines or are lost to follow up. Theoretically, clinic staff will save time to complete program activities thanks to utilization of electronic logs and reports and thus be able to allot that time to follow up activities. This trade-off allows clinic staff to maintain current allocation, but complete additional program-related activities. The current practice does not include extensive follow up to patients, but by regularly following up with such patients, the clinic may increase coverage by decreasing missed visits and patients lost to follow up.

Finally, as part of the improvement process, the clinic will seek to identify external partners to provide funding to re-employ CHWs. Though the program is unable to affect government funding of this human resource, the use of CHWs is critical to outreach components of the vaccine program. Therefore, seeking external funding opportunities and partners may prove a successful method to secure funding and utilization of CHWs. As stated earlier, challenges with commitment and sustainability of funding might complicate partnering to staff CHWs. Assessing options and evaluating the ability of potential partners to commit to the program for the long-term will be important in selecting a partner organization.

The program is in early stages of change implementation. As part of next steps, the program will document progress and evaluate effectiveness of changes. Program leaders will identify and address barriers to implementing changes and document lessons learned from the initial change as part of a larger PDSA cycle. This may involve use of CQI methods and tools, such as control charts, to track progress. Process evaluation based on these changes will allow meaningful conclusions regarding if these interventions served to improve effectiveness and
efficiency as intended and what the next steps are to refine or expand improvement changes for the program.

**Discussion**

In review of the main paper topics, conclusions can be drawn regarding utilization of CQI for community health programs and specifically benefits to vaccine programs. Immunization programs are particularly useful in resource-poor settings as they prevent resources spent on vaccine-preventable illnesses. Utilizing primary prevention impacts the target population in a greater way than solely relying on treatment (WHO, 2000). CQI assures efficient implementation and best use of scarce resources and limited funding. CQI is a valuable tool for resource-poor settings as it can improve process outcomes by targeting system components (Ramaswamy & Barker, 2013). Vaccine programs provide an excellent example of how changes to processes through CQI methods can directly result in ongoing sustainability and increases in coverage in the target population.

Due to the nature of limited and unreliable assets in resource-poor nations, CQI is an important approach to maximize the efficiency and impact of health programs in resource-poor settings. CQI can act as a tool to help practitioners leverage limited resources toward the greatest impact. Training and educating practitioners and project teams on CQI principles will improve the potential for its use and dissemination within these communities. Dissemination through publication or collaborative groups will be critical to expand lessons learned and share key success factors or challenges, which ensure a better future for other practitioners (Ramaswamy & Barker, 2013). This could involve sharing success stories with other practitioners as part of a learning network for similar initiatives or applying CQI principles to other health programs within the organization (Ramaswamy & Barker, 2013).
The role of leadership at various levels, such as organizational, program, and community leadership, will be critical to implement and instill CQI values in organizations and communities. Therefore, identifying and empowering program champions is important to lead change efforts. In the case of vaccine programs, the CHWs and key community leaders will be important partners to advocate for the adoption of vaccines and adherence to immunization schedules, including utilization of CQI as a powerful approach to carrying out this mission. Leaders will be champions of these initiatives and serve to educate stakeholders regarding utilization of CQI as well as its associated challenges, while helping them prepare for these.

Leaders play a role in identifying and adapting solutions to specific contexts within which programs will operate. For example, in implementing vaccine programs in different geographic zones, approaches may require adaptation and tailoring to the unique characteristics of each target population. Sustaining CQI efforts will require collaboration with other leaders as well as troubleshooting for change-averse individuals within the organization and other stakeholders. Fostering an environment of quality and continuous improvement will further improve likelihood for program sustainability and growth to achieve maximum vaccination coverage rates.

Challenges and Benefits of CQI

Though the potential for benefit is vast from utilization of CQI in resource-poor settings, a review of the literature consistently noted difficulties in finding and adapting evidence-based approaches to aid in program implementation and improvement. Better documentation regarding key success factors for vaccination and other health improvement programs and in certain settings is needed to promote successful programs and CQI efforts. Utilizing lessons learned from other programs will benefit current and future programs to avoid similar downfalls.
Despite these challenges, CQI can effectively identify process measures which affect program objectives and address these. For vaccine programs, CQI can increase effectiveness of processes to increase coverage rates by maximizing efficient use of time and resources to immunize the population as well as address barriers to adoption of and adherence to vaccine schedules. In the Haitian case study presented here, duplicate and manual entry work were identified as process delays leading to decreased capacity to vaccinate individuals. By addressing these, the program may free additional time for patient follow up to impact coverage rates and affect the ultimate output goal. Therefore, process streamlining through the application of CQI methods can maximize outputs with the most efficient use of time and effort. However, monitoring these changes may bring to light challenges associated with implementing and sustaining improvement efforts and changes to current processes. Additionally, ongoing monitoring of coverage rates before and after change implementation, utilizing CQI tools may inform program directors of the effectiveness of those changes and identify additional need for further process evaluation and improvement.

Key Findings

In summary, vaccine programs are cost-effective public health programs, but require ongoing improvement in order to maximize impact with the resources at hand. Particularly in resource-poor settings, CQI can be used to identify process delays and inefficiencies within a vaccine program which may impact program goals. By utilizing quality tools to examine program processes, drivers, and statistics, practitioners can target improvement efforts to improve the program system, which is comprised of its human resources, funds, supplies, and processes. Ultimately, vaccine programs can benefit from CQI to improve each system.
component and potentially operate in a more efficient and effective manner to affect
immunization coverage in the target population.

Key findings from this paper and a review of the literature indicate that CQI represents an
opportunity, but there are associated challenges which include tailoring programs and finding
evidence-based interventions. The role of leadership is essential to implement and sustain
programs and CQI initiatives surrounding them. CQI can be used as a framework to improve
health projects in resource-poor countries, which includes vaccination programs.

Generalizing these Concepts

The challenges, opportunities, and concepts associated with CQI for vaccine programs in
resource-poor settings can be generalized to other community health programs in other similar
settings. For example, a malaria control program in Ghana successfully implemented
improvement initiatives and utilizing CQI tools was able to identify resource needs and other
areas for improvement which can be applied to other similar programs in sub-Saharan countries
(Ramaswamy & Barker, 2013). In another documented example, an improvement team used the
PDSA framework to redesign a local health system in Russia ultimately resulting in improved
outcomes relating to maternal and child health (Ramaswamy & Barker, 2013). As documented
by these examples, the lessons learned from CQI efforts for a vaccine program in Haiti can be
generalized to other primary prevention efforts such as nutrition or vector-borne illness control in
other resource-poor settings, whether those be areas within high-income countries or settings in
developing nations. In order to use CQI to modify systems to produce positive health outcomes,
program leaders should adapt improvement methods to specific contexts settings and instill early
planning for quality improvement within health programs (Ramaswamy & Barker, 2013).
Conclusions drawn from this discussion are not only limited to community vaccine programs in Haiti, but also can be extended and applied to other health improvement efforts in other settings.
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Appendices

Appendix A: Impact Effort Matrix

(Andersen, Fagerhaug, & Beltz, 2010)

The numbers in each zone represent different options for interventions or changes, showing examples of how different changes confer varying degrees of impact and effort. Option 1 represents a low impact/low effort change, while option 3 represents a low effort, high impact change. Based on these, option 3 would be desirable over option 1.
Appendix B: Flow Diagram as tool for CQI for Haiti Immunizations Program

The above flow diagram was constructed after observing clinic immunization processes for the Haiti Vaccine Program. By evaluating the steps in this process and identifying rate-limiters, teams can identify areas for change or ways to streamline the process.
Appendix C: Fishbone Diagram as tool for CQI for Haiti Immunizations Program.

This fishbone (or cause-effect) diagram was created to show the main drivers (in bold) affecting immunization coverage for my practicum to improve the Haitian vaccine program. Sub-causes of those drivers are noted as offshoots; furthermore, factors which can be altered or influenced by the study team are noted in red. These are factors which should be targeted for CQI intervention; the black factors are out of the control of program planners and improvers. One factor not noted in this diagram, but mentioned in the paper is that of cultural beliefs which include wives tales, voodoo beliefs, and lack of education or resources within the population to understand the importance and safety of the process. Also noted in the paper discussion are other family factors, such as number of children, which were shown in the literature to affect coverage.