Sustainable Development in Practice

Comparative Analysis of Sauri, Kenya and Karamoja, Uganda by

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Evaluating Knowledge, Attitude, and Practice of Bed Net Usage and Malarial Transmission: A Comparative Analysis of Sauri, Kenya and Karamoja, Uganda

By Dawn Wells, Columbia University

Background

2015 marked the conclusion of the United Nations' Millennium Development Goals (MDGs), which aimed to address a multitude of sociopolitical, economic, and public health challenges facing the people of developing nations. MDG 6 aimed to halt the spread of malaria and begin to reverse the incidence of malaria and other major diseases. The Sustainable Development Goals (SDGs), Goal 3 will continue to build on the success and of the MDGs and work to stem the spread of malaria by promoting healthy lives and well-being for all at all ages.

Malaria is a major cause of mortality in African populations, particularly in children and pregnant women. It is also a major contributor to anemia and malnutrition. The spread of malaria is directly influenced by geographic factors, such as altitude, climate and proximity to standing water, which increase the prevalence of the parasite and vector. Given that East Africa is located within the equatorial zone, the elements that allow malaria to proliferate are present in the region.

Preventing the spread of malaria is critical to sustainable development since health is a key input for economic development. The consequences to a population that are chronically ill from malaria, mean that children are more likely to miss school, and a loss of labor productivity, which reduces the overall human capital. In turn, this results in a deficit in technology. Furthermore, the ability to attract labor, financial capital and outside investment decreases in regions where poor public health proliferates. Therefore, the health impacts of malaria are strongly correlated to the local economy. Furthermore, culture, education and social practice, along with the aforementioned geographic constraints, have a direct impact on how the disease is spread (*Figure 1*).

The Millennium Village Project (MVP) was initially introduced in 10 villages across Sub-Saharan Africa as a development initiative aimed at demonstrating how the MDGs could be realistically implemented in impoverished areas. Interventions employed by MVP to reduce the spread of malaria, focused primarily on education, change in social practice and distribution of bed nets. To measure the success or failure of the interventions MDG and SDG indicators to include the measuring the prevalence and death rates associated with malaria and the proportion of population in malaria-risk areas using effective malaria prevention and treatment measures.

Globally, remarkable improvement has been made in stemming malaria and eradicating it in a number of countries. Between 2000 and 2015, malaria mortality rates have declined by 60%

in all age groups. It has been estimated that 6.2 million malaria deaths have been averted, of which 5.9 million were in children aged under five years old. 55 countries are on track to reach the World Health Assembly target of a 75% reduction in the global malaria burden by the end of this year (WHO World malaria report). However, despite the decline in the global average of malaria, there are still many regions that experience high rates of malarial disease transmission. This report will provide a comparative analysis on stemming the spread of malaria in the villages of Sauri in Kisumu, Kenya and Moroto, in Karamoja, Uganda; two distinct agro-ecological zones, with different socio-cultural conditions, at different stages of development. The aim of the study will be to identify the approaches that have been successful and compare them with interventions that are less sustainable.

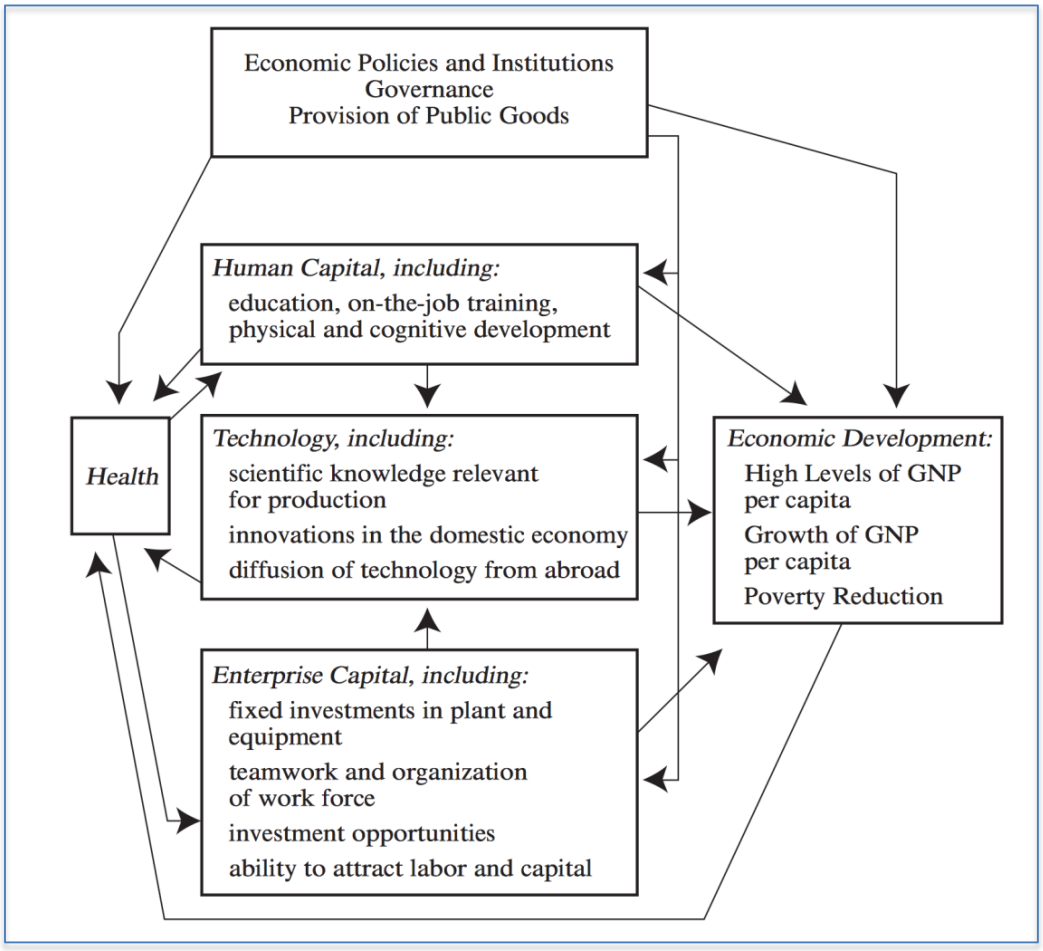

Figure 1: Health as an Input of Economic Development (WHO, 2001)

Sauri Case Study

Sauri, Kenya, was one of these initial MVP sites, which faced many challenges in the area of health. Malaria is endemic to the region and is prevalent year round, with children and pregnant women carrying the highest burden of mortality, since the adult, non-pregnant populations become partially immune. Out of a population of 500,000 people, there were 180,000 cases of malaria in 2005 and malarial prevalence was at 55% with only 21% of the population in possession of at least one malaria bed net. Of that population, only 53% of the

bed nets had been pretreated with insecticide when purchased (Sauri MVP baseline report, 2005).

Data collection for malaria was conducted during malaria season, on March 17th and April 8th 2005 and with a focus on sites where there were epidemics. Indicators show that 66% of boys and 60% of girls under the age of five tested positive for malaria. For children aged 6-16, 63% of males and 62% of females tested positive for malaria. During antenatal care, 34.7% took anti-malarial drugs. 17.4% reported to always sleep under a bed net during pregnancy and with an additional 11.6% that sometimes slept under a bed net during pregnancy.

Baseline reports found a statistically significant difference of malaria prevalence and level of income. Although 41% tested positive for malaria in the wealthiest income quartile, 56% tested positive in the lowest income quartile. Bed net ownership was found to be greater among higher income quartiles, which is a possible reason that this demographic had a lower rate of infection. The most common reported method of prevention at the household level was the clearing of bushes 45%, while 26% reported that they took anti-malarial medication, 22% reported to take no preventative measures, 19% removed or sprayed stagnant water, and only 13% used bed nets (Sauri MVP baseline report, 2005).

In order for bed nets to be effective in the reduction of infection, they must reduce the human to mosquito contact. Therefore, bed nets treated with insecticide, even those with holes, are the most effective intervention in the prevention of malaria. Surprisingly, bed nets untreated with insecticide were ineffectual at reducing the spread of malaria.

There were 11,400 insecticidal bed nets that were distributed through development partners, primarily by the CDC. Some reasons that were cited for non-use or misuse of a bed net after being provided with one included, allowing only some family members to use it, and not all, failure to tuck the bottom edges of the net under the mat or mattress, perception that it was too hot or uncomfortable to use, lack of habit, and using the bed net for other purposes all together, such as fishing nets, rope, and food storage (*Figure 2*).

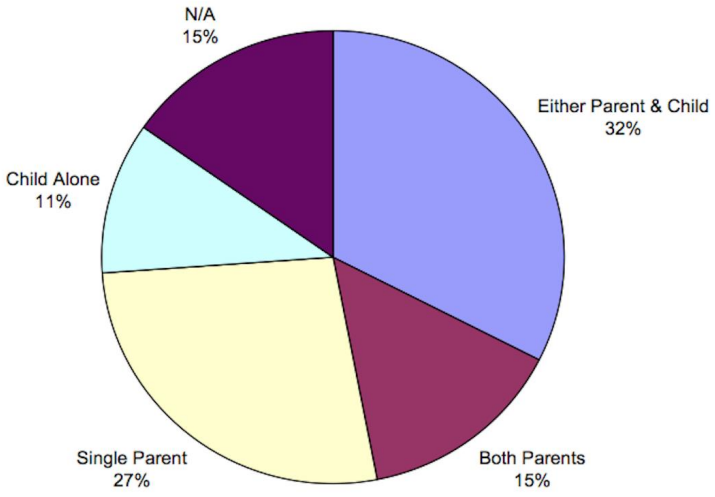

Figure 2: % of family members sleeping under bed nets, of those that owned nets (Sauri MVP, 2005)

The impact of Millennium Village Project was significant. One of the first interventions put in place was the introduction of bed nets treated with insecticide at every sleeping site. After three years, malaria prevalence decreased by 60%. Overall, there was an increase in the utilization in bed nets. Of children under the age of five years old, usage went from less than 1%, up to 34% (Sauri MVP Final Report, 2015).

Observations in the field revealed that Community Health Workers played an integral role in educating Sauri residents about the importance of and the proper methods of using bed nets. Some of the current challenges they cited related less about the knowledge of the importance of bed net usage, and more about the practice. Many people utilize a single room for their living and sleeping quarters and therefore the net was not affixed to the ceiling at all times. Transitioning the room for sleeping, by rehanging the bed net every evening became a challenging habit to adopt. Therefore, some residents would forego usage. Education about bed net usage was prevalent at both schools and health care facilities and there was a general culture around malaria prevention.

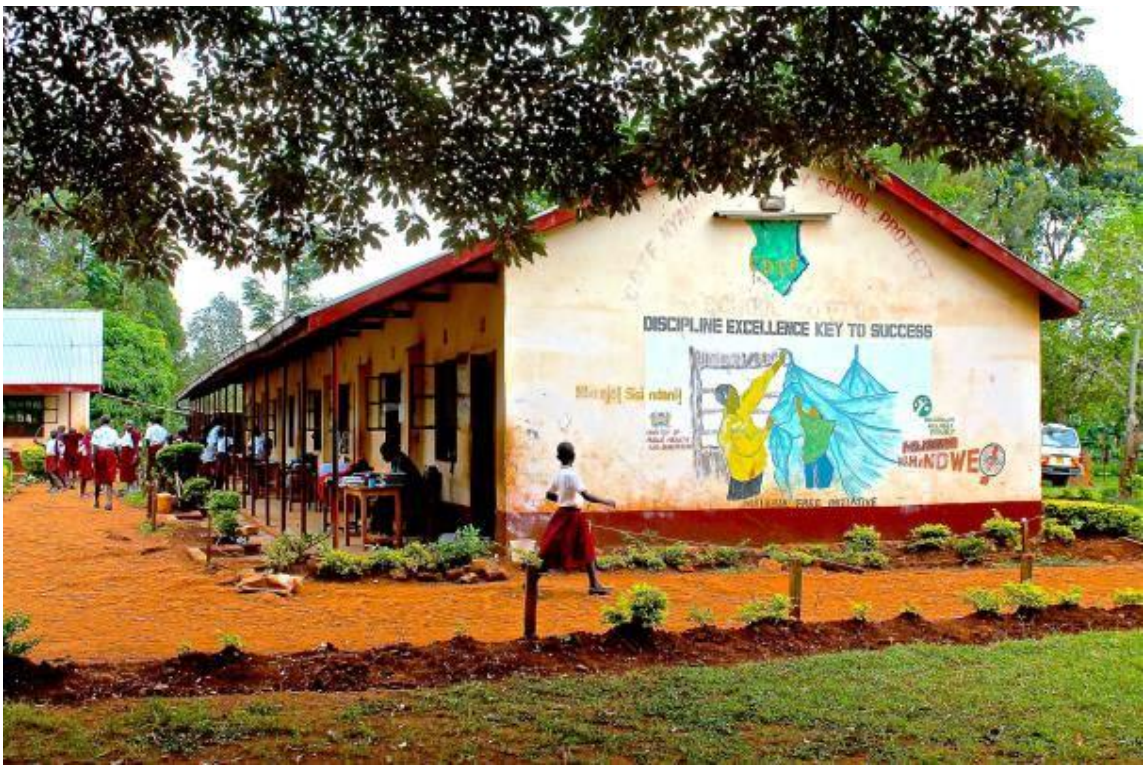

Plate 1: Nyamninia Primary School in Sauri, Kenya educating children on the importance of bed net usage via murals

Plate 2: Bar-Sauri Health Center in Yala, in Sauri, Kenya educating the public on the importance of bed net usage, particularly during pregnancy via murals

Karamoja Case Study

Malaria is the main cause of death of children under the age of five in Uganda. Further it also inhibits children's ability to regularly attend school. In 2015, through a loan with the Islamic Development Bank (IDB), the Government of Uganda launched the five year Dryland Integrated Development Project, aimed at addressing poverty challenges. The Ministry of Karamoja Affairs through Millennium Promise Alliance, a non-profit organization aimed at achieving the Millennium Development Goals and creating self-sustainable communities, is implementing the project.

Prior to the official launch and start of implementation, between December 2014 and March 2015 the Karamoja Dryland Integrated Development Project (KDIDP) conducted a baseline assessment, in order to generate indicators for MDG 6, which is to halt the spread of malaria and begin to reverse the incidence of malaria.

The KDIDP baseline study documented information on the availability and usage of bed nets at the household level and among children under the age of five, and on preventative anti-malarial treatments among pregnant women. The study found that only 61% of children under the age of five, slept under an insecticide-treated bed net, and in 2011 only 42.8% did. The proportion of children under the age of five with fever who were treated with appropriate anti-malarial drugs was 58.5% and the national target was 80% (KDIDP, 2015).

A Village Health Team (VHT) program was instituted in part by UNICEF and International

Rescue Committee. These are essentially Community Health Workers (CHWs) and are given training to identify and treat common ailments. For instance if they encounter a child under that age of five with a fever, they administer the drug Coartem.

Although in 2014 the government distributed 4 bed nets per household, many people have not been sensitized to the usage of bed nets and use them for other purposes, such as rope, food storage believing that the insecticide keeps out weevils and keeping birds. Pregnant mothers are given bed nets when they come for their first antenatal care at the health center.

Shortage of medical supplies, particularly anti-malarias continues to be an issue, and could be due to the symptomatic treatment of malaria both at the household level and at health facilities. When this occurs the district health office redistributes excess medications that are at other health facilities.

Proposed interventions are creation of extra health posts, training and sensitization of VHTs or CHWs to treat uncomplicated malaria at the household level and refer more serious cases to a health facility. Improvement of commodity security and medical supply chain of essential anti-malarial drugs as well as rapid diagnostics tests. Promotion, sensitization, and provisions of insecticide treated bed nets to households with children under the age of five and to pregnant women.

Observations in the field revealed that education with the community still remains a priority. People continued to use bed nets for other purposes such as holding food and making rope and even for fishing (*Plate 3*). To effectively address the spread of malaria, murals on schools, hospitals and town centers depicting the importance and proper use of malaria nets with insecticide will aid in sensitization of the community. As in Sauri, the distribution of nets and education should happen during all antenatal visits for pregnant women. CHWs play a critical role in combating malaria and must be adequately trained on when, and when not to give medications. The must also be supplied with rapid tests to enable them to preserve adequate supply of anti-malaria medication.

Plate 3: Some of the wrong uses of the bed nets

Lessons Learnt

Sauri and Karamoja are both vulnerable to the spread of malaria. What can be gleaned from Sauri is that, with inputs of first education, then supplies, substantial progress can be made. CHWs played a very important role in the success of Sauri and many of them were able to address the reasons behind the misuse of malaria nets, which could not be anticipated by development partners. In Karamoja, many people face extreme poverty and must be pragmatic about any supplies they receive, and it appears that building materials and the preservation of food takes precedence over the prevention of malaria. Although it is important that these other needs are met, the prevention of malaria and the preservation of health must become a priority. Like Sauri's approach with community education, if people begin to see that the quality of their health, will impact their success in both school and work, and over all productivity, they will be more likely to adopt the interventions to stem the spread of malaria.

To ensure sustainability within Sauri, education about malaria within schools, health facilities and throughout the community remains a priority. Knowledge among younger generations will ensure that the use of malaria nets continue for years to come. Likewise, for the children that do attend school in Karamoja, their knowledge about the use of bed nets is important and they can serve as change agents at the household level.

A critical lesson that that has been learned from Sauri that can be shared with Karamoja is the importance of creating a general culture around malaria prevention. The project in Karamoja is in its very early stages and has begun their baseline report, so development partners can continue to build on data collection and expand their information on antenatal care. There are many challenges ahead for the both the Sauri and Karamoja but community education, coupled with appropriate management will ensure the success in the stopping the spread of malaria.

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Technological Advancements Towards Increasing Access to Water in Sauri, Kenya and Karamoja, Uganda

By Michael Spiotta, Columbia University

Background

The rural communities of East Africa face many arduous challenges as part of everyday life. Not the least of which is access to water. The Millennium Villages Project (MVP) has just completed a 10-year development project guided by the Millennium Development Goals (MDGs) in Sauri, Kenya. Sauri is home to a predominantly sedentary agriculturist community. Another East African community, located in the drylands of Karamoja, Uganda, is the site of a similar development project, which is just getting underway, and is being guided by Millennium Promise (MP). Unlike Sauri, Karamoja is a predominantly pastoralist community. The project in Karamoja is beginning to pick up speed just as the MDGs are giving way to the Sustainable Development Goals (SDGs). While the lifestyles led by the members of these communities appear disparate on the surface, they face some similar challenges. One challenge that was addressed by MVP in Sauri, and which has the potential to prove exceedingly difficult for MP in the drylands of Karamoja, is access to water.

MDG 7, indicator 30, defines what are considered "improved" sources for access to drinking water, which include: piped water, public tap, borehole or pump, protected well, protected spring, or rainwater (Sauri Baseline). The World Health Organization (WHO), and the United Nations International Children's Emergency Fund (UNICEF) Joint Monitoring Programme for Water and Sanitation (JMP) defines sustainable access to water as "the availability of 20 liters per capita per day at a distance no longer than 1,000 meters." These 20 liters must be of high enough quality to safely use for drinking, cooking, and washing (Sauri Baseline).

While in Sauri conducting research on hand washing hygiene, we were exposed to the different ways in which local residents collected and purified water. Prior to MVP interventions, access to water was limited, and very few purification methods were readily accessible. Many of the homesteads that were observed in Sauri had piped water access either in, or in close proximity to their homes. While a piped distribution system was convenient for those who were fortunate enough to have it, the water still required treatment with either Pur or Waterguard tablets prior to being consumed. Additionally, many residents had access within a short distance to protected springs (pictured below) that had been put in place by MVP. Residents would need to walk a short distance, (sometimes through another homesteads property) with one, or sometimes several jugs, in order to fetch water and return it to their home.

Sauri Case Study

According to Sauri baselines reports, 79.4% of households used springs (*Plate 4*) during the dry season to retrieve water, while only 37.3% used springs during the wet season. A local resident advised us that this water also needed to be purified prior to being consumed. Some

residents dug shallow wells that they could fetch water from, however, one key informant at a homestead had stated that their well did not always hold water, and was only recharged during the rainy season. Though rainwater catch systems are an MDG approved water source, due to a lack of rain during the majority of the year, rainwater collection technologies are not the most reliable or sustainable source for water access. 50.6% of households reported using rainwater collection during the wet season, but only 3.5% reported using this method during the dry season (Sauri Baseline).

Plate 4: Protected springs in Sauri MVP

Roof water collection schemes (*Plate 5*), which catch water that falls on the rooftop and filters it down into a trap which then flows via gravity through a pipe and into a tank. This tank must be left open at the top in order for water to flow in, which leaves the water in the tank susceptible to contamination from animals and other pathogens. Thus, water would require treatment prior to use, and may still be unsafe for consumption. Although no boreholes were visited in our time in Sauri, we were advised that borehole technology was also used. On the contrary, during our time in Karamoja, it was evident that boreholes were the predominant technological method used to access water.

Plate 5: Roof Rainwater Collection System in Sauri MVP

Karamoja Case Study

Baseline reports on 185 water access points in Karamoja were conducted in three sub-counties (Nadunget, Lotome, and Lorengedwat). Of those 185 access points, 67.6% (125) of all these water points are boreholes, 3.2% (6) are protected dug-wells and 19.5% (36)[1] while the rest (18 water points-9.7% are simply water point outlets) (Karamoja Baseline Survey). According to the same report, water was retrieved from 122 of the 185 access points via hand pumps. In spite of having 85% water coverage in Karamoja, it was observed that the overwhelming use of boreholes in this region is due to the extremely dry conditions and lack of surface, or near surface water (Karamoja Baseline Survey).

Residents of Karamoja are reliant mainly on tapping into the water table during all but the few rainy months of the year. While boreholes can be reliable, we learned that proper drilling of such a hole requires the guidance of a skilled hydrologist to ensure they drill in a location that will provide the community with a sustainable water source. It should be noted that through baseline reports and key informant discussions, it was divulged that if a borehole that was poorly sited runs out of water, the mechanism used to pump the water will often break and the boreholes are abandoned. Furthermore, due to poor coordination and mismanagement, new boreholes are often drilled in close proximity to the aforementioned abandoned borehole. Through key informant interviews with water district officers and representatives of MP, it was revealed that hand pumps are the preferred technology for water access by local residents; however, government officials and others recognize the need for a more sustainable technology which can distribute water. Hand pumps only allow residents access to water where they are located. There have been both solar and wind powered pumps installed throughout the region by various NGOs, but many have been vandalized and tampered with by local residents (*Plate 6*).

Solar and wind powered pumps would allow for water to be piped into, or closer to homes. It was ascertained during interviews with water district officers, that presently, residents must often walk well over 1 kilometer (1,000 meters) in order to retrieve water from a hand pump. 10 kilometers was actually considered a “reachable” distance by some officials. This is in direct conflict with the WHO/UNICEF JMP definition of “sustainable access to water,” as the travel distance to reach water sources must be no longer than 1,000m (Sauri Baseline). Additionally, according to the WHO, “when it takes more than a 30 minute trip to reach a water source, the amount of water collected is not enough to reach the minimum amount required for drinking, cooking, and personal hygiene” (qtd. in Sauri Baseline). Though conversion of hand pumps to solar pumps (solar being the method seemingly preferred by the water district offices) would be costly, it would provide the people of Karamoja access to piped water via boreholes, both of which are considered by the MDGs as “improved” sources to access drinking water, and would also be utilizing a sustainable alternative energy source. While MP, government officials, NGOs, and local residents face an uphill battle regarding the implementation of more sustainable water access methods, when looking at how far Sauri has come in 10 years; the future of Karamoja looks bright.

[1] There appears to be a typo in the baseline here.

Plate 6: A Wind and Solar Powered Pumps vandalized by local residents in Moroto and Nakapiripirit districts

Lessons Learnt

If you come from a developed nation, access to clean drinking water is in all likelihood something you take for granted and never have to give much thought to, but in places like Sauri, Kenya, and Karamoja, Uganda, access to clean water can be a daily struggle, and in some cases, the difference between life and death. We observed the remarkable improvements 10 years of development has had on Sauri. Easier access to clean water has not only improved the health of many individuals by reducing the spread of communicable diseases, but for an agriculturist community, it has greatly improved their abilities to grow crops and care for livestock. In Karamoja, where many organizations are hoping to see a shift from a pastoralist, to more of an agro-pastoralist lifestyle, improved access to clean water is crucial. With the installation of solar powered pumps that could aid in distributing water closer to residents, there is potential for people to more easily care for their livestock, and even to install irrigation systems, which would improve health and potentially aid in decreasing malnutrition and under 5 mortality rates. At present, Sauri may seem much more developed than Karamoja, and it may be difficult to draw comparisons between the two, but just 10 years ago Sauri was suffering from many of the same issues that plague Karamoja today, including difficulties in accessing clean water. If strides similar to those made in Sauri are made in Karamoja, there is no reason why the residents there cannot see the same improvements in quality of life that the people of Sauri have. With proper management by the government, education of the public, and coordination between development partners, Karamoja could be on its way to being another millennium development success story.

References

1) Sauri MVP Baseline (2005) and Final (2015) Report[2]

2) Karamoja MP Baseline (2015) Report

[2] Comparable data from Sauri baseline was not available or incomplete in the Sauri Midterm and Final reports.

Achieving Universal Primary Education

By Elsbeth Kane, Columbia University

Background

The Millennium Development Goals and the Sustainable Development Goals

The United Nations considers education, especially primary school education, to be one the most powerful vehicles for sustainable development ("SDG 4: Quality education," 2016). Education gives the community the agency to make positive change from within. This change manifests itself broadly, as knowledge facilitates accelerated growth in every other focus area of the MDGs and SDGs; education can equip people with skills to expand employment opportunities, and can impart knowledge regarding health, nutrition, and HIV prevention to improve the overall well-being of the populace. Thus, ensuring the accessibility and effectiveness of education, especially for the next-generation of children, is foundational to improving people's lives now and in the future.

In 2000, the UN set forth the Millennium Development Goals, which were agreed to by the world's countries and leading development institutions. These goals addressed some of the major challenges that developing nations face, with the hope of using an integrated and comprehensive approach to make substantial progress in meeting the needs of the worlds poorest by 2015. The second Millennium Development Goal was to achieve universal primary education. The target was to ensure that, by 2015, children everywhere would be able to complete a full course of primary schooling, boys and girls alike.

The second goal of the MDGs is associated with three indicators, which were intended to help designate benchmarks for success. Net enrollment ratio in primary school and the proportion of pupils starting grade 1 who reach the last grade of primary school were the first two indicators that were used for tracking development progress. The net primary school enrollment ratio is defined as the number of children enrolled in primary school who belong to the age group that officially corresponds to the schooling level, divided by the total population of the same age group (The Millennium Villages Project (MVP), 2007). The third indicator outlined alongside goal two is the rate of literacy among young adults, particularly women and men ages 15-24. This indicator gauges literacy post-primary age. Further, young adult literacy rate specifically focuses on those people of reproductive age; literate adults are more likely to send their children to school (UNESCO). In order to engage with the issue of primary school education, development projects must acknowledge the cyclical nature of non-enrollment, similar to the cyclical nature of poverty.

As the period of MDGs comes to an end, the United Nations has adopted the Sustainable Development Goals (SDGs), which build off of and elaborate on the antecedent MDGs. The 4th Sustainable Development Goal is the advancement of the 4th MDG. The goal aims to ensure inclusive and equitable quality education and to promote life-long learning opportunities for all. Within this larger goal, the United Nation sets out to address educational

access in a broader sense by considering primary and tertiary education, as well as technical and vocational training ("SDG 4: Quality education," 2016). Of the 10 targets, 4 are specifically relevant to primary school education:

- 4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.
- 4.2 By 2030 ensure that all girls and boys have access to quality early childhood development, care, and pre-primary education so that they are ready for primary education
- 4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples, and children in vulnerable situations
- 4.6 By 2030 ensure that all youth and at least x% of adults, both men and women, achieve literacy and numeracy

Overall, the Sustainable Development Goals hope to focus on access, and equality thereof for people of all genders and levels of vulnerability, on foundation (in regards to pre-primary schooling), and achieving literacy and numeracy. Goal 4 also addresses the need for safe, inclusive school facilities, and qualified teachers.

In this age of transition from the MDGs to the SDGs, it's necessary to reflect upon what has improved and what remains to be addressed in terms of achieving universal primary education, especially in those areas of the world that remain the most vulnerable. Of approximately 57 million children of primary school age that remain out of school in 2015, 33 million are in sub-Saharan Africa; that's just over 58% of the prior figure. Armed conflict, and poverty, especially, work against progress in achieving universal primary school education. Children in the poorest households in developing areas are four times more likely to be out of school as their richer counterparts. ("Achieve universal primary education," 2016). This region has been of particular focus for various non-governmental organizations and partners.

Millennium Village Project and Implementing Partners

The Millennium Village Project was launched in 2005 as a collaborative effort between Columbia University's Earth Institute, United Nations Development Programme, and Millennium Promise. The Project aims to exemplify successful, community-led change using an integrated approach to rural development in Sub-Saharan Africa.

After the initial initiation of 10 village-sites, other projects have since begun in other parts of the continent, some funded by other non-governmental and governmental organizations, that make use of the MVP approach. However, each integrated development project faces unique challenges according to the agro-economic zone that the relevant sites fall in, as well as the history and culture of the region. It is important to compare project initiatives and successes across different regions, to see how initiatives regarding primary school enrollment are both supported and limited by the intersection of culture, livelihood, agro-economic structure, and

history within a region. In order to make further progress by 2030 in supporting the education of all youth, comprehensive analyses, and especially comparisons, amongst projects can suggest new methods for addressing primary school education.

Objectives

This report aims to compare project intervention strategies in two MVP or MVP-associated sites, specifically those interventions targeting primary-school enrollment. The first of two projects for comparison is MVP Sauri, Kenya, the first and largest site in the MVP, launched in 2005. Sauri falls within a well-watered humid, semi-humid zone that supports arable agriculture. The second project for analysis and comparison is an Integrated Drylands Development Program that was initiated within the context of the MDGs in Karamoja, Uganda in 2015, just as the project in Sauri was reaching its formal end. Karamoja is a sub-region in the northeastern region of the country. Unlike in Sauri, most of Karamoja is semi-arid plain with harsh climate and low rainfall.

By comparing Sauri and Karamoja, the report aims to clarify how project successes in primary-education enrollment in Sauri might inform the strategical interventions being implemented in Karamoja. In addition, a comparison will identify the key areas in which the sites diverge in terms of environmental, cultural, and socio-economic situation. This identification will help to inform how interventions in Karamoja might need to depart from or develop upon the strategies since established to address primary school enrollment.

Sauri Case Study

Sauri, Kenya is one of the 10 initial sites for the Millennium Villages Project (MVP). In 2007, MVP published a Baseline Report on the status of livelihoods in the village as it relates to each of the 8 MDGs (MVP, 2007). Education was outlined as a focus area for the project, however, Sauri did not suffer from extreme rates of non-enrollment at the project start.

In Kenya, primary school age is from 7-14 years. Children are supposed to reach grade five by age 12 and complete primary school by age 14. At baseline, the net primary school enrollment ratio was 84.6%, higher than the national average at the time of 76%. Both net and gross enrollment for boys and girls was comparable (83.5% male, 85.6% female) (MVP, 2007). Gross primary enrollment was at 118% as compared to the national average of 111% (Gross enrollment looks at total enrollment of children in primary, regardless of whether or not they of the official primary-age). Universal primary education was instituted in 2003, which explains the high rate of enrollment in the region at the start of the project. At baseline, the majority of those aged 12 and older who are no longer in school reached grade 5 or higher, implying high primary education survival rates were high. The youth literacy rate (15-24 year olds) in Sauri, based on responses from the baseline survey, was at 95.3%. This figure is most likely an overestimate, however the values are somewhat higher than the national and provincial values. The literacy rate was relatively comparable across genders (95.9% for males and 94.8% for females).

Despite good standing at baseline, there was room for improvement. In Sauri, as in many of the 10 initial MVP sites, education interventions focused on putting in place the human resources and physical infrastructure to accommodate all primary school age children. Net enrollment and gross enrollment were high, but facilities where in poor conditions. Interventions in Sauri, over the 10-year project, focused on: making available learning materials for children, refurbishing and constructing new programs, increasing the number of teachers, introducing sustainable school meals program, and supporting improvements in teacher capacity-building. In addition to these interventions, MVP focused on gender parity in school by various means (i.e. gender separate latrines, access to sanitary napkins, community engagement). With all of these goals in mind at baseline, education was the recipient of the largest share of budget investment, averaging $29 per year. (The Millennium Villages Project (MVP), 2010).

Interventions strengthened primary school enrollment. At year five, gross attendance rates in primary school increased from 109.9% to 140.4%. Furthermore, participation in the school meals program among primary school students increased from 18% to 98% over 5 years. This program was one of the main highlights of education sector intervention successes. However, the meals program was not implemented without challenges. Providing food for children requires community involvement and support. Rather than provide the schools directly with food, MVP focused on building capacity within the school itself. The school meals program, which has supported retention of students in Sauri, has proven to be sustainable. Our team visited both Nyamninia Primary School and Tatro Primary School, both within the MVP site. We observed school gardens, where students and staff are growing vegetables and cereals. These gardens help to provide nutritious meals for children and help to generate supportive income to maintain the program. Additionally, we observed well-functioning kitchens, with stoves, for food preparation (*Plate 7*).

Plate 7: Kitchen at Tatro Primary School

Beyond all else, community involvement was crucial to the implementation of the meals program. Families were eager to contribute food supplies as well as cooking fuel and human resources once they saw school performance increase as hunger decreased. The program specifically provided farm inputs for families to be able to provide back to the program. Children appeared to be energetic and well-fed at schools. In combination with proper classroom set-ups with blackboards, desks, and desk chairs (*Plate 8*), students could experience an accessible learning environment that enabled proper cognitive development and individual growth.

Plate 8: Class 8, Social Studies, Nyamninia Primary School

We were able to witness the success of educational interventions in its many manifestations. In field-study research, we interacted with the head principles of the two aforementioned primary schools in Sauri, Tatro and Nyamninia. Both schools emphasized that the implementation of the school meals program has made the school a hospitable environment for children, when children would otherwise go hungry throughout a long school day. At Tatro, the principal reported that attendance, now, in 2016 is over 90% across genders, and that students rarely miss class. From observations in the classroom, we saw that children were enthusiastic in their classes, to answer questions and participate. Teachers appeared to be well-respected and passionate about engaging children, both boys and girls. Of note was that we observed both schools to have early childhood education centers for kids not yet of primary age, which helps to ensure preparation and strong enrollment in primary. However, one challenge that remains is funding for programs that provide sanitary napkins for young adolescent girls in upper primary. At both schools, funding for these initiatives has phased out, despite an eagerness to see the programming continue.

Karamoja Case Study

Baseline

At the outset of the Sustainable Development Goals, universal primary education remains a dire situation in Karamoja Uganda. Challenges related to general poverty, cultural limitations, infrastructural neglect, and general marginalization intersect, resulting in primary school enrollment rates that remain astonishingly low. The Karamoja Drylands Development Project (KDIDP) has identified Millennium Development Goal 2 as a priority for project planning. Unlike in Sauri, this project is only at its initiation. In March, 2015, KDIDP completed and published a baseline survey to assess the current status of the MDG based indicators, including those indicators pertaining to MDG 2.

In Uganda, free Universal Primary Education was introduced in 1997 to improve enrollment and attainment in primary schools. However, after an influx of children into schools, the system became strained; there was a demand for learning materials, teachers, and infrastructure. In Karamoja, primary school education is 7 years long, and begins at age 6. Net Intake Ratio (NIR), the total number of new entrants in the first grade of primary education, as compared to the % of the population at entry age. In the KDIDIP project area, only one in ever20 children aged 6 years had joined class one of primary school, according to the KDIDP baseline report.

Beyond enrollment, retention and attendance challenge the success of childhood education. According to the report, Net Attendance Ratio (NAR) was very low at 11%, with proportions slightly higher for females than for males. Gross Attendance Ratios were slightly higher, at 28%, implying that there is a slightly higher degree of participation by students that do not belong to the official primary school age groups. Survival Rate (SR) to the last grade of elementary was estimated at 3.6% at baseline. This indicates the retention capacity and internal efficiency of the schooling system, and suggests that enrollment alone is not a sufficient indicator for success. Young adult literacy levels in Karamoja were around 31% at baseline.

The community faces of myriad of problems to addressing these staggering statistics regarding enrollment and retention. Infrastructure poses a huge challenge to the education sector; 23% of schools have no classrooms for students and 77% have an insufficient number of classrooms. At Lorengedwat, we were able to observe the primary school premises, although children were on holiday. One area that is used as a classroom has a chalkboard, but no desks or chairs (*Plate 9*). A history of armed conflict led to destruction of educational facilities—today, facilities aren't adequate for the growing demand for education with communities that are now increasingly more sedentary. There remains an insufficient budget for adequate infrastructure and for instructional materials such as textbooks, desks, and stationary in schools (Karamoja Drylands Integrated Development Project (KDIDP), 2015).

Within schools, high pupil-teacher ratios also strain the learning environment, and poor foundational structure, because of budgetary issues, stifles the ability of young children to be

developmentally ready for the demands of primary school. The learning environment is relatively unproductive. The KDIDP sector head of education explained that teachers are unmotivated and use methods of teaching which are non-interactive. KDIDP Baseline reports expand on this point, noting that teachers are observed to have unprofessional conduct. Some carry out non-school related work during school—perhaps because low pay fuels of a lack of motivation to properly prepare lesson plans and carry them out. (KDIDP, 2015)

Plate 9: Classroom at Lorengedwat Primary School while students were on Holiday

However, the factors that are not directly related to the school itself are those factors that may represent the largest challenges to primary school education in Karamoja. In 2015, 86% of families are food insecure in Karamoja (KDIDP, 2015). Drought, floods, and diminished livestock herds fuel food insecurity. This insecurity prevents families from being able to send children to school with lunch, or from being able to provide the youngest children with uniforms or school materials. As food is scarce, constant movement of community in search of food and water discourages children from staying in school. Furthermore, in a traditionally pastoralist community, existing pastoral-nomadic lifestyles and practices challenge the structure of formal education. To exacerbate the issue, government marginalization over long-standing insecurity leads to a dearth of funds to help support the region (KDIDP, 2015).

Karamoja Drylands Integrated Development Project

In light of all of these challenges, KDIDP has identified education as a main sector of concern. In the short term, there is a need to address infrastructure, quality of education, accessibility of school to the most vulnerable, and community engagement. To address infrastructure there are plans to boost infrastructure by equipping schools with adequate classrooms. In terms of reinforcing the quality of education from the faculty side, KDIDP plans to encourage the employment of more teachers to reduce pupil-to-teacher ratio, and to push for the establishment of a code of conduct for teaching. Continuing education programs

would also, ideally, promote better classroom preparation and better child-teacher interaction. In order for schools to be accessible, the project wants to focus on building school feeding programs equipping schools with necessary logistics and supplies, including books, stationary, and sanitary napkins for girls. Finally, capacity building in the community is seen by KDIDP as a necessary short-term plan to address community willingness to send children to school.

Despite extensive plans, there are many challenges already encountered by the project, and many challenges anticipated in carrying out these goals. We met with the education sector head for KDIDP, who outlined these challenges to progress. Child headed families are least likely to send children to school, and the issue of child-headed family families is fueled, on a larger scale, by widespread HIV and the deaths that occur because of infection. Beyond health issues, poverty remains one of the main challenges to primary school enrollment. Uniforms and scholastic materials are not cheap, and mandatory examinations and boarding fees, if applicable, are expected to be paid for by families. Parents cannot pack lunches since harvests are diminishing as a result of erratic rainfall and drought. Without food at school, children don't have the proper energy to withstand a full day of school-work. Securing proper funds for these various expenses must be considered in project budgeting. Alongside poverty, it seems that there is a cultural undervaluation of primary school education amongst the community. After a young age, children are expected to help graze livestock, which is becoming an increasingly challenging task as dry climates have reduced viable grazing pastures. Young women help their mothers collect water, or cut firewood for income, and are expected to contribute to housekeeping and cooking, which especially exacerbates the issue of secondary school enrollment. These cultural norms put strain on any of the initiatives put into place to make the school environment learning-friendly, which is one of the reasons community education and sensitization is so important.

Already, KDIDP has faced challenges implementing the school meals programme due to poor harvest. Only six, 100 kg bags of vegetables of maize were produced across all four primary schools in KDIDP scope. Maize did not adapt well to dry conditions at these schools, and sorghum, beans, and other tubers might have done better. Fencing might also pose a challenge to harvest. Fencing is necessary to deter animals during the open-grazing season, and it is unclear how the community will react to limitations on grazing ranges in an area where land is traditionally seen as communal.

Involvement by Various Other Development Partners

KDIDP is working with The World Food Programme (WFP) to feed school children. However, the World Food Programme faces its own challenges in meeting needs. In 2015, the program remained under-resourced (by $4 million dollars). Meals were reduced from 2 per day to 1, for non-boarding students; furthermore, take-home rations aimed at rewarding enrollment for girls have been suspended, according our observations in the field (*Plate 10*). Still, at present, WFP meals reach all 280 schools in Karamoja (World Food Programme (WFP), 2015).

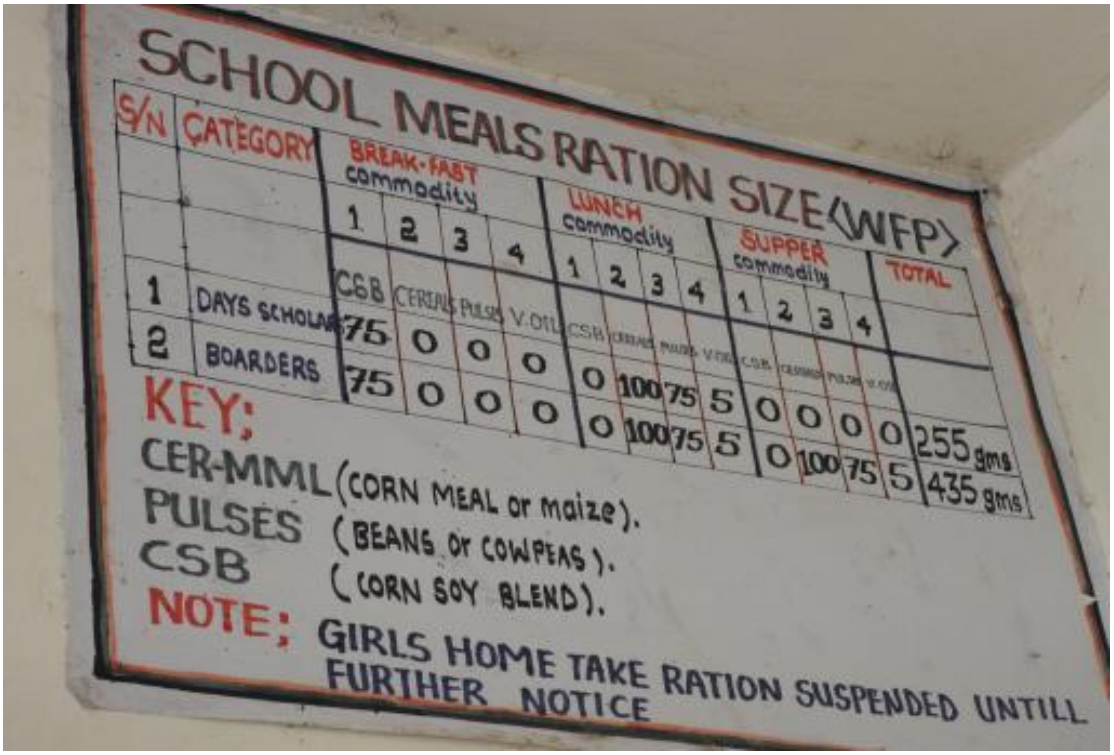

Plate 10: Schools Meals Ration Size Chart, Lorengedwat Primary School

Feeding programs aren't new to the region-- School feeding in Karamoja started in 1964, but has been historically un-sustainable, as national trends in donations to schools are dwindling. The government was previously uninvolved in supporting school meals programs in Karamoja. However, as of February 2015, the government has pledged to help WFP meet gaps in food supply. Part of this pledge is providing 300 metric tons of maize meal by the government's prison farm in Nakapiripirit district (WFP, 2015)

Recommendations

To effectively address the challenges to primary school education, and best coordinate efforts to promote enrollment *and* retention, it is imperative that government, NGOs and KDIDP meet to figure out how to make change for the sake of the sustainability of interventions. Children are 27.2% of the population in Karamoja, yet few attend school, yet 95% are not entering primary school when they reach official entry age (KDIDP, 2015). This has severe implications for the sustainability of interventions across sectors. If children lack the knowledge and the vocational skills to be able to improve their own livelihoods and contribute to new innovations, interventions elsewhere might be positive in the short-term, but not in the long-term. A critical component of the millennium villages project is local ownership, and capacity building. Primary education, at the very least, is central to building the capacity of the community to be able to take the reigns of their own wellbeing.

KDIDP needs to focus on community education programs to sensitize families to the importance of primary school education especially for the well being of the entire family, in

order to address cultural devaluation of programs. Cultural attitudes and practices will be a limiting factor, even if all other issues regarding access are solved.

Since school feeding is an important focus, KDIDP should focus on funding. As families in many parts of Karamoja face food insecurity and poverty as a result of government marginalization as well as drought and crop/livestock disease, it is unlikely that families will be able to contribute food to sustain the program. While family contribution is a good long-term goal, in the project's initial stages, it is important that the government continue to fund the School Meals Programs, which cannot be sustainably funded by non-governmental organizations (i.e., World Food Programme) alone. At Lorengedwat, we observed a kitchen, which was ill equipped for a sustainable feeding program (*Plate 11*). There were chickens roaming around, but the head teacher indicated that there was no food for them. Beyond instating the program, and providing inputs, KDIDP should help to make sure that initiatives are feasibly maintained and sustainable.

Plate 11: Kitchen at Lorengedwat Primary School

If the community is more willing and able to put children in school, and if KDIDP, in partnership with the government, can help to increase the attendance rates, the school environment needs to be effective in engaging students. This means helping to providing teachers with proper pay and housing, and organizing continuing-educational programs to help teachers learn how to best engage their students.

Comparative Analysis

Interventions in Sauri have been relatively self-sustaining, especially the school-feeding program. However, initiatives regarding gender equality and access have been limited by lack of funds. Neither primary school is able to provide sanitary napkins to young adolescent girls now that the project has ended. Even though this initiative dips into MDG 3, inclusiveness and equitable quality of education is central, along with enrollment, to SDG 4. Interventions in Karamoja, as of yet, have been minimally successful/sustainable. Maize crops have failed at schools. However, plans to enhance community involvement and better enhance crop productivity seem to be strong.

At the start of the Millennium Village Project in Sauri, net primary school enrollment was already high relative to the enrollment rates in Karamoja at baseline. MVP Sauri was able to implement various initiatives within an established framework wherein enrollment rates were already high. Beyond enrollment, the project was able to target hunger and low performance by improving accessibility, especially for the poorest children. Furthermore, MVP Sauri moved beyond gender parity and start to address MDG 3, to help ensure that girls are equally empowered in their school environments and equally capable of growth and development in a gender-sensitive environment However, at baseline, enrollment rates in Karamoja were staggeringly low, and addressing poor enrollment, in and of itself, will be a huge hurdle to jump. Furthermore, addressing this problem requires addressing limitations related to culture, livelihood, and environment.

One of the main focuses of both projects has been the institution of school feeding programs in primary schools to enhance the learning environment, boost enrollment rates, and encourage consistent attendance. However, in Sauri, the success of the school feeding programs was rooted in the ability of the school to grow food to supplement small donations from the community. The ecological environment and climate in Sauri is such that crop harvest has been sustainable at schools. Head-principals did not voice any specific concerns about the sustainability of agriculture and horticulture or the threat of drought. Nyamninia Primary School was able to grow vegetables like avocado and paw paw, in addition to kale, and we observed these gardens, which looked healthy and productive. Cows provided to the school are providing milk for children as well.

Therefore, not only have the schools been able to provide food, but also the food has become more diversified in terms of micronutrient offerings (Mroz, 2011). In Karamoja, the semi-arid environment limits the school-feeding program. KDIDP must work within the confines of a limiting climate, to determine which crops, if any, will be viable and productive. In order to provide the school with livestock, the program also needs to consider that these cows will have limited grass to graze on, and we saw from observations that even chickens, donated to the school, were roaming since the school lacked any feed. Whereas MVP Sauri was able to use the feeding program to address poor performance, attendance, and hunger, KDIDP must also use it as a source of attraction for enrollment. The demands are high.

Interventions related to universal primary school education in Karamoja must address the cultural barriers to enrollment associated with early marriage, which did not seem to be as large of a barrier to enrollment in Sauri. In general, in Karamoja, primary school is not always a priority, especially when children are needed to help the family with income-generating activities, including livestock herding and petty-wage labor. In Sauri, school enrollment was high, suggesting primary school was, at the very least, valued as an institution among the people. Most importantly, it is difficult to address these issues in Karamoja since they are engrained in cultural traditions and are also strained by the state of poverty in the area. Children are needed to help generate income and look after livestock because the state of food insecurity is so dire. Essentially, it seems as if the challenges to universal primary school enrollment in Karamoja are cyclical in nature, and it is hard to identify an entry point for intervention that doesn't rely on stability in another sector.

Despite the explicit differences between the projects, there are some lessons that can be learned from Sauri to inform the KDIDP project in Karamoja. Mainly, the ability of the MVP Sauri to engage with the community to recruit support for school feeding programs should be a goal for the KDIDP project. This spirit of community engagement is central to the success of this type of program. School- feeding is a key entry point for interventions. If the school-feeding program could simultaneously serve as an agricultural/horticultural demonstration site for people, and if enough research goes into determining which crops are viable in this region, then people will become enthusiastic about the feeding program, and perhaps more enthusiastic about becoming active agents of change in the development of primary school education in their communities.

An important development lesson that rises out of this comparison is that initiatives that are successful in one region are not necessarily successful in other, especially when the cultural/environmental situation in each region is unambiguously different. Furthermore, community involvement is necessary for the success of initiatives beyond the timeline of any development project. Even if government and non-governmental organizations can work together to improve the state of primary education, the community must be motivated, on their own will, to see education as a priority. With this engagement, development will likely be more sustainable since there is willingness for change, even in the face of many challenges.

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A Silent Killer:
HIV/AIDS Preventative and Curative Efforts in Sauri and Karamoja

By Juliana Cuartas, Columbia University

Background

Since HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) was identified in 1981, the infection and subsequent disease has claimed approximately 39 million deaths worldwide (CDC, 2015). In 2014 alone, HIV/AIDS took the lives of 1.2 million individuals. In the same year, over 37 million people were estimated to be living with HIV, the great majority—about 30 million—in Sub-Saharan Africa (WHO, 2015). The virus can be contracted through sexual intercourse, contact with blood or other heavily infected tissues, and through "vertical" mother to child transmission (Markovitz, 2007).

The seriousness of HIV/AIDS cannot be underemphasized—without treatment the disease shortens life-span, and increases the vulnerability to and mortality from opportunistic infections (Hel *et al*., 2006). Furthermore, in countries that have high rates of HIV infection, it is correlated with lost income and increased healthcare spending in affected households, death from AIDS-related complications is one of the primary causes of double orphanage, and has decreased the Gross Domestic Product as a result of a reduction in the labor force due to unemployment or death (Greener, 2002). Thus, when the United Nations established the Millennium Development Goals following the Millennium Summit in 2000, combatting the HIV/AIDS pandemic (in addition to "malaria and other diseases") was made the sixth Millennium Development Goal (UNSD, 2008).

Millennium Development Goal 6 has two targets that focus on the fight against HIV/AIDS: "Target 6A" aimed to have stopped, and begun to reverse the spread of the virus by 2015; "Target 6B" aimed to attain universal access to HIV/AIDS treatments by 2010. Five "Indicators" that would help monitor progress supplemented both of these targets: the HIV prevalence among young people aged 15-24, the condom use during the last "high risk" sexual encounter, the proportion of the young population (15-24) with broad and accurate knowledge concerning HIV/AIDS, the ratio of orphans (10-14 years old) to non-orphans attending school, and the proportion of the population with advanced HIV infections that has access to antiretroviral treatment drugs (UNSD, 2008).

Millennium Development Goal 6—as is true of the other seven Millennium Development Goals—, along with its targets 6A and 6B were incredibly lofty, and almost impossible to achieve on a global scale in a short period of time. This does not mean that there are not success stories— for example, the Millennium Villages Project in Sauri, Kenya, made great strides in preventing and treating HIV/AIDS in a region that had been ravaged by the infection. However, now that the Earth Institute, United Nations Development Programme and Millennium Promise backed project has ended, Sustainable Development Goals (SDGs) have been put into place in order to preserve the progress that has been made in the last 10 years. Sustainable Development Goal 3 addresses the issue of world health more broadly.

Only Target 3.3 addresses HIV/AIDS explicitly: By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases; the relevant indicator 3.3.1 for the target measures the number of new HIV infections per individuals.

The same amount of effort and care must be taken to combat this—*extremely preventable*—disease in newer development projects (e.g. MV3s) that are governed by the Sustainable Development Goals. The first Millennium Villages only succeeded in this area because they prioritized educating the population on ways to prevent both vertical and horizontal transmission, as well as de-stigmatizing the disease so that those affected could more easily seek treatment. While efforts to reduce the rates of HIV/AIDS have had great success in many of the original Millennium Villages, great care must be taken to *continue* to prioritize the fight against HIV/AIDS. This disease affects a population at every level, from the individual to the continental and beyond. During a Sustainable Development in Practice course that I was privileged to be a part of, I was able to observe in the field and analyze data on HIV/AIDS prevention and curative efforts. As was already mentioned, Sauri, Kenya, showed vast improvements in this sector over the lifetime of the Millennium Villages Project, and I would like to highlight a few of the methods that seem to have worked. On the contrary, the newer MV3 in Karamoja, Uganda, seems to be one of the few areas that has not benefited from the Ugandan AIDS eradication effort—I will attempt to consider some of the reasons for the differences, and whether similar approaches to those used in Sauri could be effective in Karamoja.

Sauri Case Study

While specific lifestyle impacts of HIV/AIDS were not mentioned in Sauri's baseline or year five reports, the impacts of HIV/AIDS on the individual as well as at the population level have been well studied, and were mentioned in the background. At the individual level, the risk of death is aggravated by an impaired immune system prone to opportunistic infections, as well as the increased healthcare costs that come with managing the disease (whether or not it's treated with antiretroviral drugs), and the risk of leaving single or double orphans as a result of death from the disease. At the population level, the labor capital is severely restricted when levels of HIV in a population are particularly high, as the disease weakens and impairs possible workers. However, while the effects are devastating, the disease itself is incredibly preventable, and thus even sky-high rates can eventually be reversed through education on transmission and prevention, increased testing, and mother-to-child prevention mechanisms.

The rate of HIV/AIDS that exists in a population is sometimes difficult to measure if there are few testing sites available, and further, if HIV/AIDS is stigmatized in the study population. This was the case in the Sauri, Kenya Millennium Village at baseline. Thus, the 86% of pregnant women that accepted HIV testing among those who went to the Yala sub-district hospital for antenatal visits were used as a proxy. Among those, 30% tested positive for the virus—prompting MVP to initiate a prevention of mother-to-child transmission program almost immediately after the project was started. This number was higher than both

the national and district estimates, indicating that Sauri was an incredibly high-risk population.

Plate 12: Health facilities supported by MVP

While there had been many efforts to build awareness about HIV in the Nyanza province, comprehensive knowledge of the HIV virus and AIDS was extremely low. However, there were signs of hope among the younger demographic, where 21% of 15-24 year olds had been tested for HIV (even though there was no testing facility in Sauri at baseline). Furthermore, 85% of respondents from the same demographic said they would want to be tested for the virus, and the same number said that they knew where they could go to get tested. In general, however, there still remained a stigma against the disease as 47% of survey participants stated that they would want an HIV positive diagnosis of a family member to remain a secret.

One of the easiest methods to prevent the horizontal (not vertical, as in mother-to-child transmission) spread of HIV is the barrier method, thus the rate of use of male and female condoms is important to measure. Among women surveyed at baseline in Sauri, only 9% stated that they were using a barrier method as a contraceptive—28% of women surveyed said they used "some form" of contraception. Among men 15-24, 45.5% reported having used a barrier method of contraception the last time they had intercourse. The Sauri baseline survey also asked five questions to gauge the comprehensive knowledge of HIV/AIDS in the general population, which is useful in implementing prevention strategies. The questions asked whether there was a way to avoid getting HIV, whether HIV could be transmitted by mosquitoes, whether condoms reduced the chances of acquiring the virus, whether there were any methods that could prevent mother-to-child-transmission, and whether there is any medicine that a person with AIDS can use to stay alive. 38% of respondents answered all five questions correctly (compared to 0.7% who responded to every question incorrectly). In addition to the information presented above, the Sauri baseline survey also includes data on the enrollment of orphans (single or double) in school, as HIV is one of the main causes of death among adults.

After a series of interventions that involved construction, refurbishment and staffing of Sauri clinics on a general sector level, as well as several interventions specifically targeted toward reducing the impact of HIV in the area, the Sauri year 5 evaluation report tells a much different story. Likely as a result of radically increased HIV testing (both at nearby clinics as

well as door to door testing conducted by medical staff and Community Health Workers), and prevention programs for mother-to-child transmission, the HIV/AIDS situation in Sauri started to look much better after 2005. 100% of women had received at least one antenatal visit—this is significant, as women have the option of being tested for HIV at these visits, and if the result were positive, they would receive information on preventing mother-to-child transmission. The use of contraceptives in general had risen to 40.3% from the baseline, a nearly ten-point increase. Most surprising of all however, was that HIV testing among 15-49 year olds had risen from 13.5% at baseline (although 21% in 15-24 year olds) to 54.6%. While it can't be said that there were no challenges—men in the community tended to oppose or want little to do with adoption of family planning methods—the project was able to mitigate the effects of these by focusing heavily on this indicator. After the 5 year report, MVP in Sauri identified two more goals to sustain the success in HIV prevention: the project would hire HIV counselors that would be able to test patients in order to take the strain off of already overworked nurses, and would attempt to have testing kits always in stock in order to avoid "missed opportunities".

While the final assessment of the quantitative data on the Millennium Village Project in Sauri has yet to be released, some preliminary data for 2015 was released. The proportion of women who tested positive for HIV during labor or antenatal visits was averaged at 16% over 2015, as compared to the estimated 30% at baseline. 96% of pregnant women infected with HIV were assessed for antiretroviral therapy eligibility, likely because of this increase, only one child who was exposed to HIV in-utero was HIV positive in 2015. According to Community Health Worker reports, there were 23 new cases of HIV in Sauri "proper" (not including other villages in the cluster) from January-September 2015. While the fact that there are new cases at all might seem troubling, the rate of increase of the disease has slowed tremendously over the Millennium Village Project's tenure.

In general, the data provided indicates that HIV/AIDS in Sauri is under much better control now, in 2016, than it was at baseline. In an effort to supplement the quantitative data with a qualitative account I would like to add that I was very impressed with the level III Bar Sauri health clinic that my team and I saw on our first day in Sauri. There was a full laboratory where HIV testing was possible (among testing for malaria, common sexually transmitted infections, tuberculosis and others), contraceptives—including condoms—were promoted and free, and there was an entire wing of the clinic that was dedicated to HIV patients. Here, patients could speak to a counselor in order to get tested, but the counselor could also provide guidance on how to prevent transmission and how to manage cultural stigma. The waiting room in this wing of the clinic was extremely crowded—which was initially troubling until I realized that people in Sauri were willing to be tested, willing to be counseled.

On some level, the crowdedness of the HIV ward of the clinic indicates that the knowledge outweighs the stigma. The counselor spoke to us briefly about the role that Community Health Workers played in educating the public about HIV, in encouraging "at risk" individuals to get tested, and in educating mothers about vertical transmission. Furthermore, she introduced us to the concept of "male champions,"—well regarded men in the community whose role was to educate and influence others on the dangers of HIV, the methods of

prevention, and to try to alleviate the stigmatization of those affected. The Millennium Villages Project with the help of Community Health Workers, Male Champions and other community volunteers, as well as government health workers assigned to the clinics, Sauri is in a much better state in regards to HIV/AIDS now than it was ten years ago. Karamoja is a much different story, and the HIV/AIDS problem may be much more difficult to solve for several reasons.

Karamoja Case Study

In short, while the HIV/AIDS epidemic in Karamoja is definitely a problem, this long-marginalized region of northeastern Uganda has much bigger fish to fry. According to the KDIDP baseline survey, 86% of households in the region are food insecure as a result of crop failure, climate change, and the stresses of shifting from the traditional pastoralist livelihoods to more sedentary agrarian livelihoods. Furthermore, both protein-energy malnutrition as well as micronutrient deficiencies plague the region's people. There is little efficient and reliable access to potable water as a result of miscommunications and uncoordinated efforts among NGOs in the region, and county offices. There is a culture of defecating outside (open defecation) in the region, which impacts the sanitation and hygiene inside the homes, increases incidences of parasites in addition to exacerbating other diseases such as malaria and pneumonia. Thus, while HIV/AIDS is a problem in Karamoja, it is not by any means the biggest problem in the region.

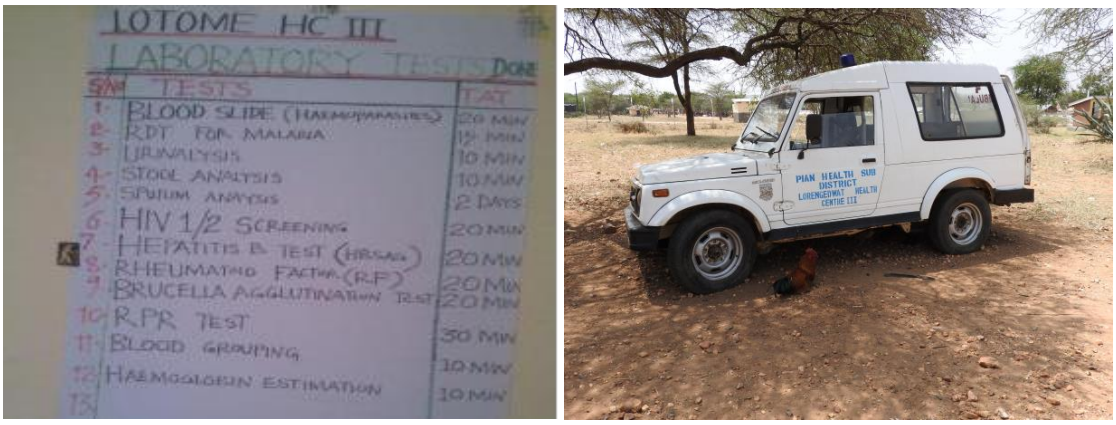

Plate 13: List of laboratory tests at Lotome health centre and a broken down ambulance

However, this does not mean that it should be forgotten while the project focuses on other, more pressing issues. According to the KDIDP Qualitative Baseline Survey Report, in every single one of the region's sub-counties, HIV/AIDS is one of the most common diseases, and one of the most common causes of death in adults (in addition to tuberculosis and malaria). Often HIV infected individuals are particularly prone to severe infections and subsequent death from tuberculosis, and thus two of the three most common causes of adult death in Karamoja might be related. The effects of HIV/AIDS on the livelihoods of the people in Karamoja are roughly the same as those stated for Sauri, but on a larger scale, as so many other health-related issues already plague the region. Women in Karamoja are the primary household breadwinners, thus the families of those affected do not only incur higher health

costs (that they cannot afford to pay), but are placed in an even more vulnerable condition if the mother is affected. Children of parents who either suffer from or have died as a result of HIV/AIDS are much more likely to attend school irregularly and to drop out of school. Furthermore, HIV/AIDS is cited in the KDIDP baseline survey as one of the major causes of teacher absenteeism, as infected teachers are often absent due to HIV/AIDS induced sickness. While at first glance it seems as though the HIV/AIDS epidemic is one of the least pressing problems that Karamoja faces, its prevalence greatly exacerbates existing problems.

According to KDIDP's baseline assessments, the majority of health centers (though not all) have the facilities to test for HIV (as well as more portable HIV testing kits) and offer family planning services. The elimination of mother-to-child transmission of HIV program has already been implemented, and there are enough antiretroviral drugs to sustain the portion of the population that is HIV positive. Despite this, KDIDP hopes to go above and beyond to establish a greater number of well-staffed health posts, recruit experienced staff to provide HIV clinic resources at level II and III health centers, improve transport infrastructure to make the health centers accessible for those who live around (especially during the rainy season), and increase the number of health facilities in distant parishes without coverage. The problem seems to stem from a lack of knowledge about prevention and transmission in the population, not necessarily a lack of services.

Because the data from the KDIDP Quantitative Baseline and the data from the qualitative baseline survey seem to contradict each other (e.g. the qualitative data lists HIV/AIDS as one of the most common cause of adult death, and one of the most common diseases overall, but the KDIDP quantitative baseline survey estimates the HIV prevalence in the population to be between 3.4-6.5%) and the quantitative data also seems to contradict the Uganda Demographic and Health Survey from 2011 (although this might have to do with the difference in timing between the two data sources), therefore the data that I will be presenting is from the UDHS survey.

According to the Uganda Demographic and Health Survey, 38% of women from Karamoja know that using condoms can prevent the spread of HIV (the next lowest regional percentage is at 65%, almost 30 percentage points higher than Karamoja). Karamoja is also several percentage points behind *most or all* regions of the country in women that understand that limiting sexual intercourse to one uninfected partner, and combining both methods can also prevent the spread of the infection. For men, the percentage of those who know that condoms can prevent HIV infection is slightly higher, but at 53% is still the lowest in the country. Furthermore, only 20% of women aged 15-49 in the Karamoja had a comprehensive knowledge about AIDS. "Comprehensive knowledge" was evaluated by answering questions correctly about whether a healthy looking person could have AIDS, whether HIV can be transmitted by mosquitoes, and whether HIV can be transmitted through supernatural means, whether the infection can be transmitted by sharing food. On the other hand, 44% of men in Karamoja have a comprehensive knowledge about AIDS. Furthermore, Karamoja's women performed comparatively worse than other regions' women, *and* Karamoja's men in responding to questions about vertical HIV transmission, such as whether the disease could be transmitted by breastfeeding, and whether the risk of Mother-to Child-Transmission can

be mitigated by taking certain drugs. Furthermore, women in Karamoja also tended to be less accepting of people with AIDS than men in Karamoja and women in other regions.

In the data presented above we see two things that are troubling. One, that the population of Karamoja in general knows less about HIV/AIDS transmission and prevention, and that they tend to be less accepting toward those who are open about having the disease. Furthermore, the percentage of women who answered HIV/AIDS questions correctly was lower than the percentage of men who answered questions correctly—in every category. This tells us that women in Karamoja are even less informed than their male counterparts about HIV/AIDS. Furthermore, according to the UDHS, less than half of women feel justified in refusing to have sexual intercourse with their husbands if he has sex with other women, and in asking that he wear a condom if they know he has an STI. This data speaks directly to a phenomenon called the feminization of AIDS, in which women are more likely to fall victim to HIV infection because of a discrepancy in knowledge about transmission and prevention. This also means that women (who are already uneducated about the disease) are much more likely to pass on the infection to their children.

What KDIDP plans to do regarding prevention, transmission and treatment of HIV/AIDS is mostly infrastructural. This is incredibly helpful, as it will allow more individuals to get tested for the infection, and will allow more of those infected to get necessary antiretroviral drugs. The infrastructural changes are valuable and definitely need to be realized. However, equally important is to institute a larger scale education initiative (Community Health Workers are already helping educate the population) regarding HIV/AIDS—this initiative must target women to a greater degree than men, as they are the less knowledgeable gender when it comes to HIV/AIDS prevention and transmission. The spread of HIV/AIDS is only preventable if the population is educated. I spoke to Dr. Charles Nuwagaba (the KDIDP Health Sector Coordinator) about the current educational HIV/AIDS prevention initiative. He said that the current strategy involved teaching the "ABCD" method: A is Abstinence, B is Be faithful to your partner, C is use a Condom, and D is Death. Several studies conducted in the United States have suggested that there is a need for comprehensive sex education, as an emphasis on abstinence—as opposed to safe sex—does not lower unwanted pregnancy or STD/I rates among teenagers or adults (Stanger-Hall *et al*., 2011). While HIV prevention education that stresses abstinence and fidelity might be more sensitive to cultural differences, it is important to emphasize that "safe sex" through condom usage would be a more effective HIV prevention strategy. Other contraceptive methods do not prevent the spread of HIV/AIDS, and while abstinence and fidelity to one, uninfected partner are ideal, they are not always feasible. Further, even if fidelity to one partner was emphasized, an infected partner could still transmit the infection. Therefore, in order to reduce the spread of HIV/AIDS in Karamoja the large-scale education initiative should focus on barrier methods (male and female condoms) that can prevent HIV transmission.

Again, it might seem as though HIV/AIDS prevention should not be a priority in the face of the myriad of challenges that Karamoja faces. This is not to diminish the nutritional, infrastructural and sanitation concerns that are vastly important, but stopping the spread of HIV/AIDS in the region is critical as well. It will increase the quality of life in general, by

increasing labor capital, decreasing the impacts of lost income due to lack of wages and increased healthcare costs, and will reduce the amount of children who are orphaned and thus absent in schools.

Lessons Learnt

Sauri and Karamoja's HIV/AIDS problem have much in common. However, Sauri's baseline proxy indicates that the problem here may have been substantially worse than what is reported in Karamoja. The Sauri baseline suggested an incredibly high rate of HIV infection. In Karamoja it is difficult to say what the rate of infection in the general population is. The KDIDP quantitative baseline suggests that the rate may have risen from 3.4% to 6% in recent years, but the KDIDP qualitative baseline reports HIV/AIDS as one of the most common causes of death in adults, and the UDHS suggests that the degree of knowledge about HIV/AIDS in the region, particularly among women, is much lower than the rest of the country. The comprehensive knowledge of AIDS at baseline in Sauri was 38%, whereas in Karamoja the average between the percentages of comprehensive knowledge among men and women averaged out to 32%. However, there is a large discrepancy between the sexes—men scored 24 percentage points higher than women. Both regions had problematic levels of comprehensive knowledge of the disease. In both regions, MVP and KDIDP invested (or are planning to invest) money and effort into infrastructural changes that made/will make it easier for people to be tested for HIV, for mothers to avoid transmitting the infection to their children, and for those infected to receive medication. In both regions community health workers play a substantial part in educating the population, as well as facilitating testing for the virus. In both regions, initial levels of contraceptive use (including condoms) were very low at baseline. Sauri showed a success story in a region where the prevalence of HIV at baseline was more than four times that of the country as a whole. This incredible feat was accomplished through a blend of infrastructural changes (improvements to the health center, laboratory testing abilities, etc.,) and education initiatives (HIV counselors at the health centers, Community Health Workers in homes, etc.,). KDIDP is just now starting to intervene, but there are huge differences in Sauri and Karamoja, even at baseline, that determine the way that the problem of HIV/AIDS manifests itself in each region.

Firstly, as was mentioned before, Karamoja has several more challenging problems that obscure the gravity of HIV/AIDS. Dr. Charles Nuwagaba mentioned that people didn't care to learn about prevention or transmission of the disease because it wasn't an "immediate problem", as opposed to malnutrition, or other more visible troubles. Culturally there are also deterrents to implementing *much needed* education initiatives. Contraceptives, including condoms, are seen as a method for Western countries to drive down the birth rate and thus control the region, and large families are considered a tangible measure of wealth (Dr. Nuwagaba, personal communication). This does not mean that eradicating HIV/AIDS in the region is impossible—but it does mean that it will prove to be more difficult than in Sauri. Efforts must be made to underscore the severity of AIDS, and the consequences of living in a highly infected region. There must be a reason for people to care enough to want to prevent the spread of the disease. Furthermore, efficient education initiatives must be implemented, and they must target women at a greater rate than men. This is partly because they are more

likely to be uninformed about the disease, and therefore fall victim to it, but also because if infected, they are more likely to pass the infection on to their children and thus continue the cycle of infection.

Sauri showed us how much of a difference changes in infrastructure and education make in preventing the spread, and further de-stigmatizing HIV/AIDS. Karamoja highlights the importance of working *with* and sometimes *around* the population in order to come up with the most effective intervention strategies. Both sites demonstrate the importance of education, *alongside* infrastructure as a method of eradicating transmittable, preventative diseases. MDG 6 is lofty—this is undeniable—but it *is* achievable.

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Assessment of Child Health Initiatives in Sauri and Karamoja

By Kaylee Monroe, Princeton University

Background

Child mortality, specifically the number of children who die by the age of five, per thousand births per year, is a key indicator for child health and well being in a society. In 2000, the UN outlined 8 Millennium Development Goals (MDGs), with the 4th being, "Reduce Child Mortality", which called for decreasing the under-five mortality rate by two thirds between 1990 and 2015. Sub-Saharan Africa has the world's highest child mortality rates, despite dramatic declines over the past two decades. The causes of death are diverse and dependent upon the region, but most are preventable diseases, such as tetanus, measles, diarrhea, and intestinal worms.

Strategies to improve child health and reach MDG 4 have included immunization programs, improved health facilities, and educational outreach. Yet by 2015, many countries, especially in Sub-Saharan Africa, failed to reach the targeted reduction in child mortality. Thus, with the development of the Sustainable Development Goals(SDGs) in September of 2015, improving child health remained a central concern. SDG 3 is to "Ensure healthy lives and promote well being for all at all ages," with one of the targets being to "by 2030, end preventable deaths of newborns and children under 5 years of age." It is essential to carefully consider the most prevalent preventable diseases that affect children in each population, in order to develop the best integrated management approach and reach this target. While the issues affecting child health are multi-faceted and complex, in this paper I will specifically analyze the dominant diseases plaguing children in Sauri, Kenya and Karamoja, Uganda that could be eradicated explicitly with immunization, routine health visits, and education.

Sauri Case Study

Sauri is a cluster of villages in western Kenya, and was the site of the first and largest Millennium Village Project. The baseline survey conducted between September 2005 and January 2006 reported that the under-five mortality rate for the population was 149/1000, which was higher than the Kenya national average of 115/1000. Regarding another important indicator for MDG 4, the proportion of one year old children vaccinated against measles was 67.1%. Globally, measles is the leading cause of death in children. The disease is highly contagious and can be severe for children under 5, who lack a fully developed immune system. Symptoms include fever, runny nose, cough, and red and watery eyes.

Tuberculosis is another disease essentially eliminated in developed countries, that continues to afflict impoverished areas. The CDC believes that tuberculosis in children is a "hidden epidemic," due to the fact that childhood TB is difficult to diagnose, symptoms can be confused with those of other diseases, and the cases are likely to be misreported as death due to HIV, pneumonia, or malnutrition. Measles and Tuberculosis are of particular concern in

developing communities such as Sauri, where malnutrition, vitamin A deficiencies, and HIV/AIDs further weaken children's immunity.

The Millennium Village Project created many initiatives in order to address the pervasiveness of these diseases. First, MVP focused on improving the strength of health systems over all, through clinic construction, refurbishment, and staffing. The Year Five report for Sauri described the intention to reduce the distance to the points of service, expand services, and increase awareness. Furthermore, one of the most important undertakings was the establishment of the Community Health Worker (CHW) program. MVP worked with the Ministry of Health to recruit community members and give them essential training. The purpose of this program is to use respected local residents in order to encourage increased utilization of health care services and support preventive health programs. Each CHW is assigned to a number of households to visit every month. In my discussions with MVP leaders they advised that while MVP did contribute a small stipend, they advised that CHWs love their job and role in helping the community. Therefore, it is likely that this program will continue even without MVP funding, given the culture of volunteerism.

Regarding directives specifically related to child health, the staff at the Sauri clinic received training in and tools for the integrated management of childhood illness (ICMI). As a result, the clinic expanded immunization capabilities and introduced growth monitoring, vitamin A supplementation, and deworming. When I had the chance to visit the clinic, I noticed charts on the walls tracking high rates of vaccination for a number of key diseases, including measles and tuberculosis. I also noted that there were many patients at the clinic, the majority of which were children. Thus it appears that many families are able to take their children to the health center. Throughout my visits to Sauri the majority of the children I saw appeared to be in good health.

The year 5 report for Sauri noted that the proportion of one year old children immunized against measles was 91.7%, a great improvement. It's likely that other vaccination rates similarly improved. Additionally, after five years the proportion of children receiving vitamin A supplementation increased from 70.9% to 84.7%. According to the WHO, vitamin A deficiency (VAD) increases the risk of disease and death from severe infections. MVP also instituted routine deworming for children every four months from the age of one onwards. Globally, human infection by parasitic worms, intestinal helminthes, is extraordinarily common, and children appear to be particularly susceptible. The baseline report for Sauri related that the prevalence of soil-transmitted helminthes (STHs) was 48%. Like VAD, infection with a STH can lead to a depressed immune system, and increase the likelihood of getting measles or tuberculosis.

The government of Kenya has also worked to improved child health. In 2006 it launched a two-phase integrated measles vaccination campaign. Not only did the campaign work to provide residents of the western provinces with measles vaccination, they also provided vitamin A supplements and de-worming medicine. The campaign was supported by the Measles Initiative, a partnership between the Red Cross, United Nations Foundation, World Health organization, and UNICEF (Pharma Marketletter 2006).

Combining immunization with vitamin A supplementation and routine deworming is extremely important for reducing the incidence of measles and Tuberculosis, since immunization doesn't completely guarantee that the receiver will never contract the disease. It's crucial that the government continues to stock the clinic with the supplies necessary to continue these programs and maintain the progressions made through the Millennium Village Project over the past 10 years. However, while immunization will most likely be necessary for the foreseeable future, vitamin A supplementation and deworming can't be long term solutions. Improvements in nutrition through additional progress in terms of agriculture practices would disregard the need for supplements. Furthermore, advances in sanitation would decrease the incidence of STHs. Moreover, while MVP instated a verbal autopsy program to determine the cause of death for children that has started to inform the adaptation of health interventions, it would be beneficial to collect and consolidate data on the frequency of measles and tuberculosis, though this would require improvements in the availability of tests to diagnosis.

Plate 14: Bar-Sauri Health Center Level III supported by MVP

Karamoja Case Study

In 2015 the Government of the republic of Uganda launched the Karamoja Drylands Integrated Development Project (KDIDP), based off the millennium village model. Karamoja is a harsh semi arid northeastern sub region, largely inhabited by pastoralists and agro-pastoralists. It's prone to problems such as water scarcity and food shortage, stemming from drought and low agricultural production. The region has been historically marginalized in terms of development due to it's remoteness and low economic potential.

Public health overall is an extremely important issue that the KDIDP intends to address. The Baseline Survey reported that the area only had seven health facilities, none of which were served by a medical doctor, and that the communities had to travel long distances to access services from these centers. Child health is particularly important due to the fact that children

constitute a high proportion of the overall population. In 2011, the under five mortality rate was 90/1000, according to the qualitative baseline report. At baseline, the MDG indicator of the rate of measles vaccination of children aged one year was surprisingly high, at 75.8% However, there was conflicting data on both indicators in the quantitative report. Better data collection and reporting for these indicators as well as others is vital for informing public health initiatives.

Before the KDIDP, UNICEF and IRC partnered to support a Village Health Team (VHT) program. On average, a VHT takes care of 50 households. They're able to treat simple pneumonia, mild and moderate diarrhea, and fever. However, the extent that they educate the households they serve, increase awareness, and promote routine visits to the health center is unclear. When I visited a health center III in the sub county of Lorengedwat, one of the workers noted that the majority of the time mothers only bring their children in when they are severely sick. Many families don't have the money to be able to take their children to the health center when they're sick, let alone just for a routine check up. Thus, there is no regular growth monitoring of children, and it's likely that vaccination rates for diseases outside of measles are low. While all HC III's have vaccines at the facilities, supplied by the District health office, if the children aren't taken there, it's difficult to get them the vaccine. Weekly immunization outreaches are the intention, but transport to the communities is challenging due to the lack of infrastructure in the region. The dirt roads are particularly poor during the rainy season. Additionally, not all facilities have a functional transport vehicle regardless.

During my visit to the health center I noticed a low population of patients, and the children appeared very sick. Throughout my time in Karamoja I continued to see children in poor condition. Many had distended stomachs, likely indicating an infection with a soil-transmitted helminth. Due to cultural beliefs, NGO's have had difficulty in promoting good sanitation practices. Most households don't use latrines, so soil contamination is rampant, and children are constantly playing outside in the dirt. Furthermore, a lot children I saw appeared to have difficulty breathing, possibly due to tuberculosis or another respiratory disease, and many had red eyes and runny noses.

Children who are malnourished are much more susceptible to infectious diseases such as measles and tuberculosis, due to their weakened immune system. Many NGOs have sought to address malnourishment and nutrition in Karamoja. For example, the WFP provides supplementary feeding through the Andre Food Consult to children below five years old. The food is received when a mother comes in for antenatal care. UNICEF also provides Ready to Use Therapeutic Food to severely malnourished children. Additionally, as Vitamin A deficiency is a problem that hinders proper immune system functioning and is a major contributor to the mortality of children, supplementation programs have been established. At baseline, 74% of children received vitamin A supplements. While these programs provide short term help, they've created a culture of dependency. When visiting several households the mothers appeared to exaggerate their food situation, looking for handouts from us.

The KDIDP is looking to enact several initiatives to address child mortality. They intend to create a functional community health worker program to serve as a link between the

household and health facility. CHs will be utilized to promote immunization of children under five, in order to improve uptake of immunization in this age-group. They will also hopefully be more adequately trained to address many health issues affecting children.

Plate 15: Lorengedwat health center and non-functional ambulance vehicle

Lessons Learnt

Children represent the next generation, and thus their health and well being is extraordinarily important for sustainable development. Healthy children are more likely to attend and perform well in school, and grow into happy, productive, and motivated adults. The health of children, as the most vulnerable age group, is indicative of the health system of any society. As evidenced by the above case studies, child mortality is a complex issue affected by plethora of factors, that may differ based on the specific region.

Karamoja is subject to many of the same challenges that Sauri was at baseline, such as difficulty in accessing health care, lack of staff and supplies, malnourishment, and high rates of diseases. Measles, tuberculosis, and STHs were all significant contributors to child mortality. Thus several of the same initiatives taken in Sauri, could be helpful in Karamoja. Based off the note in the baseline report that they intend to create a functional CHW system, the KDIDP appears to recognize this. A CHW system would be extremely beneficial in reaching everyone in the community, particularly the poorest who otherwise wouldn't have access to any sort of treatment. Also an immunization campaign such as the one in Kenya would also be helpful to increase immunization uptake.

However, the differences in Karamoja will significantly affect the implementation of these programs. In order to have a good CHW program the KDIDP will have to work to recruit highly motivated individuals, and provide a significant stipend, at least in the beginning. Karamoja isn't composed of a population that is as inspired and willing to volunteer as that of Sauri. Although once the community begins to see change, this may change. Infrastructure is a larger obstacle in Karamoja, due in part to the environment and climate. Furthermore, since there are many cultural beliefs against using latrines, sanitation issues will continue to affect the rate of STHs. Poor farming practices necessitate vitamin A supplementation, until there is development in the Agricultural sector.

These are only some of the many important differences that if properly analyzed will enlighten development partners' future plans in Karamoja.

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Maternal Health: Access to Care in Sauri, Kenya and Karamoja, Uganda

By Sylvia Jacobson, Princeton University

Background

Most maternal deaths are preventable, as the health care solutions to ensuring safe deliveries for mothers and children are known. However, there are drastic global disparities in access to trained medical personnel and proper resources—99% of all maternal deaths occur in developing countries. Thus, health interventions can have a great impact in saving the lives of mothers if targeted at poorer and rural communities (WHO, 2015).

The United Nations Millennium Development Goals (MDGs) set improving maternal health as the fifth of eight primary objectives for international development. Specifically, the goal aimed to reduce the maternal mortality ratio by three quarters between 1990 and 2015. Since the inauguration of the MDGs, vast improvements have been made—a number of countries in sub-Saharan Africa have halved levels of maternal mortality since 1990 (WHO, 2015). As the UN transitions to a new set of development targets called the Sustainable Development Goals (SDGs), maternal mortality is once again a priority. SDG three aims to reduce the global maternal mortality ratio to less than 70 births per 100,000 live births by 2030.

Maternal mortality is defined as the "death of a woman while pregnant or within 42 days of termination of pregnancy from any cause related to or aggravated by the pregnancy or its management" (Mutuo *et al*., 2007). The main complications that lead to maternal deaths are severe bleeding after childbirth, post-delivery infections, high blood pressure during pregnancy (pre-eclampsia and eclampsia), and unsafe abortions (WHO, 2015). Women are deterred from seeking care during pregnancy and childbirth because of several factors including inability to pay for medical care, long distances to health facilities, lack of information, inadequate maternal services, and cultural traditions.

Maternal Mortality Ratio (MMR) cannot be measured precisely over short-term periods and in zones with smaller populations (as MMR is measured in deaths per 100,000 live births), so many interventions use proxy indicators such as prevalence of contraceptive use, proportion of unwanted pregnancies, prevalence of antenatal care, proportion of births attended by skilled health personnel, and availability of emergency obstetric services (KDIDP, 2015; Mutuo *et al*., 2007). In this paper, I focus on access to quality healthcare facilities and prevalence of births attended by skilled health personnel, in Sauri, Kenya and Karamoja, Uganda. This paper compares maternal health challenges and interventions under the Millennium Village Project (MVP) in Sauri and the Karamoja Drylands Integrated Development Project (KDIDP) in Karamoja.

Sauri Case Study

Prior to MVP's involvement in the region, there was no access in Sauri to emergency obstetric care—the closest facility was in Siaya District hospital, 35 km away (Mutuo *et al*.,

2007). This was a primary concern since almost half of all births had some sort of pregnancy complication. The MVP baseline report in Sauri found that the number of women who had antenatal care was relatively high at 91.4%, but only 18% had 4 antenatal visits—the WHO recommended number. Only 51.8% of births were attended by skilled health personnel, defined as accredited professionals such as doctors, clinical officers, nurses, and midwives (Mutuo *et al*., 2007). During a field visit to Sauri, the head nurse at a health clinic spoke of how, prior to MVP's interventions, Sauri women would give birth at home or be brought to a health facility in a wheelbarrow and deliver along the road. These practices meant that women did not necessarily have sanitary conditions, support from a birth attendant, or, most importantly, access to higher medical care in cases of life-threatening complications. Many women died from postpartum hemorrhages—severe bleeding following delivery.

High maternal mortality rates in Sauri meant an increase in single parent and child-headed households. Motherless children are often left without sufficient care and economic resources and, thus, may drop out of school to provide for their family. In addition, women should be able to have children without fear of suffering or death. Healthy mothers can better contribute to their communities and lead fulfilling lives. Maternal health affects multiple sectors in Sauri—a village in which the main livelihood is subsistence farming—including agriculture, education, gender equality, and, of course, the health sector.

MVP set out to improve maternal health and safe delivery services through several interventions. One of the main MVP strategies is the Community Health Worker (CHW) program, through which community members are elected, trained, and supervised. In Sauri, the head nurse at the health clinic and Salome, a member of the MVP team, described how CHWs conduct monthly household visits to check on the health status of families and to educate about health services and disease prevention. When Sauri women become pregnant, CHWs can refer them to the health facility for antenatal visits and giving birth. MVP updated the community health center (*Plate 16*), even constructing a maternity ward. In addition, MVP organized a fleet of three ambulances for the village, which provide access to higher medical care in case of emergencies.

Sauri's 2010 Year 5 Report highlights success stories regarding many of these interventions. The rate of births attended by skilled health personnel rose from 51.2% in 2005 to 67.8% in 2010. Notably, 100% of women received antenatal care, an increase from 91%. However, I observed on a field visit in February 2016 to the clinic that the maternity ward had closed and was no longer delivering babies, as the government had not provided funding for skilled workers. Community health workers formerly received stipends funded by MVP, but they currently fulfill their duties voluntarily.

Plate 16: Sauri Community Health Center (Photo from http://millenniumvillages.org)

Karamoja Case Study

Karamoja has the highest maternal mortality rate in Uganda—at 750 per 100,000 live births—and its women are the least likely to deliver in a health facility (Resilience Analysis Unit, 2015). Residents of this impoverished region, in which 86% of households report food insecurity, often cannot afford basic health services (KDIDP, 2015). The cost of treatment, associated costs of transportation and accommodation, and the opportunity cost of not working, all contribute to the financial burden of accessing health care (Resilience Analysis Unit, 2015). During a field visit to Nadunget, I met a family who could not take their son who had a seriously injured foot to a hospital because of unaffordable fees. Similar barriers may exist for expectant mothers, as delivery costs in private hospitals can range from 5,000-30,000 UGX. (Columbia Global Centers, 2015). The NGO Doctors with Africa (CUAMM) provided payments for pregnant mothers and newborns, but this three-year program ended in 2015 (Columbia Global Centers, 2015).

Traditional pastoral livelihoods also meant that communities were mobile and did not have access to permanent health facilities, although Karamoja citizens are becoming more sedentary due to governmental pressure and climate change. According to the KDIDP Baseline report, only 52% of births were attended by skilled health personnel, a comparable value to Sauri's baseline statistic. 87% of women had at least one antenatal visit and 63% had the recommended four visits. Improved maternal health in Karamoja would enhance multiple areas of development in the region. Food insecurity and malnutrition levels may decrease, as healthier mothers give birth to healthier children. Further, the community could better focus on pastoral and agrarian developments in order to promote food security and economic growth.

KDIDP's maternal health strategies mainly focus on increasing access to medical care. Community health workers encourage mothers to attend antenatal visits and give birth in the

hospital. When conducting fieldwork in Achorichor and Nadunget with my food security project team, Dr. Nuwagaba from KDIDP encouraged women to attend a minimum of four antenatal visits when pregnant and to visit the updated health facility to give birth. KDIDP is working to improve health facilities, including providing access to clean water and training qualified health personnel to staff the facilities (KDIDP, 2015). During a visit to a health clinic in Moroto district, we observed the sole clinic ambulance in disrepair with flat tires (*Plate 17*).

Plate 17: Broken-down Ambulance at a Moroto Health Clinic

There are several cultural practices—such as child marriage and female genital mutilation—that pose additional challenges in addressing maternal mortality in Karamoja. The 2015 Resilience Context Analysis found that 49% of women in Karamoja married before the age of 18 and 15% married before age 15. Adolescent mothers are more likely to have birth complications and thus have higher rates of mortality (WHO, 2015). Certain regions of Karamoja practice female genital mutilation, which also greatly increases the risk of maternal death particularly due to postpartum hemorrhage, which is excessive bleeding after delivery (WHO, 2016). During a field visit to Achorichor parish, Dr. Nuwagaba from KDIDP explained how girls in this community nearly universally undergo female genital mutilation (FGM) when they reach puberty. Not only does FGM increase risk of birth complications (in addition to dangers posed by the surgery itself), women with FGM are deterred from seeking medical care because they do not want health providers to know about the practice, according to Dr. Nuwagaba. FGM is illegal in Uganda and perpetrators can be arrested. Many women erroneously believe that if they are found to be a victim of FGM, they, too, will be punishable by law.

Comparison and Analysis of Maternal Health in Sauri and Karamoja

Sauri and Karamoja's baseline reports both reflect similar rates of delivery attendance by trained personnel and antenatal visits pre-Millennium Development intervention. As only about half of women had deliveries attended by professional health workers, both regions

focused on increasing access to health facilities with trained personnel. The Community Health Worker program seemed to be extremely successful in Sauri in increasing rates of deliveries and antenatal visits in health facilities. Thus, it seems the CHW program in Karamoja has great potential in improving maternal health. Extension worker programs, in general, are one of the most effective components of Millennium Development Projects and future development projects should emulate the program and treat community members as crucial change agents.

In Sauri, one of the main challenges was a lack of access to higher medical care, so the ambulances were a critical improvement. In Karamoja, broken ambulances should be repaired and additional ambulances should be provided to increase access to medical facilities during obstetric emergencies. However, due to the prevalence of extreme poverty and private hospitals that charge fees for care, interventions must go further than providing transportation. Maternal wards that give antenatal assessments and assist with deliveries free-of-charge should be included and well staffed in all health care centers in Karamoja.

Karamoja also has the added challenge of addressing deeply entrenched cultural practices that pose risks to maternal health. Widespread child marriage and female genital mutilation both increase maternal mortality. KDIDP interventions must be culturally sensitive to these practices, but not be afraid to advocate changes for the sake of girls and women's health. At minimum, CHWs should educate on the risks of delivery for adolescent mothers and women with FGM and clarify that women will not be penalized if they seek care at a medical facility and are found to have undergone FGM. Current interventions in improving access to medical care in Karamoja cannot be sustainable until they address the cultural barriers that threaten women's health and keep them away from health facilities. Future development efforts can learn from Karamoja's challenges by seriously considering how existing cultural practices can enhance and hinder development and by brainstorming methods of building upon and adapting cultural practices where necessary with the input of the community.

In Sauri, the improvements made in maternal health are not sustainable, as the government was not sufficiently involved in development. Already, the maternity ward at the health clinic lies empty, since the government did not provide staff once MVP funding ended. This disappointment can provide two lessons for maternal health developments efforts in Karamoja and globally. First, it is critical that the government be involved in the project to the greatest extent possible. If only outside parties invest in development, then progress will not be sustained when these parties leave. According to Margaret Wanjiko of the MVP office in Nairobi, governments often disengage in areas in which MVP works because they want to shift their limited resources to more desperate regions. However, development projects must make clear to local, regional, and national governments that they require government participation. Secondly, the dearth of healthcare staff in Sauri demonstrates that training qualified health workers must be a priority of future development projects in order to improve maternal health.

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