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DELIVERING WATER, SANITATION AND HYGIENE SERVICES
IN AN UNCERTAIN ENVIRONMENT

Designing a school water treatment and interactive education program in Kenya to enable future scale-up

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Many small-scale public health efforts including those to improve water, sanitation and hygiene (WASH) have not expanded beyond their initial scope. To improve the likelihood of scaling, the goal of this project led by the Program for Appropriate Technology in Health (PATH) was to design a small-scale innovative WASH project in three schools (the pilot) that was embedded within a larger-scale, multi-year program (AIDs Population and Health Integrated Assistance plus [APHIAplus]) focused on capacity-building to achieve integrated health delivery in Kenya. The innovative elements of the pilot included use of onsite electrochlorination and an interactive WASH curriculum that resulted in improved water quality and WASH knowledge at the schools. By aligning the pilot with the results framework of APHIAplus and utilizing a pre-existing partnership with schools, the integrated approach provided structure for implementation and an efficient use of resources. The pilot will be expanded to include 23 schools in 2013-2014.

Introduction

National surveys have indicated that less than half of Kenyan schools have access to safe water (JMP 2010, UNICEF 2010). The five-year Sustaining and Scaling School Water, Sanitation and Hygiene Plus Community Impact (SWASH+) project in Nyanza province, Kenya, worked with 185 primary schools to test solutions to improve water, sanitation and hygiene (WASH) conditions. SWASH+ and other school-based water treatment and hand-washing interventions have highlighted the impact that WASH improvements can have on child health and education. For example, these interventions led to reductions in pupil absenteeism by 26 to 39 percent (OReilly et al. 2008, Blanton et al. 2010, SWASH+ 2012). SWASH+ found that increasing WASH software (knowledge) must be emphasized in addition to hardware in order to be effective and achieve sustainability (SWASH+ 2012). SWASH+ also identified that school supply chain and budget constraints are key limitations of water treatment and hygiene interventions because replacement consumable goods like chlorine and soap are often not purchased (SWASH+ 2012). Hence, promising approaches should also identify how schools and governing bodies can address the challenge of providing and budgeting for consumable goods.

Given the great public health need for improved WASH in schools, there is urgency to scale up promising school WASH programs. However, transitioning public health interventions from small to large scale can be challenging due to insufficient planning and resources. Similarly, funding priorities and grant cycles often favor testing novel approaches over short time periods. As a result, many promising pilot projects are prematurely dropped without reaching their fullest potential (Simmons et al. 2007). Not only is this unfortunate from a public health perspective, but performing isolated small-scale projects can be an inefficient use of resources. Considerable effort goes into the development of programs, and scale-up does not always incur costs linearly. For example, the cost of implementing a WASH program in two schools may be less than doubling the cost of implementing the WASH program in one school (some program tools may be reusable, etc.). As a result, our

goal was to develop a small pilot-scale school WASH program to be embedded within a larger, integrated health program that would allow for initial piloting, moderate expansion and then eventual scale-up.

Pilot goals and design

The larger, five-year, integrated health program, the AIDS Population and Health Integrated Assistance plus (APHIAplus) Western Kenya project is funded by the United States Agency for International Development (USAID) and led by the Program for Appropriate Technology in Health (PATH). The overarching goal of APHIAplus is to strengthen existing structures to build capacity and achieve fully integrated service delivery resulting in sustained improvements in health and well-being for Kenyans (Figure 1). Within this framework, APHIAplus focuses on many programmatic areas including HIV/AIDS/TB integration; HIV prevention, care and treatment; maternal and child health and survival including malaria and nutrition; building coalitions and public-private partnerships to address social determinants of health; and community and school WASH with a focus on orphans and other vulnerable populations affected by HIV/AIDS. Four organizations make up the implementing consortium: PATH (lead organization), the Elizabeth Glaser Pediatric AIDS Foundation, Jhpiego, and World Vision. The project manages sub-grants with over 90 local not-for-profit and civil society organizations to deliver program activities.

The small-scale, nine-month, water treatment and education pilot project in three schools in Butere District of Western Kenya was co-funded by the 2011 Reed Elsevier Environmental Challenge and the USAID APHIAplus Western Kenya project. The pilot had two immediate objectives: 1) to improve school water quality and 2) to increase knowledge about WASH in schools and surrounding communities. In order to improve water quality, schools treated water with the Smart Electrochlorinator 200 (SE200), which generates chlorine on demand. The SE200, co-designed by Cascade Designs, Inc. and PATH, produces enough chlorine to treat 200 L of water in 6 to 8 minutes using only salt, water, and power. By using locally available salt and generating chlorine on demand, the SE200 minimizes resupply issues common to chlorine water treatment. In order to address the second goal of increasing WASH knowledge, schools tested an interactive education program designed to promote creative thinking via hands-on exercises in contrast to conventional lecturing and rote memorization. The lessons, developed in partnership with American and Kenyan teachers, covered topics related to water, science and hygiene. One lesson used glow-in-the-dark lotion to teach about germ theory and environmental disease transmission. In another lesson, pupils played a game where they were assigned the role of "chlorine molecule" or "pathogen" to teach about chlorine-based water treatment.

The pilot project was strategically designed to enable scale-up within APHIAplus by: 1) aligning with the APHIAplus goals and results framework (Figure 1), and 2) complementing ongoing APHIAplus activities targeted at orphans and vulnerable children and aimed at enhancing access to improved water supply, sanitation and hygiene. PATH led the development, implementation and evaluation of the pilot project. However, the pilot study required coordination between staff from World Vision and PATH since World Vision is the lead agency for the expected outcome of enhancing access to improved water supply in communities and schools and improving sanitation and hygiene.

APHIAplus supported the installation of water storage tanks, hand-washing facilities, and ventilated improved pit latrines in 78 schools in Nyanza and Western provinces. Therefore, pilot schools already had water storage capacity in the form of rainwater harvesting tanks. Introducing water treatment via the SE200 in these pilot schools (to improve water quality) complemented ongoing APHIAplus activities (to increase water quantity). In this way, the pilot also challenged whether water supply alone was sufficient to improve access to safe water. Furthermore, the pilot targeted the intended beneficiaries (marginalized, poor and underserved populations) more effectively because it was embedded within an integrated, health-based results framework.

Other APHIAplus activities, like School Health Days, educated pupils on issues pertaining to disease and hygiene on a regular basis. During School Health Days, political and community players including representatives from the Ministry of Public Health and Sanitation (MoPHS) and Ministry of Education (MoE), community health workers and parents visited the schools to address pupil health. The pilot interactive WASH lessons enhanced these APHIAplus educational activities by providing more in-depth coverage of WASH topics.

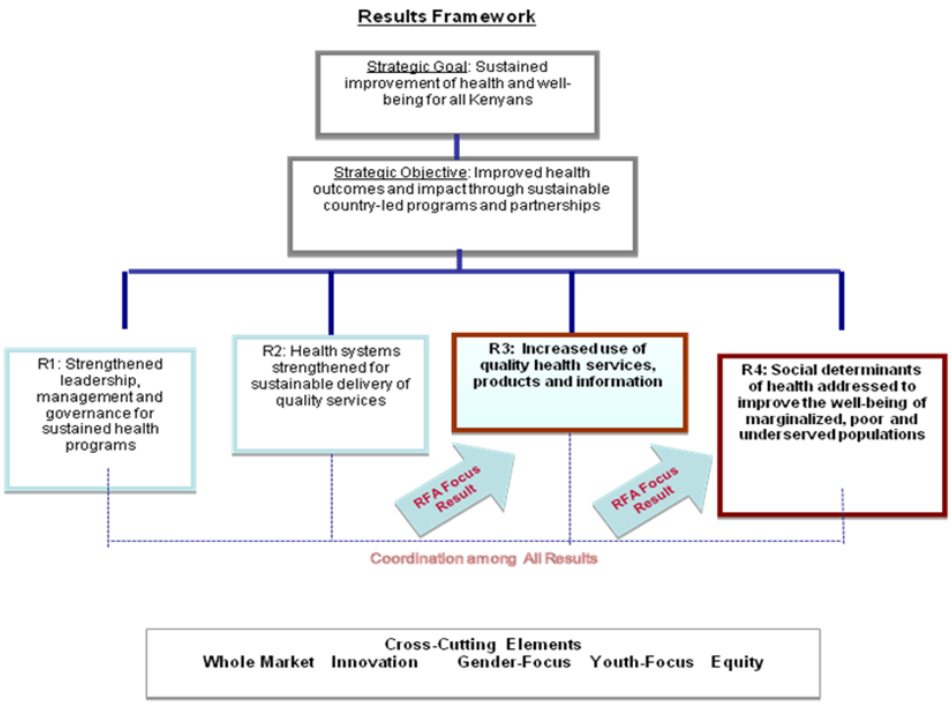

Figure 1. USAID APHIAplus results framework

Source: USAID request for applications (2010)

Pilot activities and evaluation

The following pilot activities, led by PATH, occurred during three phases:

1. Pre-implementation:
   - Water sampling to measure microbial contamination and chlorine concentration of available drinking water at each school
   - WASH knowledge tests for 20 participating pupils at each school
   - Information sessions for parents of the 20 participating pupils
   - Training workshops for teachers and MoPHS and MoE officers regarding SE200 water treatment and educational lessons
2. Implementation:
   - Introduction of the SE200 for water treatment
   - Introduction of interactive WASH lessons
3. Post-implementation:
   - Water sampling to measure microbial contamination and chlorine concentration of available drinking water at each school
   - WASH knowledge tests for 20 participating pupils at each school
   - Focus group discussions with participating teachers and pupils
   - Monthly monitoring visits to measure chlorine concentration and make structured observations of use and implementation of the chlorine treatment

Throughout the pilot, PATH collected and analysed data and observations from the activities. Following Phase 3, PATH evaluated pre- and post-implementation water quality on the basis of *E. coli* concentration, an indicator

of faecal contamination (WHO 2008). PATH also evaluated pupil knowledge on the basis of the pre- and post-implementation WASH knowledge tests to measure impact and to give recommendations for scale-up.

Results

Water quality

The goal of improving water quality in the pilot schools was achieved. Furthermore, the results confirmed the need for and the benefits of water treatment as a complement to APHIAplus activities aimed at increasing water supply. To ensure that drinking water is safe, the World Health Organization (WHO) recommends that the concentration of *E. coli* be zero colony-forming units (CFU) per 100-mL sample (WHO 2008). During the pre-implementation phase, when school water was not treated, only an average of 38.6 percent of all samples (n=39) met WHO standards. The results varied among schools from only 8.3 percent of samples containing safe concentrations of *E. coli* at School 1 to 50 and 54 percent at School 2 and 3, respectively.

However, following SE200 implementation for regular water treatment, 100 percent of all drinking water samples at the three schools met WHO recommendations and did not contain any detectable *E. coli* (n=15). Similarly, safe concentrations of chlorine were detectable in every drinking water sample immediately following implementation and during the four monthly visits following implementation. This result suggests that schools continued to treat their water accurately with the SE200.

WASH knowledge

The second goal of improving WASH knowledge was also achieved among pupils at the schools. During the pre-implementation WASH knowledge test, only 37 percent of all pupils (or 22/60) demonstrated some WASH knowledge (i.e., could correctly answer at least one question). Similar to the water quality results, baseline WASH knowledge varied considerably from school to school. The percentage of pupils who demonstrated some WASH knowledge ranged from 10 percent of pupils (or 2/20) at School 2 and 25 percent of pupils (or 5/20) at School 1, to 75 percent of pupils (or 15/20) at School 3.

Following the implementation of the educational lessons, 70 to 100 percent of pupils improved their score on the WASH knowledge test (90 percent improved at School 1, 100 percent at School 2, and 70 percent at School 3). Several factors impact the success of a WASH educational lesson, including the teacher skill level. School 2, with a 100 percent improvement rate, had a very passionate and innovative teacher capable of adapting the lessons to be clear for her pupils. During focus group discussions, all teachers and pupils indicated that the interactive nature of the lessons helped clarify complicated topics better than traditional lecture-style teaching.

Pilot expansion

The pilot project provided sufficient validation that the expansion project is now included as an additional activity area aimed at improving access to safe water in APHIAplus schools. Based on the pilot project's water quality and WASH knowledge findings, the intervention was selected for expansion from 3 schools to 20 additional schools during 2013 to 2014. The expansion project will also diversify geographically to now include Nyanza Province in addition to Western Province.

As originally envisioned, there were considerable benefits to embedding the pilot effort within APHIAplus ranging from resource efficiency to stakeholder engagement. Designing the pilot to enhance APHIAplus goals allowed for a more efficient use of programmatic funding and resources. Since APHIAplus activities focused on increasing the water supply at schools, this also ensured that water would be available to treat. In addition, the pilot benefitted from the network of political and community stakeholders involved with APHIAplus. Stakeholder engagement is a strategic process aimed at enhancing integration of project activities within existing administrative structures and inviting political support. Since the MoPHS and MoE officers were already familiar with previous APHIAplus activities when the pilot began, they had a sense of ownership and pride that led them to invest in the pilot and the expansion project. Similarly, since teachers and parents were familiar with APHIAplus activities from previous School Health Day events and the water storage tank installations, they were quickly supportive of the complementary pilot activities.

Piloting a project within the APHIAplus framework also presented management challenges that should be addressed during the expansion project. Pilots are valuable for testing a concept; however, the small-scale nature requires a more attuned level of attention to ensure that the small activity is adequately managed and not forgotten. For the expansion project, a primary coordinator will be selected to work with the implementing county teams and the supporting country and technical personnel. Another aspect of personnel management will be to avoid over-burdening the implementing staff with extra obligations on top of current duties. Hence, the expansion project will include monitoring that aligns with the same schedule as the ongoing monitoring activities led by the county teams. Lastly, Kenya's provincial structure is currently devolving to include "county" and "sub-county" administrative levels. Since sub-counties will be the old districts, the expansion project coordinator must adapt to these changes.

Conclusion

Overall, the pilot project validated the use of the SE200 in schools to improve water quality and an interactive education program to enhance WASH knowledge. As a result, the pilot will be expanded in 2013 to 2014 from 3 to 23 schools. The pilot highlighted the potential to enhance current APHIAplus activities, enabling the pilot and APHIAplus to achieve their goals of improving access to safe water to a greater degree by coupling water supply with water treatment provisions. By placing the pilot within a larger framework, benefits included greater efficiency and more political, community and school buy-in. The primary challenge of the expansion will be to adequately coordinate and manage APHIAplus implementers.

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