

Stanford SSLP Uganda 2017

Final Documentation



Digitally Managed Community-Based Health Scheme for Kabale District

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1. Executive Summary

The 2017 SSLP Uganda team was tasked with addressing the emerging issue of gaps between available externally-sourced funding for private not-for-profit healthcare organizations like KIHEFO, based in Kabale, and the growing needs of the patient population in the remote Kigezi region of southwestern Uganda. One proposed solution that has seen success in similar developing communities elsewhere has been the implementation of Community-Based Health Schemes (CBHS) to reduce the burden of healthcare costs on patients and cushion gaps in external funding. However, historically, community engagement in such programs has been minimal, and the biggest barrier to success is implementation of such systems. The 2017 SSLP Uganda team was challenged with creating a solution that empowers and engages local community groups, utilizes available resources and existing infrastructure to improve access to and utilization of KIHEFO healthcare services.

This report summarizes the 2017 SSLP Uganda Community-Based Health Scheme project for the not-for-profit health services provider, KIHEFO, based in Kabale. The report begins with a background on Ugandan healthcare and culture, the day-to-day workings of KIHEFO clinics, and the financial structure of the various forms of aid and international involvement that keep KIHEFO in business. The report then goes on to summarize field interviews with KIHEFO staff, local community members served by KIHEFO outreach events, and community leaders such as Ngozi group leaders. Insights gained in these interviews and observations were critical in forming the basis of a sustainable, adequate, and appropriate Community-Based Health Scheme.

Based on the key learnings gained through field interviews and observations during weeks one and two, the Stanford team was broken into three groups to tackle three of the most important aspects of designing such a scheme: Group I: Software development/Database application, Group II: Organizational Integration, and Group III: Financial model. The report includes explanations of the structure and responsibilities of these groups as well as the development of the designs associated with each. Design development, which occurred during weeks 3, 4, and 5, included, generally, a software and database application (front end/back end) to enroll patients and store and access patient data, methods for integrating the health scheme information into KIHEFO's current workflow, creating training materials to ensure KIHEFO staff are comfortable and knowledgeable about the new health scheme system, creating a system of health scheme packages to offer potential enrollees, a financial model to confirm the long-term financial sustainability of the system with dynamic premium pricing, and a marketing strategy to identify and target a sufficient number of enrollees to sustain the system.

Upon completing prototypes of each of the major components listed above, user testing began in week five. Integration of the KIHEFO Community-Based Health Scheme into the daily workings of the KIHEFO clinics and outreach events is critical to the successful and sustained

deployment of the system, and the Stanford team spent significant time creating materials and holding sessions to ensure adequate levels of knowledge and skills were imparted to as many KIHEFO staff as possible. Key KIHEFO staff were trained on the structure of the new health scheme packages and how to best convey such information to potential enrollees. They were also trained to use the software built in weeks three and four to confirm enrollment and look up patient information. Feedback from these sessions was used to iterate upon training materials to leave with KIHEFO and prototypes were re-designed to better suit KIHEFO staff and potential-enrollee needs. Final design specifications were recorded in this document to ensure knowledge is not lost as future students and KIHEFO staff continue to iterate on the health scheme.

As the final step in the deployment of the KIHEFO – CBHS, an official enrollment session was held at the end of week five, where a KIHEFO social worker successfully informed and signed up a family of nine for a KIHEFO - CBHS package. Feedback and insights from this session and future improvements for the various components of the health scheme were recorded at the end of this document. Though Stanford's involvement with the KIHEFO Community-Based Health Scheme will be minimal upon conclusion of the SSLP program, the hope is that the KIHEFO – CBHS will become an integral and self-sustaining part of the KIHEFO organization that will increase access to and utilization of KIHEFO health care services in the rural Kigezi region.

2. Context

2.1 Glossary

- **ART:** Antiretroviral Treatments are medicine to help alleviate side effects, control, and prevent the transmission of HIV/AIDs.
- **CBHS:** Community-Based Health Scheme is an insurance scheme that will have a cash flow but no profit. It is just for continued sustainability.
- **DHS:** District Health Service
- **Digging:** A common job in Kabale that includes cultivating land, planting crops, tending to crops, and picking crops.
- **EMR:** Electronic medical record
- **Health Insurance:** A type of insurance coverage that pays for medical and surgical expenses incurred by the insured, with some exclusions. Profit-driven.
- **Health Care Scheme:** A type of insurance where the policyholder is encouraged to join by the intervention of a third-party. Strong social ties, not-for-profit. Also referred to as a health scheme, scheme, community health scheme, Community-Based Health Scheme.
- **KIHEFO:** Kigezi Healthcare Foundation
- **Kwezika:** Rukiga translation is “life,” it is akin to an Ngozi group.
- **Mobile Money:** A way of interacting with a person’s money via their mobile phone. A person can meet with an agent to deposit their money on their phone. With an active account people can transfer money between accounts and to other people. Some activity requires an agent and some activity incurs additional fees.
- **MOH:** Ministry of Health
- **MUAC:** Middle upper arm circumference is a measurement normally taken to determine if a patient is malnourished.
- **Mzungu:** Pronounced “muh-zoon-goo.” Rukiga translation for white people (singular), Bzungu is the plural form.
- **MVP:** Minimum viable product, the most basic database application that would provide KIHEFO with the needed functionality.
- **NGO:** Non-governmental organization
- **Ngozi:** Either the physical contraption used to carry community members to seek medical attention/burial or the community group that organizes community death procedures.
- **Rukiga:** Pronounced “ru-chi-ga”. The dominant local language in Kabale.
- **Subsistence Farming:** When someone farms just enough to provide for their family.

2.1.1 Health Scheme Terms

- **Allowable charge:** Sometimes known as the “allowed amount,” “maximum allowable,” and “usual, customary, and reasonable (UCR)” charge, this is the dollar amount

considered by a health insurance company to be a reasonable charge for medical services or supplies based on the rates in your area.

- **Annual Limit:** The dollar limit over the course of the year that insurance companies will pay after the member has capped out of their out-of-pocket maximum. The ACA now requires new plans after 2010 to no longer have annual limits, and some existing plans now must have annual limits \$2M+.
- **Benefit:** The amount payable by the insurance company to a plan member for medical costs.
- **Benefit level:** The maximum amount a health insurance company has agreed to pay for a covered benefit.
- **Benefit year:** The 12-month period for which health insurance benefits are calculated, not necessarily coinciding with the calendar year. Health insurance companies may update plan benefits and rates at the beginning of the benefit year.
- **Claim:** A request by a plan member, or a plan member's health care provider, for the insurance company to pay for medical services.
- **Coinsurance:** The amount a member pays to share the cost of covered services after their deductible has been paid. The coinsurance rate is usually a percentage. For example, if the insurance company pays 80% of the claim, the member pays 20%.
- **Coordination of benefits:** A system used in group health plans to eliminate duplication of benefits when members are covered under more than one group plan. Benefits under the two plans usually are limited to no more than 100% of the claim.
- **Co-payment:** One of the ways members share in their medical costs. A member pays a flat fee for certain medical expenses (e.g., \$30 for every visit to the doctor), while the insurance company pays the rest.
- **Deductible:** The amount of money an individual must pay each year to cover eligible medical expenses before the insurance policy starts paying.
- **Dependent:** Any individual, either spouse or child, that is covered by the primary insured member's plan.
- **Drug formulary:** A list of prescription medications covered by the insurance plan.
- **Effective date:** The date on which a policyholder's coverage begins.
- **Exclusion or limitation:** Any specific situation, condition, or treatment that a health insurance plan does not cover.
- **Explanation of benefits:** The health insurance company's written explanation of how a medical claim was paid. It contains detailed information about what the company paid and what portion of the costs the patient is responsible for.
- **Group health insurance:** A coverage plan offered by an employer or other organization that covers the individuals in that group and their dependents under a single policy.
- **Health maintenance organization (HMO):** A health care financing and delivery system that provides comprehensive health care services for enrollees in a particular geographic area. HMOs require the use of specific, in-network plan providers.
- **Health savings account (HSA):** A personal savings account that allows participants to pay for medical expenses with pre-tax dollars. HSAs are designed to complement a special type of health insurance called an HSA-qualified high-deductible health plan

(HDHP). HDHPs typically offer lower monthly premiums than traditional health plans. With an HSA-qualified HDHP, members can take the money they save on premiums and invest it in the HSA to pay for future qualified medical expenses.

- **In-network provider:** A health care professional, hospital, or pharmacy that is part of a health plan's network of preferred providers. Members will generally pay less for services received from in-network providers because they have negotiated a discount for their services in exchange for the insurance company sending more patients their way.
- **Individual health insurance:** Health insurance plans purchased by individuals to cover themselves and their families. Different from group plans, which are offered by employers to cover all of their employees.
- **Medicaid:** A health insurance program in the United States created in 1965 that provides health benefits to low-income individuals who cannot afford Medicare or other commercial plans. Medicaid is funded by the federal and state governments, and managed by the states.
- **Medicare:** The federal health insurance program in the United States that provides health benefits to Americans age 65 and older. Signed into law on July 30, 1965, the program was first available to beneficiaries on July 1, 1966 and later expanded to include disabled people under 65 and people with certain medical conditions. Medicare has two parts; Part A, which covers hospital services, and Part B, which covers doctor services.
- **Medicare supplement plans:** Plans offered by private insurance companies to help fill the gaps in Medicare coverage.
- **Network:** The group of doctors, hospitals, and other health care providers that insurance companies contract with to provide services at discounted rates. Individuals will generally pay less for services received from providers in their network.
- **Out-of-network provider:** A health care professional, hospital, or pharmacy that is not part of a health plan's network of preferred providers. Individuals will generally pay more for services received from out-of-network providers.
- **Out-of-pocket maximum:** The most money a member will pay during a year for coverage. It includes deductibles, copayments, and coinsurance, but is in addition to regular premiums. Beyond this amount, the insurance company will pay all expenses for the remainder of the year.
- **Payer:** The health insurance company whose plan pays to help cover the cost of an individual's care. Also known as a carrier.
- **Pre-existing condition:** A health problem that has been diagnosed, or for which you have been treated, before buying a health insurance plan.
- **Preferred provider organization (PPO):** A health insurance plan that offers greater freedom of choice than HMO (health maintenance organization) plans. Members of PPOs are free to receive care from both in-network or out-of-network (non-preferred) providers, but will receive the highest level of benefits when they use providers inside the network.
- **Premium:** The amount the individual or their employer pays each month in exchange for insurance coverage.

- **Provider:** Any person (i.e., doctor, nurse, dentist) or institution (i.e., hospital or clinic) that provides medical care.
- **Rider:** Coverage options that enable members to expand their basic insurance plan for an additional premium. A common example is a maternity rider.
- **Underwriting:** The process by which health insurance companies determine whether to extend coverage to an applicant and/or set the policy's premium.
- **Waiting period:** The period of time that an employer makes a new employee wait before he or she becomes eligible for coverage under the company's health plan. Also, the period of time beginning with a policy's effective date during which a health plan may not pay benefits for certain pre-existing conditions.

2.1.2 People of KIHEFO

- **Peter:** Peter does not officially work for KIHEFO anymore, but he has stayed around to help oversee our project. We are under the impression that he will come back to help oversee the Stanford project next year. Peter has worked with international NGOs in Uganda for many years so he understands how these types of projects work.
- **Dr. G:** Dr. Geoffrey Anguyo. He founded KIHEFO and is now the doctor in charge.
- **Collins:** Software Engineer. Collins worked with the software team and for the whole development of our project.
- **Sylvia:** Dr. G's wife. She is in charge of the Women's Empowerment Center and runs their weekly meeting on Thursdays. She also has some knowledge of KIHEFO's finances.
- **Alison:** Social worker.
- **Gift:** Computer Critic
- **Frank the Dentist:** He is the only dentist within KIHEFO and all dental appointments and services go through him
- **Judith:** Nutrition center accountant. She is in charge of the finances behind all of the supplies coming into Kihefo.
- **Lillian:** Lillian is on the finance team and seems to be somewhat of Judith's assistant. She also sometimes works in the kitchen.
- **Patricia:** Patricia takes care of all of the apartments and the kitchen. She cleans all of the rooms and cooks most of our meals.
- **Scodious:** Scodious is in charge of all weekend excursions.
- **Hakim:** IT Engineer, maintains the KIHEFO website.
- **Frances:** Media person. He takes pictures and video for Kihefo.
- **Paul:** Does general tasks for KIHEFO, sometimes works in the kitchen and does laundry
- **Isaac:** Also does general tasks for KIHEFO and often cooks in the kitchen
- **Johnson:** Engineer at KIHEFO
- **Martin:** Head accountant for KIHEFO, based in Kampala

2.2 Stanford Engineering Team

Summer Service Learning Program (SSLP) is an opportunity for Stanford Engineering students to work on a significant project supporting a developing community abroad. The 2017 SSLP Uganda team is a group of eleven graduate and undergraduate students studying engineering at Stanford. We come from diverse backgrounds and expertise. During the spring 2017 quarter we had a weekly course to meet together, develop ideas, research topics, and prepare for our five week trip to Kabale, Uganda. A short bio from each participant is below as well as a group photo.



Danee Kenyon: Team Lead. I am a master's student in Mechanical Engineering with a focus in product design and manufacturing. I have worked on several international engineering projects and managed several more through the mechanical engineering product design program at Stanford and am excited to bring my expertise to bear on this new challenge proposed to us. I am excited to see our team grow together and rise to the challenge to present a sustainable, viable solution for our partners and the community in Kabale, Uganda.



Abisola Kusimo: Abisola is a Nigerian-American slam poet veteran—competing in dozens of local and national competitions. She loves spreading messages of radical self-love, culture, and politicized bodies at any opportunity. Abisola is also concurrently pursuing her dream of becoming a Professor and social entrepreneur as a Ph.D. student in the Mechanical Engineering Department working with Professor Sheri Sheppard. This summer, she is interning at a manufacturing company in Nigeria as a Stanford Seed intern, and is eager to apply what she learns to her future research.

Dillon Schoen: My name is Dillon Schoen, and I am a rising senior studying Product Design and French. Originally from Connecticut, I am a Captain of the Women's Lacrosse team and also involved with an organization called Smart Woman Securities, which provides seminars on financial literacy and investing to undergraduate students. I am very excited to join the SSLP Uganda team, as this will be my first time in Africa, and my first experience working in a developing region. Having studied the design-thinking methodology in my



undergraduate curriculum, I am excited to iterate through the need-finding and empathy phases of the problem space by having meaningful conversations with our community partners and local Ugandans. I look forward to meeting new people, building relationships, and stepping outside of my comfort zone to work towards proposing a solution to the community health scheme in Kabale.

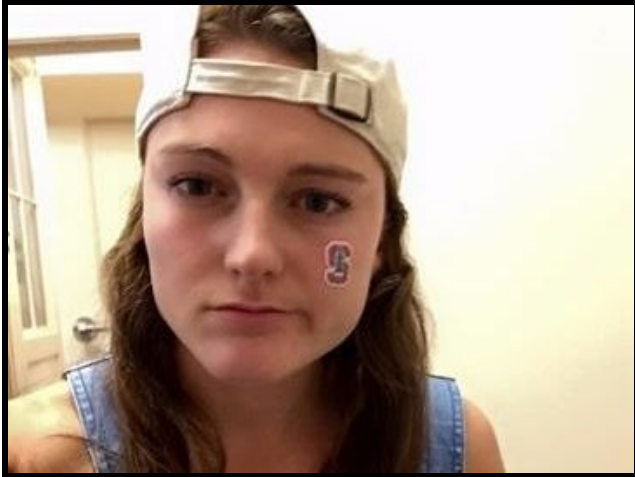


Hollis Crowder: My name is Hollis and I'm a master's student in the Mechanical Engineering graduate program with a focus in biomechanics. Though I don't currently have any experience working or traveling in developing regions, I'm excited to put the knowledge I gained in the ME310 product design series to work on the SSLP Uganda 2017 project! I'm very interested in the intersection between engineering and healthcare, and I'm looking forward to learning how to apply skills I have developed in the classroom and in the tech industry to the unique circumstances of the Kabale

region of Uganda. I'm especially excited to meet new people in the community and learn all I can about different forms of healthcare outside of the United States. When I'm not in school or working, I like to fill my free time with traveling to new places, training for triathlons, and snowboarding.

Joyce Kang: Hi! I'm Joyce, a rising senior from Nashville, TN studying Computer Science and Biology. An aspiring medical researcher in genomics and bioinformatics, I'm excited by the application of the engineering tools and mindset towards problems in health. I'm looking forward to working with my amazing teammates on this project and hopefully contributing something useful and meaningful to our NGO partners and the community of Kabale. During my free time, I enjoy playing tennis, running, yoga, and volunteering as a peer counselor and EMT.





Katie Schneider: Hi! My name is Katie Schneider and I am a rising senior studying Product Design. I have been fascinated by Uganda for a while now and am interested in global health and engineering so I am super excited to be working in Kabale. I love being able to learn about people and hopefully through that we can help the people in Kabale to implement something that comes from them and is sustainable. This is an incredible opportunity for all of us. I have 2 parents and 2 younger sisters (Mikayla and Jessica) back in Pennsylvania and we have a series of music videos. At Stanford, I love

being a part of Running Club, WYSE, Dance Marathon, and leading SPOT and trips with the Outdoor Center. I love penguins, hiking/backpacking, any/all sports, skiing, dancing, and eating good food. I can teach you the One, Two, Step dance if you are interested and once ate 17 peaches in one day.

Mihika Hemmady: I'm a graduate student in Mechanical Engineering, specializing in Design, Manufacturing and Mechatronics. During my undergraduate career in Biomechanical Engineering, I realized that I could not imagine a career without some aspect of giving back, and strive to use engineering to improve the quality of people's lives, particularly within the healthcare/medical devices industries. I am passionate about social entrepreneurship and in developing products for low income and resources-strapped communities. Outside of class I love playing and listening to music, figure drawing, and traveling. I'm very excited to collaborate with the people of Kabale, Uganda, to help develop something of real use to the community.





Rachael Tompa: My name is Rachael and I am a west coast transplant from New Jersey currently pursuing a PhD in Aeronautics and Astronautics. While my coursework and research are quite different than this upcoming experience, I am passionate about outreach, service, working with groups, meeting new people, exploring various cultures, and I strive towards making the world a better place. I am so excited for the opportunity to participate in the utilization of health services in Kabale, Uganda. In my spare time I really enjoy running, traveling, baking, and puzzles.

Reinaldo Perez: Hi! My name is Rey and I am a rising Junior at Stanford majoring in Biomedical Computations. I am originally from Cuba but now live in Miami, Florida. I have experience working in an infectious disease lab that studies the transmission patterns of several arbovirus diseases in Kenya. I am excited to be a part of the SSLP 2017 Uganda team and learn about healthcare systems, and their setbacks and strengths in developing countries. In my free time, I enjoy playing chess, watching Youtube videos, and playing soccer.



Theresa Sievert: I'm a rising senior studying bioengineering. I am excited to help the community of Kabale, Uganda and apply my Stanford education to an international problem to create a sustainable solution for the community. Growing up, I have always been interested in health care and helping people, and this opportunity will be a great first hand experience. In my free time I play the bassoon, enjoy paper crafts, and am the softball team manager.

Tina Diao: Hi there, my name is Tina and I am a PhD student in management science and engineering at Stanford University. Prior to graduate school, I worked as an actuarial analyst at CSAA Insurance Exchange and Towers Watson. I am interested in integrating decision analysis, data science and entrepreneurship in long-term projects with social impact. I am excited and grateful for an opportunity to work on the Community-Based Health Scheme (CBHS) program in Kabale, Uganda with my fellow engineering students of different disciplines.



2.3 Ugandan Technical Team

While on the ground our main IT contacts were Collins and Hakim. Collins was the main contact for helping build the Community-Based Health Scheme database application. Hakim was the main contact for all of the clinic technology. Below is a short bio of each and a photo of the two.

Amanyire Collins

School: Mbarara University of Science and Technology

Degree: Information Technology

Hometown: Masindi, Uganda

Role within KIHEFO: IT personnel

How long you have worked with KIHEFO: Started August 6, 2017

Malayalam Abdallah Hakim

School: Uganda Christian University

Degree: Mass Communications

Hometown: Kaliilo, Uganda

Role within KIHEFO: Monitoring and Evaluation

How long you have worked with KIHEFO: 4 years



Figure 1: Malayalam Abdallah Hakim (“Hakim”) on left, and Amanyire Collins (“Collins”) on right.

2.4 Uganda

2.4.1 Health Care in Uganda

Looking at the statistics, health care in Uganda is one of the poorest in the world. It has been historically ranked as one of the worst countries in both health care performance as well as health and life expectancy. Less than 80% of the population is using improved drinking water sources, and most is through bottled water, not through taps. Only about 30% have improved sanitation facilities. The probability of dying before age 15 in 2012 was 27% for males and 23% for females [1, 2].

HIV/AIDS has historically been the biggest issue in Uganda. It initially was the poster country for HIV/AIDS prevention, starting the ABC (abstinence, be faithful, use condoms) campaign. However, as condoms became stigmatized, HIV/AIDS prevalence started increasing again. As of 2017, family planning services are becoming much more widely available, but condoms are still stigmatized. Antiretroviral treatment is now becoming much more widely available. While

Uganda has made large strides and reached a tipping point in 2013 where the number of people receiving antiretroviral treatment outnumbered the number of new infections each year, there are still 40% of adults who are not on treatment [3].

Uganda is under a lot of pressure to increase resources for health care. There is an expectation that Uganda will continue to reliably receive outside aid, and they usually underestimate future aid as many donor commitments fall through. As a result, health services have been historically underfunded. The total expenditure on health per capita in 2014 was only \$133 USD per person and was only 7.2% of the total gross domestic product (GDP) of Uganda [4]. This often results in drug/equipment shortages, poor infrastructure, poor sterilization procedures, understaffed facilities, low salaries, lack of nearby facilities, and low quality care. Rural areas are hit the hardest by these issues [5].

The Uganda health care system is highly decentralized. The highest central level is responsible for policy and regulation. Services are provided through decentralized units, either public, private for-profit, and private not-for-profit. The hierarchy of public service providers are as follows: national referral hospitals, regional hospitals, general hospitals, Health Centres IV, Health Centres III, Health Centres II, and then Village Health Teams (VHTs). If a health facility cannot handle a case, it refers the patient to the next level up. The national referral hospital is located in Kampala and gives specialized services and have teaching and research. Regional referral hospitals give general preventative and curative and specialized services, and general hospitals give general preventative and curative services. Health centre IVs give curative, preventative, emergency surgery and blood transfusions. Health centre IIIs and IIs give outpatient care, antenatal care, immunization, and outreach, and IIIs also have inpatient and basic emergency obstetric care. VHTs are located within a community to provide information. Services in all public facilities are supposed to be free, but there have been cases of corruption where health workers have scammed money from desperate patients for services [6]. For a while, many local districts introduced user fees, which disproportionately affected the poor. Uganda abolished user fees in 2001. As a result, out-of-pocket fees are the biggest source of financing, and the percentage of household expenditures spent on health is extremely high in the country [5].

Cultural beliefs and social norms inhibit access to services. Improving care-seeking of pregnant women especially is critical, however many times husbands or other relatives make decisions for women about whether to seek care and are prevented in that way [7].

In Uganda, the Uganda National Drug Authority regularly inspects private pharmacies to inspect their "Good Pharmacy Practices" (GPP). In a 2016 study looking at public facilities, it was found that only 57.4% of the inspected facilities meet GPP standards [8].

In a 2016 study in Butaleja district, very few children receive treatment in accordance with Uganda's national guidelines. There seems to be a consensus that training and certification of

all medical staff is lacking and needs to be improved. Rural communities in particular are especially likely to have less trained staff, and that is where child mortality is higher [9, 10].

In general, private healthcare providers in Uganda are poorly monitored. People often have to choose their provider based on proximity and the skills of the provider, but if there is only one provider nearby they don't really have a choice. In a sample of Iganga, Mpigi, and Masaka districts, 4% of the total facilities were public, 19% were private, and 77% were traditional healers or medicine shops. Only 50% of the people surveyed went to a healthcare facility for their most recent sickness. The higher their education, the more likely they were to seek care. Of the people who sought care, only 5.8% went to a traditional healer, a way lower percentage than the percentage they take up of healthcare facilities. The role of traditional healers was seen to be very limited and irregular. There is a general view that traditional healers are more of social workers for family, love, sexual, or wealth problems than for more common medical issues, or were for a very specific, more obscure treatment. There also was a reported stigma associated with visiting traditional healers and people often visited at dark to avoid being seen [11].

Out-of-pocket expenses are often a huge burden for rural Ugandans. A 2014 study showed that an alternate healthcare fee reduction may increase the chances of simultaneous growth, poverty reduction, and improved healthcare access for households [12].

Health-seeking behavior is also a process. In the Wakiso district, 89% of citizens were aware that mobile clinics existed, but only 28% had used them in the last month. 84% didn't even know that community health workers existed in their own community. The most significant challenges they had with healthcare facilities were regular out-of-stock drugs, high cost, and long distance [13].

2.4.2 Gender Dynamics

In rural Kigezi (Southwestern region of Uganda), gender dynamics play a big role in everyday life. Typically a family includes a husband, wife, and many children. Normally, a man will have a home that will be taken care of by the wife after marriage. The husband will work, spend as much of his earnings as he wants, and provide the rest to his wife and family, at his discretion. It is very common for the husband to be irresponsible with his money, spending more on alcohol or gambling than on his family. The wife also works and is either paid in money or in food for her and her family. The wife is responsible for taking care of all of the children and addressing all their needs, including but not limited to: feeding them, clothing them, seeking medical attention, providing school fees, and providing school supplies. If the family cannot afford school or school supplies for all their children, then the family may keep their male children in school and take their female children out of school to start working.

2.4.3 Ngozi Groups

The people of the Bakiga culture (people of northern Rwanda and southern Uganda) organize themselves into Ngozi groups. Ngozi is an indigenous word that literally means “medical stretcher,” which is a large human-sized basket made from papyrus reeds [14]. In general, Ngozi groups pool monthly savings from individuals in a community to build informal emergency health funds that are utilized to perform basic medical services like comforting the sick, transporting them to clinics or hospitals, and burying the dead. Each group is specific to its particular community, but a typical Ngozi group has both female and male members who contribute equal funds, but perform different roles when an emergency arises. Men are responsible for transporting the sick to roads accessible by car/ambulance, building coffins, and burying the dead. Women are in charge of making food and comforting the grieving family during the funeral. Funds from the Ngozi group typically go towards supplies for these activities, such as timber for the coffin, reeds for the baskets, chairs and tables for the funeral meal, and pots and pans for cooking the funeral food.

While such groups organize vital services and are somewhat successful because of the strong community ties, their small size is often limiting. Though stretcher services are often offered to the pregnant and the sick, as one of the benefits of being a part of the community group, these stretchers, by virtue of being manpowered, tend to be largely inefficient and it often takes hours to transport a patient to a health center or accessible road which may be only a few kilometers away [15]. Sick people can potentially die during transport, women in labor can potentially give birth during transport, and often cannot pay for the care they receive if they do arrive to the clinic/hospital alive.

2.4.4 Traditional Healers

Once a well-respected and acknowledged mode of treatment, and now a stigmatized option, Traditional Healers have seen changing attitudes towards their practices. As part of the context-gathering experience, a few students visited a local traditional healer on Lake Bunyonyi, about a 20-minute drive and additional 15-minute boat-ride from the KIHEFO Kabale compound. The Traditional Healer has three wives and 16 children between them (all of whom assist in collecting his herbs and tending to patients). He took over the role after his great-grandfather who was also a Traditional Healer and wore animal skins on his body. New Healers are chosen by small gods which guide the selection process among the males in the current Traditional Healer’s family.

The Traditional Healer showed several herbal remedies to common ailments such as kidney problems, loss of appetite, sexual frustrations in marriage, and lack of a romantic partner. Most of the herbal medicines are mixed into people’s food and are taken at normal intervals, many of which smelled of familiar spices and plants. Pictured below in Figure 2, the “Love Tree,” is made of three branches and the collected soil from the footprint of someone the individual admires. The individual brings the soil to the Traditional Healer who adds herbs and boils this to

determine if the individual will eventually marry or always be single. Traditional Healers have assisted community members in delivering babies, caring for people that suffer from mental illnesses, and attend to people with malaria; however, with the rise of new strains and types of diseases, Traditional Healers have a difficult time keeping up. Should Traditional Healers encounter medical problems that are beyond their capacity, they have a relationship with a nearby clinic/hospital they are able to refer patients to. The clinic helps provide transport for the patient after receiving the call from the Traditional Healer.



Figure 2: The Love Tree created by the Traditional Healer to determine an individual's future marital status

With mounting faith in Westernized medicine, seeking a Traditional Healers is becoming less common among the Ugandan community. While people may still come to ask questions about whether or not they will get married, fewer and fewer people are willing to go for other ailments and many come late in the evening when they can be disguised with the darkness.

2.4.5 Defining Poverty Levels

Because one of the major economic sectors in the Kigezi region is subsistence farming, defining poverty levels in terms of income or assets in this region is particularly difficult. Based on conversations and interviews with Dr. Geoffrey and other KIHEFO staff, a basic understanding of the various definitions or divisions of poverty derived from anecdotal evidence is outlined below:

Poverty levels in the Kigezi region (within ~50 km of town), as defined by people's ability to pay for medical services at KIHEFO, are as follows:

- 30% cannot pay for any medical expenses at all
 - KIHEFO absorbs the costs of treating these patients.
 - They often qualify for free services through government or international NGO subsidies.
- 60-65% can pay for some, or most medical expenses
 - This is the target group for the digital Community-Based Health Scheme. This sector of the population has the potential to save and pay for medical expenses, though they may not have steady sources of income throughout the year (may be seasonal due to wet/dry seasons and harvest seasons).
- 5-10% are insured already
 - This sector of the population accesses insurance through one of two ways: employer-based insurance if they work at a bank or an NGO, or private insurance they purchase themselves.

Poverty levels in the Kigezi region defined by income, in US dollars, are as follows:

- Earn less than \$1 per day
 - The poorest sector of the population engages in subsistence farming.
 - This sector may not earn any income at all, or sporadically at best.
- At or around \$1 per day
 - This sector of the population may earn small incomes through working for larger farms/plantations, or through selling their own crops.
 - Many do not own land, they rent.
- Between ~\$1-\$10 per day
 - This sector of the population may earn more substantial incomes through growing and selling crops in the market, or by learning a trade or breeding animals.
 - Target population of digital Community-Based Health Scheme—this sector of the population can likely afford or save enough to finance health care coverage

Again, because incomes are varied across the Kigezi region, and so many people in this region make their livings through subsistence farming, using income distributions or rigid definitions through assets or other easily trackable data for defining levels of poverty is difficult. In addition, there are various levels of poverty that are structured differently than the poverty seen in developed nations, such as the United States.

2.5 KIHEFO

Kigezi Healthcare Foundation (KIHEFO) was founded by Dr. Geoffrey Anguyo in 2001 to achieve the vision of “an educated community, free of poverty, communicable and preventable diseases, with adequate and sustainable income at the household level.” To do this, KIHEFO’s follows its mission statement in which it states that its goal is “to fight disease, poverty, and ignorance using integrated, sustainable and innovative approaches,” and through its core values: “integrity, teamwork, empathy, and motivation.” Specifically, KIHEFO provides the

following services for the community: General Clinic, HIV/AIDS Clinic, Maternal Clinic, Maternal/Child Health, Nutrition and Rehabilitation Center, Dental Clinic, Rural Health Outreach Camps, Rabbit Breeding and Training Center, Mobilizing Ngozi (village) Groups, Youth Media Center, Youth Construction Training Center, and a Women Empowerment Center. The organization also conducts community-based research. An organizational chart for KIHEFO's official structure is provided in Figure 3, below, followed by subsections detailing the services our group interacted with further.

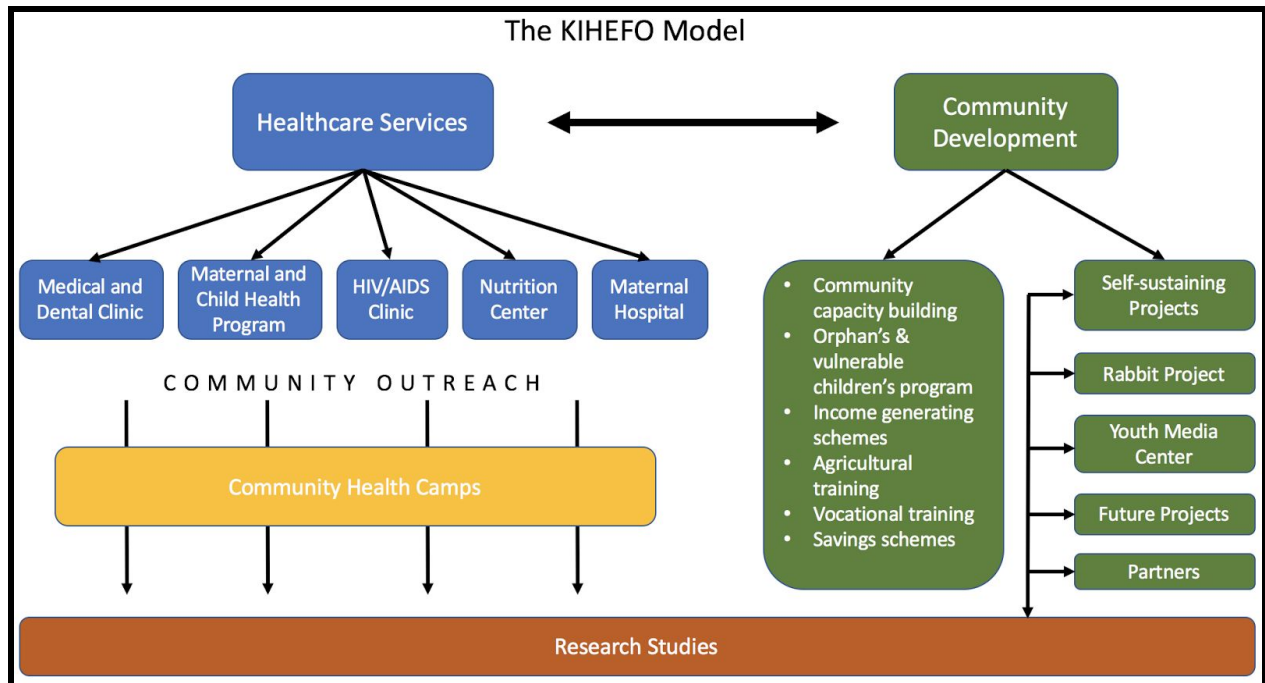


Figure 3: The KIHEFO model showing relationships between various KIHEFO programs.

2.5.1 General Clinic

The General Clinic houses the Dental Clinic and has four doctors on staff. They offer both inpatient and outpatient services. When a patient walks in, they are greeted by a courtyard with several rooms.



Figure 4: Front of General Clinic/Dental Clinic



Figure 5: Waiting area for the General Clinic that shows the Cashier/Receptionist Office

Most of the rooms are occupied by beds for patients looking to use inpatient services. A few of the rooms are doctor's offices, one room is the "Bleeding Room," and another room is for the receptionist and cashier. When a patient first enters the clinic, they are greeted by a receptionist

who records their information into a book. They are put into a queue and then go see one of the doctors. Once they are done with the visit, they talk to the cashier who bills them a doctor's fee and all of the additional lab tests that are required.

The patient pays, and then goes to the Bleeding Room with a receipt for payment. The nurses draw blood samples from the patient and take them to the Lab for testing (discussed further in the laboratory section). The nurses record information from the patient and also track information over time such as: common diseases, headaches, viral testing (they first try to rule out HIV), hypertension, diabetes, anemia, and TB. They also track patient's weight, height, and MUAC to track nutrition levels. Once the results come back, the patients are met by the doctor who talks with the patients about treatment options and medications they can take. They are then recommended medications from the pharmacy, where they pay.

2.5.1.a Other Health Insurance Providers

Jubilee is another insurance people within the region have that would not be covered by our CBHS. Below is a list of exclusions under Jubilee insurance.

Jubilee Exclusions:

- Intentional self-injury while sane or insane, suicide or attempted suicide, treatment of chronic alcoholism and drug addiction
- Congenital conditions-when members are admitted seek approval/clearance
- Sexually transmitted diseases except in HIV/AIDS
- Cosmetic or plastic surgery unless necessitated by accidental injury that occurs while the insured is covered under this contract
- Injuries sustained from professional and extreme sports
- Beauty treatment or massage
- Naval, military and air force operations
- Stays at sanatoria, old age homes, place of rest etc
- Medical check-up, general health examinations, International vaccines e.g. Rota Virus, Pneumococcal, yellow fever etc.
- Hearing tests or costs of deaf aids unless resulting from an accidental injury
- Nutritional food supplements
- Vitamins & Multivitamins
- Family planning and fertility treatment i.e. costs of treatment related to infertility and impotence
- Injury or illness from insurrection or war, declared or undeclared, civil commotion or an act of terrorism
- Injury as a result or active participation in riot, strike
- Alternative treatment such as herbal treatment, acupuncture treatment, chiropractors, spinal manipulations
- Routine deworming
- Hormonal therapy

- Male circumcision

Below in Figure 6 is a picture of the medical claim form used for Jubilee insurance.

MEDICAL INSURANCE CLAIM FORM

DIRECTIONS
 1. This form must be legibly filled out in BLOCK letters in order to process your claim.
 2. Date and sign the claim form and ensure that the same is signed and stamped by the Doctor.
 3. Incomplete Claim Form will delay processing of the claim.
 4. No claim form will be considered if submitted after 90 days from the date of illness.

EMPLOYEE (MEMBER) INFORMATION:
 Scheme/Company _____ Office - Phone _____
 Employee Name _____ Mobile _____
 Employee/ID Card No. _____ Email _____
 Medical Card No. _____

PATIENT INFORMATION:
 Patient Name _____
 Medical card No. _____ Sex: Male Female
 Date of Birth _____ Relationship: Employee Spouse Child Other

MEDICAL INFORMATION: (Doctor to complete this section)
 Diagnosis _____
 The above condition is: Acute Chronic Congenital Dental Optical
 Any previous history of this condition? Yes No
 Has the Patient been treated for this condition before? Yes No
 Any underlying condition which could result in this illness / injury? Yes No

SERVICE		COST		
1.	Consultation Fee			
2.	Laboratory / Xrays/ other diagnostic tests			
3.				
4.				
5.				

Drugs prescribed / Treatment / other	Quantity	Cost	Number of days	Total
1.				
2.				
3.				
4.				
5.				

AUTHORISATION FOR RELEASE OF INFORMATION (Patient or parent must sign below)
 I hereby warrant the truth of the above statements, that I have not withheld from The Jubilee Insurance Company of Uganda Limited any information relating to this claim. I have no objection to Jubilee Insurance Company of Uganda Limited and/or their representatives communicating with the Doctor/Physician or Hospital I have consulted or visited and shall submit to any medical examination(s) if so required by The Jubilee Insurance Company of Uganda Limited.
 Signature of patient or Parent (if patient is a minor).....Date.....

CERTIFICATION BY MEDICAL PRACTITIONER:-
 I certify that the above information regarding this patient is true to the best of my knowledge and expense incurred are as a result of accident, illness/injury to.....
 Doctor's Name..... Official Stamp and Date:.....
 Qualifications.....
 Signature:.....

Figure 6: Medical claim form for Jubilee Insurance

2.5.2 HIV/AIDS Clinic

The HIV/AIDS Clinic is located in downtown Kabale near the Nutrition and Rehabilitation Center, General Clinic, Dental Clinic, and Women’s Empowerment Center. The clinic is mostly funded by USAID which covers all HIV testing, ART, CD4 testing, hemoglobin (Hb) testing, and counselling. KIHEFO provides HIV testing not only from their HIV Clinic, but also at their General Clinic, Maternal Clinic, and on all Outreaches. All HIV positive patients are then referred to the HIV Clinic. Once referred, patients are brought in for post-test counselling. This includes advice and information about disclosure of their status to relatives, positive living with HIV, nutrition, sustaining life with ARTs, reminders to take ARTs, family living situation counselling (how to deal with spouses and children), and checking/monitoring side effects. Once a patient has received their post-test counselling, the clinic usually performs a CD4 blood test to monitor the T-cells/immune function, liver test, Hb test, urine analysis, monitor height, weight, MUAC, pregnancy test, and TB test. Only the CD4 and Hb tests are free of charge.



Figure 7: View of the KIHEFO HIV/AIDS Clinic from the street - opposite to the Nutrition Center.

Every Monday, Wednesday, and Friday are ART Clinic days when people have scheduled visits to receive their treatment. Many patients will come as scheduled or potentially come in a day or two after their scheduled appointment. The clinic will ask the reason why they missed, but will still give treatment regardless. The clinic closely watches the treatment of the patients and calls if they still have not come in two days after their appointment.

The HIV/AIDS Clinic sends quarterly reports to the MOH, which are generated from their EMR system. These reports are sent directly on paper to the DHS. The DHS then puts all reports on the computer and electronically sends them to the MOH. The reports are sent to the DHS on paper because many rural villages do not have electricity and/or computers making it more efficient to have all records sent on paper rather than on multiple mediums. The clinic also has a quality improvement system to try to internally monitor the clinic's performance. They have two graphs on their wall as part of this. One graph tracks the percent compliance with the MOH recommendation that all children with HIV positive parents should be HIV tested. The second graph tracks the percent compliance with the requirement that all patients must attend a nutrition assessment.

When patients come in, the staff initially takes their info down on paper records. They track all of the information mentioned above regarding testing, what type of ARTs they are on, whether they have been coming in every month for ARTs and counselling, viral load monitoring, lost clients, and whether each patient attended the nutrition assessment they are all required to

attend. The staff is supposed to update the EMR daily from the patient reports but currently, the clinic's EMR is not up-to-date because many staff members cannot use the EMR. Further, the clinic needs to keep hard copies of records in case the electricity goes out. The clinic does have a backup power generator for the main clinic computer.

In terms of billing, everything goes through the General Clinic cashier and all billing for HIV-positive patients are filed separately for record keeping. Due to the high volume of medications required, the HIV/AIDS Clinic keeps a dispensing log for medications. Every two months, the clinic uses the log to order medicine by scanning and sending it to the supply center.

Future improvements: Margaret (the in-charge nurse at the HIV/AIDS Clinic) said if she could choose what information she would want to track on an electronic database, she would want all of the information that they currently track on paper, plus a family HIV tracker and graphs of weight, immunity levels, and viral load monitoring over time.

2.5.2.a HIV/AIDS Data Center

The data center is in the HIV/AIDS Clinic and has multiple computers. Because USAID provides funding for the HIV/AIDS Clinic, they have the computer setup with an EMR system through the Ugandan MOH. The EMR gives the clinic the ability to look up patients, their records, and their past appointments that have been input. A national ID number can be recorded and the HIV Clinic ID can be put in. The national ID number is a 14-alphanumeric unique identifier provided to each individual in Uganda by the government. The national ID program is a recent development (within the past 2 years), but it is considered mandatory for all Ugandan citizens over the age of 16 to enroll, and the government is making national IDs for children mandatory in the next couple years. The EMR system can technically work offline, but KIHEFO currently does not have the correct routers to make it work. Whenever the power goes out, there is a backup generator that powers the computer with the EMR on it. The HIV/AIDS Clinic staff are encouraged to enter patient data into the EMR daily when putting away paper records. Many of the staff are older and do not want to learn how to use the computer and often have other people input the records for them. Not all HIV/AIDS Clinic records are in the computer because it takes a lot of time and only four people in the HIV/AIDS Clinic know how to work the EMR. The server is not robust enough to connect the other clinics to the EMR so there is no cross-referencing of records between KIHEFO clinics. Photos of the EMR are below in section 5.1 on software development.

2.5.3 Maternal Clinic

The Maternal Clinic officially opened in 2015 and is the newest of KIHEFO's clinics. A woman coming into the clinic starts by being greeted and asked if she is pregnant and then takes a seat. The clinic asks the woman if they have a Marie Stopes voucher card or a "Mother Child Health Passport" booklet. Marie Stopes voucher cards are given to poor pregnant woman who cannot afford services and when presented to KIHEFO they do not have to pay (Figure 8). To

see if they qualify for a Marie Stopes voucher, the poverty level is determined using a poverty level survey. The Mother Child Health Passport booklet is given to expecting mothers at any hospital and they use this to document visits and findings over the course of one pregnancy (Figure 9). The mother is expected to bring this for each visit and the client number is written on the passport. The client number is a number that follows a woman through her pregnancy and given by any clinic (not just at KIHEFO).

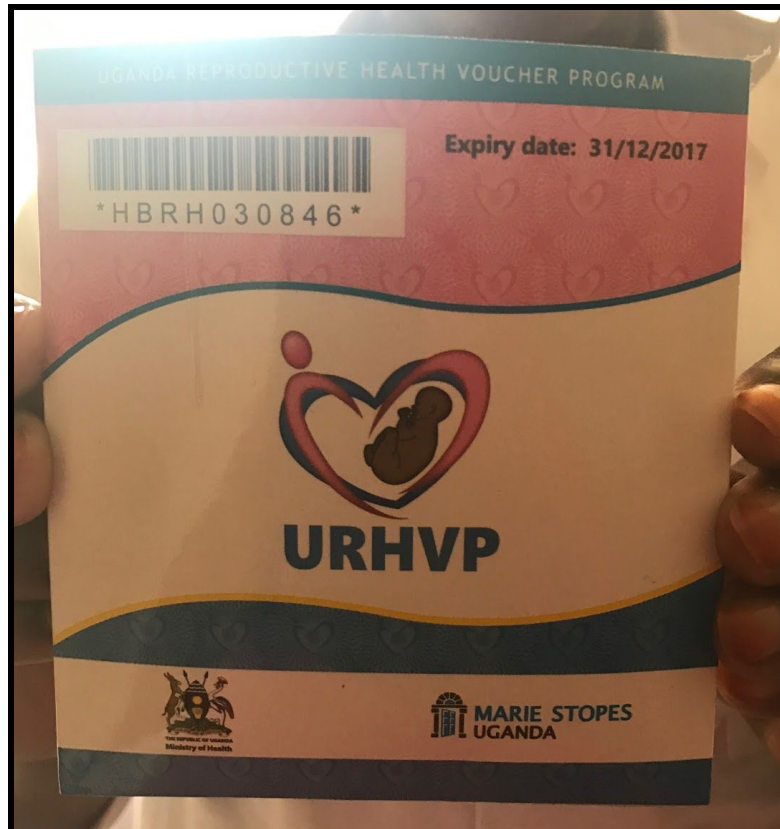


Figure 8: The Marie Stopes voucher card is given to poor pregnant mothers who cannot afford antenatal services.

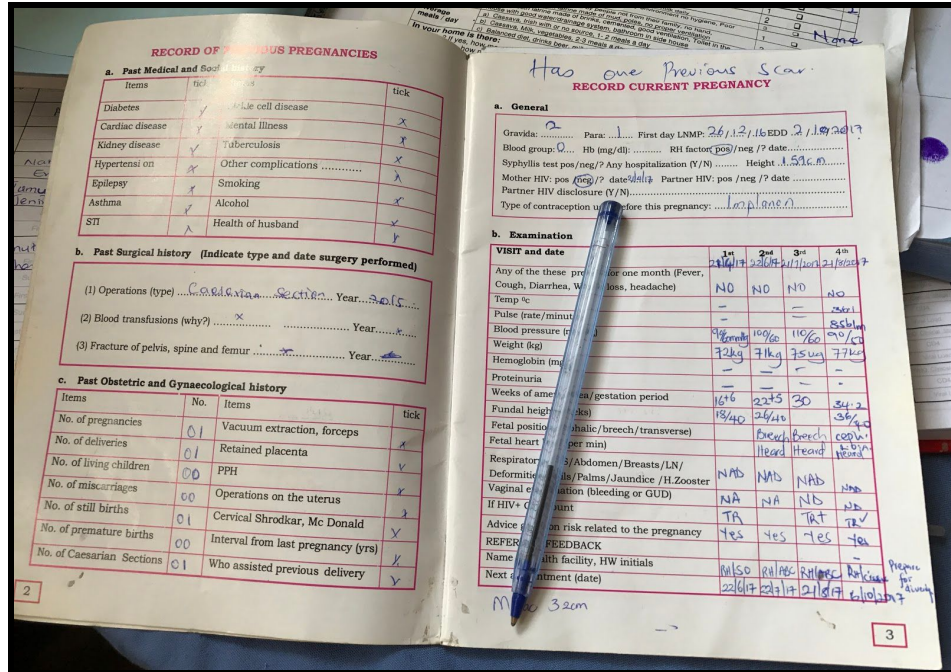


Figure 9: The Mother Child Health Passport given to mothers that records information over the course of their pregnancy.

Once the clinic checks for these two documents, the mother is taken into an exam room and is tested for blood pressure, arm circumference for malnourishment, blood glucose. Vitals and measurements are recorded in both the “passport” and a KIHEFO log book. The KIHEFO log book records everything about the mother and the books are used until they are full. The mother then has a physical examination while lying on the bed where the midwife palpates to find the baby’s head and find the back of the baby to listen for the fetal heartbeat. Afterwards, if the women is new to the clinic, her blood is tested for blood type and HIV. If it is a high-risk pregnancy or there is heightened concern for the baby, the mother can get an ultrasound, but otherwise they need to pay for them if they are not referred to get one. Thursdays are the walk-in days at the clinic, and many women come in to get checked.

The Maternal Clinic has rooms for antenatal care, a Lab for blood tests, an ultrasound room, a delivery room, and a ward where women stay for a day after giving birth (Figure 10). Husbands are encouraged to come with their wives to appointments and get care as well. To incentivise this KIHEFO works on couples before mothers alone and provides the following for the husband:

- Medical examinations through blood pressure, random blood sugar (RBS), and weight monitoring
- Deworming
- Pretest and posttest counseling
- HIV/syphilis screening
- Health talks



Figure 10: A look into the maternity ward where mothers stay after giving birth at KIHEFO.

2.5.4 Lab

KIHEFO has two labs to serve its clinics: one for the General and HIV/AIDS Clinics and one for the Maternal Clinic. Two people work in the Lab for the General and HIV/AIDS Clinics while one person works in the Lab for the Maternal Clinic. From the General Clinic, labs are requested via a form that the doctor fills out (shown in Figure 11) and then is sent with the blood to the Lab. The results are written on the back of this form and given to the patient to take with them after their appointment. From the HIV/AIDS Clinic, there is a request form that the patient takes to the General Clinic and then is sent with the blood to the Lab. The HIV Lab form has a detachable portion on the bottom for the patient to take home while the upper portion is filed in the patient's HIV/AIDS Clinic file. In the General/HIV Lab the results are recorded in a book shown in Figure 12 that has record back to 2010. This allows the clinic to look back and reference past tests and results if needed. For the Maternal Clinic, the mothers all have books where the midwives write the requested labs and where the results are transcribed.

KIGONZI MODERN DIAGNOSTIC CENTRE (KMDC) KIGONZI CLINIC
DR. ANGYO GEOFREY MBCH (MUK)
P.O. BOX 1127, Kabale Tel: 0486-23176/23167
Email: kigezi@utonline.com.ug
Mob. 0773-822988/0772-449444

5382

LABORATORY REQUEST FORM

Name: MUCUNGUZI XOMMARI
Age: 37 Sex: M
Address: ... Date: 23/8/12

Clinical Notes:
Diarrhoea 10/12

Examination Required

Stool microscopy

P.T.O for requests [Signature]

Figure 11: Lab Request Form filled out by the Doctor about a recent patient from the General Clinic

Name of Health Unit			Month						Financial Year																		
1	2	3	4	5	6	7	8	9	Haematology/Serology							Parasitology			Stool Microscopy		Urine Microscopy			Microbiology			26 others (e.g. Bacter. aspirates)
Date	Lab No.	OPD / PD No.	Name	Sex	Age	Village	Unit	Specimens	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
								HB	WBCT	VDBL/MPK	Malaria Microscopy	Malaria RDTs	Other haemoparasites	Microscopy	Microscopy	Microscopy	Microscopy	Protein	Sugar	Pregnancy	Type	Wet Prep	Gram Stain				
									27. TOTAL NUMBER OF POSITIVE TESTS TOTAL FOR EACH TEST DONE																		

Figure 12: The KIHEFO log book is where all patient lab records are stored; KIHEFO has records going back to 2010.

For the General and HIV Clinics, the blood is collected by nurses in the respective clinics and then sent to the Lab because of a lack of space in the Lab (Figure 13). In the Maternal Clinic, the mothers and their husbands go into the Lab and have their blood taken in the Lab. Blood samples in the Lab are labeled with a number from the General Clinic or Maternal Clinic that is given the day of the appointment or if they are from the HIV Lab they are labeled with patient name, sex, age, test, or some combination of those on the blood tubes. The Labs test for blood type, HIV, malaria, typhoid, tuberculosis, and other simple tests. For tests that are too complex at the Maternal Clinic Lab, nurses bring them over to the main Lab and results are sent back to the Maternal Clinic. For the more complex tests, they are sent to Kampala which can take one to two weeks to be processed. These test results are sent back to the local hospital, printed out, and then delivered to local clinics via motorcycle. Some tests are free, but the ones that are not are charged via the cashier in the General Clinic.



Figure 13: View of the General/HIV lab bench

Test results used to be printed out from the computer instead of written on the back of the form in the General/HIV Lab, but the computer has not been updated and has no available space. When the power goes out, the Lab has a generator to power their lights, computer, that can power the lights, this computer, and the fridge that stores the medicine and can be refilled with ice packs if the power is out for long. Monthly reports have to be written on how many tests and what kind were done. Because of the paper record system for tests, these reports can take two days to write.

Future Improvements: The lab technician would want a software in the future that could integrate all the KIHEFO Labs so results could be sent to the clinicians to print out. Being able to see a patient history through a computer would also be nice because then previous test and

results could be easily seen. Also, it would be helpful to have a way to see the trends of the number of people tested and tests done over a period of time. Tests like malaria are used more frequently within the rainy season and being able to see trends like this would help with ordering inventory from month to month. This would also help with the monthly reports that take two days compile.

2.5.5 Nutrition and Rehabilitation Center

This center treats children with malnutrition and teaches their guardian (almost exclusively the mother) about good nutrition practices. Upon entrance, each child is weighed, measured, and tested for HIV. If not a severe case, the child is given RUTFs (calorie packed nutrition packets) for two weeks and scheduled a follow up in two weeks. When it is a severe case, the child is admitted with a guardian for a week with full room and board. During these stays, the children are weighed and measured daily to track progress. Simultaneously, the guardian is taught about nutrition, how to cook nutritious meals, and about good hygiene procedures. When possible, KIHEFO will provide rabbits (and the adequate training) for the family to bring home and use as a nutrition source. Once a child has been treated, they stay in the system for five years and are expected to visit the clinic the last Saturday of every month for follow up and education on: family planning, agriculture, nutrition, and hygiene. When patients live far away or miss appointments, KIHEFO visits them at their house or conducts follow-up calls. All of the services provided at the Nutrition and Rehabilitation Center are, and will continue to be, free of charge, even after USAID tapers off.



Figure 14: View of the KIHEFO Nutrition Rehabilitation Center from the street.



Figure 15: On the left, a tool for measuring malnutrition by middle upper arm circumference (MUAC), and on the right a dosing chart for children’s nutrition by their weight.

Future improvements: Janette, a staff member at the Nutrition Clinic, suggested that it would be beneficial for the clinic to have a computer with which to organize all of the patient records. Currently, the clinic keeps all of the records in a physical book and sorts through the book to manually look up patient records. Janette expressed that she thought a computerized record system would allow helpful visualization of patient’s measurements over time to track patients’ progress and hopefully recovery.

2.5.6 Dental Clinic

The Dental Clinic is a separate partition of rooms situated inside of the General Clinic, but the patient check-in and care processes are completely separate from those of the General Clinic, and are handled by Dr. Frank (the dentist, and only member of the Dental Clinic staff). Dr. Frank used to have an assistant, but the assistant was let go due to budget constraints. The only process that is intertwined with the General Clinic is payment, which is handled by the General Clinic cashier.



Figure 16: View of Dr. Frank's workstation and examination room at the Dental Clinic.

The patient process for the Dental Clinic is as follows: for new patients, baseline information is collected such as name, age, gender, occupation, contact information, address/location, dental history, and health scheme status (yes/no). Each patient is then assigned a registration number for the Dental Clinic that is separate from any registration numbers they may receive at any other KIHEFO clinic. Patient records are kept forever; often, patients will only come in when there is a problem or if they are in pain, and so their visits to the clinic may be separated by years, even decades. If the patient has an appointment, they are given a sheet of paper with the appointment date and time as a reminder. The patients will also receive call/text reminders of their appointment beforehand, and they can call or text to set up future appointments. If the patient is a walk-in (most common type of visit), they are checked in, any new/relevant information is collected, and then they proceed with the appointment. Payments are not requested until services are rendered, which means sometimes the Dental Clinic treats patients who cannot pay. The clinic has been known to give patients "credit" (treat now, pay later), but one-off and new clients are risky to give credit to, and the expectation is that most of these patients will not come back to pay. Most of the visits the clinic receives are pain-driven, meaning that, someone will only come in when the pain becomes unbearable. This usually means the dentist does emergency dental work as opposed to routine cleanings and preventative care.



Figure 17: The clinic often works with patients who do not know to brush their teeth and who cannot afford a toothbrush - miswak (meaning “weed/plant”) is a free alternative.

Equipment in the Dental Clinic: There is currently no working computer in the Dental Clinic. If there is a need for a computer, Dr. Frank will bring his personal laptop from home. Examples of this type of need include emailing/contacting other staff members in the General Clinic for information or requests. Dr. Frank does not keep any of his patients’ personal information on his personal laptop so as to keep patient information secure. Power is also a huge issue—the generator Dr. Frank uses to power his sterilization equipment is loud and obnoxious, and he does not work on patients while it is on because noise levels make it unsafe. He is also short on general supplies and relies on donated equipment.

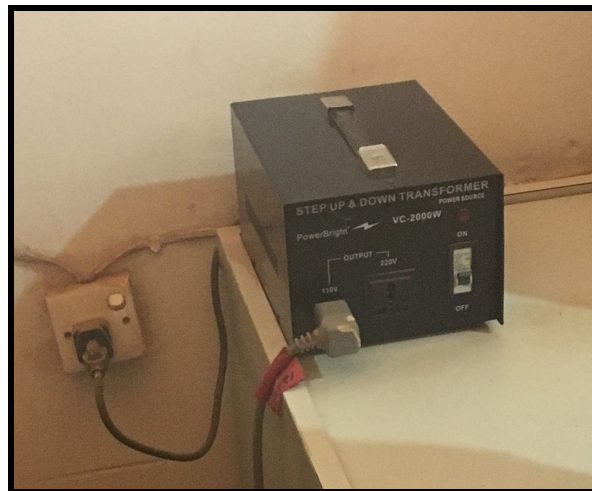


Figure 18: Because the clinic relies on donated equipment, a transformer is used to make the new equipment compatible with Ugandan electrical infrastructure.

Future Improvements: If Dr. Frank had a digitalized system for keeping track of patient records and other helpful information, he would want to keep records of patients' cavities and problem areas, extractions, healing time, bleeding issues, whether patients have hypertension or are epileptic, their HIV status (for safety reasons) and past and future appointments.

2.5.7 Rural Health Outreach Camps (Outreaches)

In addition to the clinics that operate within Kabale, KIHEFO also provides medical services in the form of Outreaches. The staff members travel to rural areas, which are often too far away for the residents to easily travel to Kabale for medical attention (short of dire emergency). Services offered include HIV testing, maternal care, preventative care (taking blood pressure), and general health care services such as treating ringworm and respiratory illness, at no cost to the community residents. Medications and lab testing are provided for free, as needed. KIHEFO brings a mix of doctors, nurses, and general staff members, depending on the availability of funding and external support. Since Outreach is completely free, it is supported by outside organizations. In particular, USAID has been funding the Outreaches recently, which enables KIHEFO to go to particular communities, such as the one at Bunyonyi, at regular intervals. Otherwise, they have to wait until large groups of doctors or health workers from the United States, Canada, or otherwise, come out to support these events. Outreaches are supported infrastructurally by the community, who may provide a church or some other building to house patient exams. With enough funding/support, KIHEFO can bring extra vans and tents to set up in a field. Students with KIHEFO will accompany these Outreach events to assist with basic testing and diagnosis, by taking vitals, shadowing, or help wherever else they are needed.

2.5.8 Rabbit Breeding and Training Center

One of the big projects KIHEFO is working on is trying to help families find a way to earn money and feed themselves on their own, which is the motivation for the Rabbit Project. KIHEFO provides some patients at the Nutrition and Rehabilitation Center with rabbits to take home and care for. It is unknown how KIHEFO decides which patients they give the rabbits to. Rabbits are easy and cheap to house and feed, and they reproduce at high rates (usually about six times a year). Rabbit meat is a high source of protein so the rabbits provide meat for a family, and they can also be sold as a source of income for a family. KIHEFO's Rabbit Breeding Center holds a few different types of rabbits, including California and Dutch. They keep the male and female rabbits separate and put them together for select breeding times to prevent the rabbits from becoming pregnant before they properly care for their current newborns.

2.5.9 Mobilizing Ngozi (Village) Groups

In Kabale, KIHEFO has been working with Ngozi groups since at least 2013 [14]. KIHEFO works with over 50 Ngozi groups to help them increase their own capital for community saving beyond paying only for burials. Through the pooled money, services beyond health care are provided, where farmers can access seeds, tools and pay for school fees and hospital bills [16]. The relationship between these Ngozi groups and KIHEFO is somewhat informal, and the

groups range in size (from as few as 25-30 members to as more than 100 members), composition, wealth and services. KIHEFO plans to continue its involvement with local Ngozi groups through the creation of the Community-Based Health Scheme that aims to leverage the existing structure of the Ngozi groups to reach and inform more rural community members [16].

2.5.10 Women Empowerment Center

Due to the gender dynamics in the Kigezi region, many women are undereducated, living in poverty, and unable to provide for their children. KIHEFO's Women Empowerment Center is an organization that enables women to learn skills that can provide them with profitable jobs. Furthermore, the organization teaches the women about savings and gives out low interest loans so the women can provide for their children even during rough times. The group meets weekly to have motivating learning sessions to inspire the women to enhance their quality of life. Outside teachers come in and teach sessions including self-sustaining skills, business skills, and computing skills. The center started last year in 2016, and most women who started at the beginning are still there. The group consists of about 40 women. Sylvia who runs the center, and is Dr.G's wife, is uncertain at this point about whether the women will stay in the empowerment group for their lifetime or if it will be a set period of time. In general, there are few job opportunities for women even if they have taken classes, so Sylvia's goal is that after two years of being a part of this group and of saving, each woman should be able to earn more than \$1 per day and move out of the poverty bracket.

Sylvia has been trying to change these women's attitudes towards saving. While the people of the Bakiga culture have always been accustomed to the idea of saving for burial through Ngozi groups, Sylvia introduced the idea of "saving for investment." This includes saving to eat well on Christmas and saving to incur interest. She teaches them to control their extra expenditures in order to save, and teaches the women all have skills they can use to make money at home. She connects some of the women to housework jobs, and encourages others to identify what unique skill they have. She gives out loans to women who have a purpose for them—she has given out only three loans so far. The loans are divided into 6 months with a 2% interest rate. As a baseline, Sylvia encourages the women to save a minimum of 10,000 shillings per month, and if they have saved well, she gives them a 15% interest on their savings. In addition to the general saving, the women also bring a small amount of money weekly and it is pooled together then they rotate who it goes to as a mini loan, usually about \$12-13.

2.5.11 Money Flow Chart

Due to its nonprofit status, the funding sources for KIHEFO's various clinics and programs are somewhat nebulous. To determine where the proposed Community-Based Health Scheme might lie in KIHEFO's funding structure, and thus what coverage it needs to replace, it was necessary to untangle which funding sources fed into which programs. A summary of the current funding network is shown in Figure 19 below.

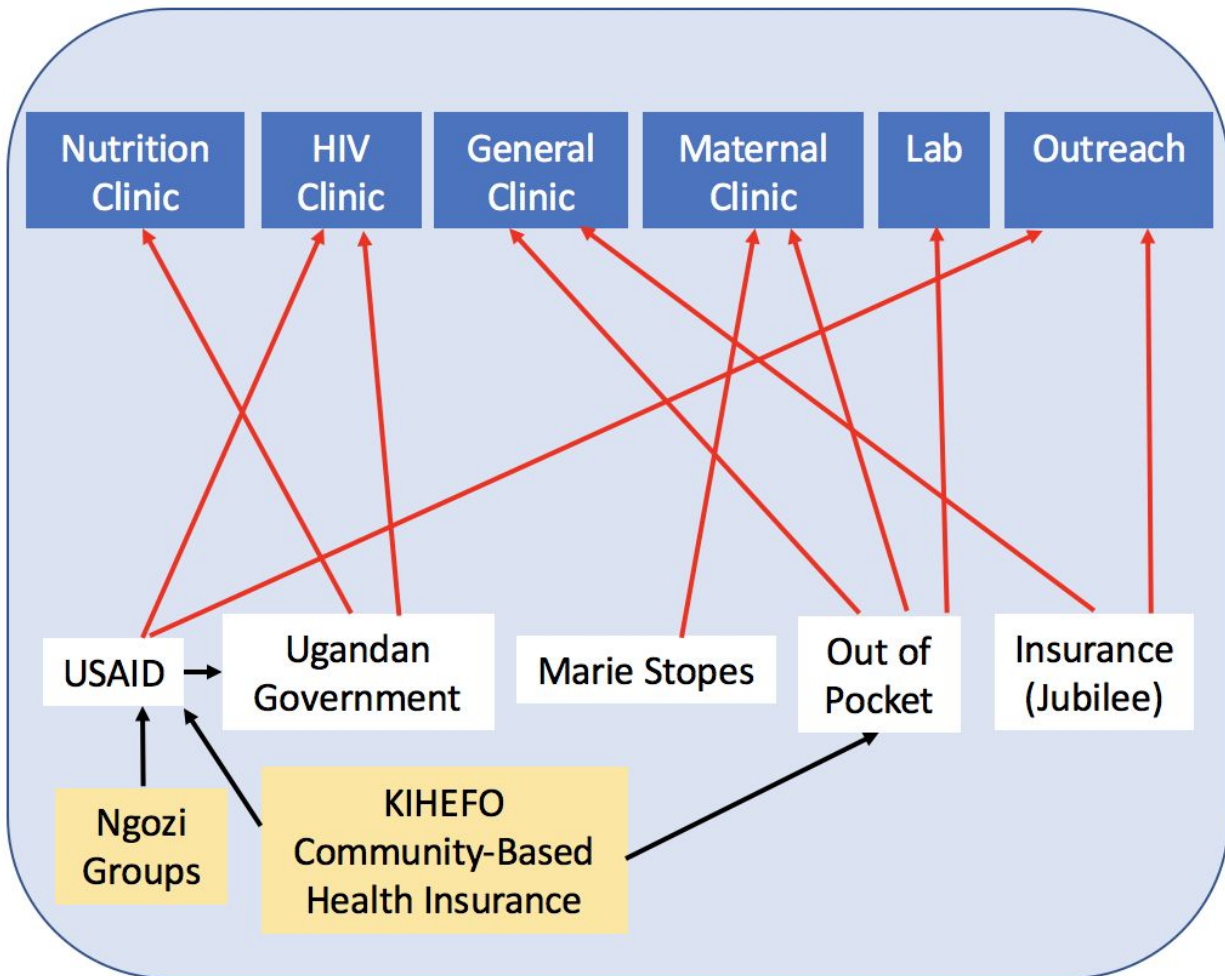


Figure 19: Summary of KIHEFO’s funding structure as it relates to each of their programs.

The boxes in blue, at the top of the figure, are existing programs that KIHEFO offers. The boxes in white are existing funding sources that feed into each of the KIHEFO programs. The red arrows show which funding sources support which KIHEFO programs. KIHEFO anticipates that the funding from USAID will no longer be reliable in the coming years. They anticipate that USAID may disappear entirely before 2020. The yellow boxes at the bottom show where KIHEFO hopes that Ngozi groups and the Community-Based Health Scheme proposed in this document will fit within the larger funding scheme. Thus, it is necessary to focus the services a health scheme might offer on areas where USAID is currently supporting. If more patients are covered under KIHEFO’s Community-Based Health Scheme, out-of-pocket costs incurred for such patients in the General and Maternal Clinics will also be reduced.

2.6 CFHI

KIHEFO partnered Child Family Health International (CFHI) to bring the Stanford students to Kabale, Uganda. CFHI is a 501(c)3 non-profit organization based out of San Francisco, CA, USA. CFHI provides community-based global health education programs for students and institutions and acted as the liaison between Stanford and KIHEFO. CFHI was selected for its ethical approach to service learning, unique funding structure, local community empowerment, and asset-based community development model. CFHI was established in 1992, currently has 20+ sites in 7 countries, works with 250+ medical professionals worldwide, has donated over \$10 million in medical supplies/equipment, and over 8,000 volunteers have completed their programs.

2.7 Problem Space

KIHEFO is losing USAID money over the course of the next two years and needs alternate revenue streams in order to continue providing services both in the clinics and at Outreaches. In the interest of sustainability, KIHEFO wants the funding to come from local sources. They also want to build on existing community structures like the Ngozi groups in order to build support for their program. They have done background research and interviews, and believe a CBHS is the best way to provide revenue to KIHEFO. CBHS have been implemented in other regions within Uganda with limited success, and are usually managed by a single clinic and advertised through a local church or parish [17]. These CBHS tend to be regional, and limited by the ability of people to travel to clinics, attitudes regarding healthcare, and the ability to logistically manage a few thousand people's health scheme information. This logistical challenge in particular relates to the fact that most medical record keeping systems, at least in the Kabale region, are paper based. Managing a system of ten thousand people using paper records is somewhat infeasible, so KIHEFO sees the first challenge for setting up this system as implementing a digital management system to enroll and check scheme status of enrollees. Therefore, the main challenge explored by this team relates to how to logistically manage a CBHS digitally.

3. Research

Though initial research was conducted during the spring quarter to prepare ourselves to work effectively in a foreign country, the details of the status of the Stanford team's project at the time of our arrival were not entirely clear. To better understand the community the proposed health scheme would benefit, the KIHEFO staff who would run the scheme and care for those who are both insured and uninsured, and how the whole operation would be financed under KIHEFO's aid and income-generating structures, the Stanford team spent several days in need-finding interviews with KIHEFO staff and community members in Kabale and the surrounding villages. The following sections briefly describe the methods for preparing for and conducting the interviews, and the key learnings gathered from the information that influenced the final design.

3.1 Interviews

The team was able to interview clinic workers, members of an Ngozi group, Outreach patients, and Dr. G. Initially, most of these interviews were scheduled by a KIHEFO liaison assigned to work with the Stanford team, but as time went on it became more useful for us to call specific people and set up interviews ourselves. Before interviews that required the entire team to participate, the team created a set of questions to ensure valuable and consistent questions. The questions could and would be deviated from depending on the conversation. For the clinic, Ngozi, and Outreach interviews, the team broke into smaller groups, who would ask the same questions, in order to make more personal and less overwhelming scenarios. For the interviews with Dr. G. he was emailed the questions before the meetings in order for him to prepare and provide sufficient feedback. For smaller, more specific interviews that occurred after the team had broken up into smaller teams to tackle specific aspects of the projects, a less formal attitude was adopted to allow for faster information gathering. The following sections describe the people interviewed and the main takeaways from each set on interviews. The transcripts from the interviews are in a folder attached to this document titles "Interview Transcripts."

3.1.1 Clinic Interviews

The main purpose of the clinic interviews was to understand the norms for the clinic, specifically, the patient intake process, the services provided by the clinic, the technology resources of the clinic, and the money flow within the clinic. Nurses and the cashier at the General Clinic were interviewed. The in-charge, Margaret, and the counselor, Jessica, were interviewed from the HIV/AIDS Clinic. Midwives, Ruth and Brenda, were interviewed at the Maternal Clinic. A woman named Janette was interviewed at the Nutrition and Rehabilitation Center as well as the accountant Judith. Dr. Frank was interviewed at the Dental Clinic and a lab technician was interviewed at the Lab.

3.1.2 Ngozi Members

The main purpose of the Ngozi Members interviews was to understand how communities currently address health care costs, where there are voids in their process, how they handle money collection, and how they foresee their relationship with KIHEFO growing. The group was able to interview the nutritionist, mobilizer, vice chairperson, and treasurer from the Nyakiju Ngozi group in the Nyakiju village, approximately 10km from Kabale.

3.1.3 Outreach Interviews

The main purpose of the Outreach interviews was to understand the clientele of the proposed health scheme system. The interviews were conducted to understand the current health care demand, the current willingness of patients seen in Outreach Clinics to pay for services they receive, and better understand the culture we were building a system for. In total we were able to interview 19 Outreach patients. These interviews were crucial in informing the structure of a Community-Based Health Scheme that is sustainable.

3.1.4 Meetings with Dr. G

The main purpose of the meetings with Dr. G was to understand his expectations for our project and the background and inner-workings of KIHEFO. Our meetings touched on a broad range of topics, including Ugandan culture, current KIHEFO practices, and his thoughts and needs for the health scheme. These meetings were critical in shaping our plan moving forward on the project and defined what would turn out to be our end deliverables. Due to the nature of our meetings and the way information was presented, the summary below will be presented in a bulleted form:

3.1.4.a Summary of Dr. G Meetings

KIHEFO Background:

- KIHEFO started informally in 1997
 - Started officially in 2000
- 80% of work is in the rural community bordering town / 20% is locally within Kabale town proper
 - The Kabale clinics used to be packed, but a lot of those problems were solved by going out into the community and helping before things reach the extreme cases
- Mission: fight disease, poverty, and ignorance using sustainable approaches
- Many doctors and healers are associated with pain here, so many people often try to hide their pain to avoid them
- Most Ugandans cannot read
- Ugandan expression/communication is very indirect they will not tell someone exactly how they feel

Past Stanford Projects:

- 2013: Dr. G first came to Stanford

- 2015: first Stanford project—water distribution system
 - Stanford and KIHEFO had very different expectations
- 2016: second Stanford project (2 groups)
 - One group worked on an underground rainwater harvesting system
 - KIHEFO paid local technical workers to build
 - Currently 12 of 15 are built—waiting for more funding
 - Other group worked on designing a motorcycle ambulance
 - KIHEFO still needs \$5000 to have it manufactured

3.1.4.b Health Scheme System

Instructions from Dr. G:

- Things we should track in the system:
 - If patients are insured/what package they have/expiration date
 - Alert reminding them if it is going to expire soon
 - Bio of each patient/health history
 - When they come in for check-ups, screenings, appointments
 - Integrate with existing HIV database
- Want people to come in 3 times a year for checkups and screenings
- Medications will be covered under this scheme
- Personnel cost is fixed and is the biggest cost
- 90% of households at least have a phone
 - Easy for them to call
- Dr. G said that if a family cannot pay for everyone to have at least outpatient they cannot have this care → all or nothing
 - Families have to pay per person
 - Wants to insure all members of the family individually
 - Wants flat rate for each person
- CBHS has been in the works since 2011
 - This thing has already taken 5 years of work
 - Dr. G really wants to get people enrolled by the end of our time, or if not then by October/November
 - Consultant groups have done needs assessments and financial models
 - Motivation to get it started now: USAID Outreach funding will most likely stop in 2020
- Many failed projects in the past—all had manual/paper records
- Has told people that they can pay in rabbits
 - 1 rabbit = 10,000 shillings
 - “rabbit economics”
- People cannot be told that we are planning something they will expect it to be ready right away
- Publicity campaign: October-January?
- Scheme coverage starts January 1st

- Dr. G wants them to pay annually
- Dr. G said that 10,000 people is their breakeven point (assuming each person is paying 30,000 shillings)

Pricing:

- Outpatient = 30,000 UGX
- Out + Inpatient = 60,000 UGX
- Ambulance = 10,000 UGX
- Pregnancy (includes outpatient + inpatient) = 60,000 UGX
- Life #1 = 5,000 UGX
- Life #2 = 10,000 UGX
- If everyone in a Ngozi group pays, they will give a discount on ambulance

Special Pregnancy Packages:

- 1) 60,000 UGX
 - 2) 100,000 UGX
- If a patient comes for pregnancy services and they do not have a scheme membership, the 60,000 UGX only covers pregnancy if they do not sign up other family members. If they do also sign up their family members with them, the 60,000 UGX will provide coverage all year.

Payment:

- 3 options for payment
 - Bring it to bank
 - Mobile money
 - Bring to Ngozi groups
- Wants to minimize collection by middlemen
- Ability to pay:
 - About 5% of patients cannot pay anything
 - About 5% more can pay for half
 - Want to give them options such as paying in rabbits
- December is a very big harvesting season hopefully farmers will have a big influx of money
- Once a family has paid for the year, they can start saving for the next year
 - Can bring smaller amounts in installments

Sustainability:

- Collins and Hakim will be able to fix the program if something happens in the future
- Training: Hakim will train all nurses

3.1.4.c General Notes

Gender Differences:

- Men will only come to the clinics if they are close to dying
- Very few men have been tested for HIV they don't want to get tested because there is still a stigma around it for men

- Care for children is the responsibility of the women so they always bring the children to the clinics

Mobile Clinics versus Community Outreach:

- Outreach = current program
 - Mostly involves a lot of screening
 - Is completely free
 - KIHEFO will continue to have Outreaches as long as there is funding (at least the next 2 years)
 - They bring people in for general services, but their main underlying purpose is to test for HIV (instructions from USAID)
 - Student volunteer fees fund the additional Outreaches that are not covered by USAID funding
 - Dr. G hopes that most Outreach people will move to the Mobile Clinics
- Mobile Clinic = future idea
 - Targeting sick treatment
 - Wants it to be for people with scheme membership
 - Others can come and pay for treatment, but insured will have priority
 - Funded by the health scheme
 - KIHEFO will only bring a computer to Mobile Clinics
 - Verification by picture and ID number
 - Will have pilot programs to learn
 - Eventually wants it to be an established location in each community that they always go to

Health insurance versus scheme:

- Insurance is taxed → for business
 - Only for those who can pay
 - Profit is taxed
- Scheme
 - Providing a service for the community
 - Profit goes back into the scheme
 - Usually run by health management organizations

Maternal Health/Marie Stopes:

- Maternal fees are subsidized from outside sources and from KIHEFO until the health scheme starts
- KIHEFO is still affiliated with the public hospital
 - Will send mothers there for C-sections
- Marie Stopes is funded by USAID
- Family planning services are also funded by USAID
 - Was supposed to end in June but was extended to December
- Marie Stopes vouchers are given to community health workers by Marie Stopes
- Vouchers cover maternal care for mothers in both poverty and poor ranges
 - Number of vouchers vary depending on the day
 - Mothers will pay 4000 UGX to community health worker for a voucher

- With scheme, KIHEFO will pay the community health worker for a voucher

Poverty Levels:

- 3 levels:
 - “Poverty” = less than \$1 per day (30% of population)
 - “Poor” = less than \$10 per day (60%)
 - “Middle class” = greater than \$10 per day (10%)
- Target for health scheme is “bankable poor”
 - Njakiju Ngozi group was half poverty and half poor
 - Outreaches are mixed poverty and poor
 - Clinics very rarely have anyone in the poverty range
- Sometimes people are not as poor as they say they are
 - They know that if they seem poor they will get more help
 - Associate mzungus with money
 - KIHEFO’s policy of helping poor people is not advertised
 - Done on a case-by-case basis
 - Outreach is the only thing that is openly free
 - If you say that you will help the poor, everybody will say that they are poor
- Rural versus Urban:
 - Ugandan rural communities have strong connections
 - People bring food to each other and eat together
 - Ugandan urban centers/Kabale are closer to American society
 - People often rent and change locations
 - “Urban centers are all about the survival of the fittest”

Other Insurance Systems:

- Examples: Jubilee, IAA
- For middle class
- Have many package options/minimum package is \$300
- Usually paid by their employer
 - The percentage that is from the employee’s paycheck varies (usually less than 50%)

Funding:

- Nutrition and HIV Clinic:
 - Supplies come from the government
 - Will continue to be free
- USAID only directly funds Outreach
 - Other funding goes through the government

Additional sections outline information and clarification of KIHEFO’s initial vision for the healthcare system, including a financial model acquired through the previous efforts of a financial consultant to support the continued survival of a community health scheme in the coming years, and how KIHEFO proposed that a new system might integrate into their established organizational structure. Parts of KIHEFO’s initial assessment of a basic health

scheme were also reviewed and incorporated into a comprehensive healthcare scheme proposed in the Design Specifications section (*Section 6: Design Specifications*).

3.2 KIHEFO Community Outreach & Mobile Clinics

KIHEFO holds Outreach events at various villages in the Kigezi region at various times throughout the month where they bring doctors, social workers, student shadowers visiting KIHEFO, and other KIHEFO staff to provide services to more rural and poorer villages. Announcements are made in local churches and by leaders at local gatherings in advance to get the word out. These events, which are quite popular, are typically held in churches or other common meeting spaces on a first-come, first-serve basis; those who arrive first get seen first. Basic counseling and primary care services/treatments and some medications are offered on the spot, and other, more serious cases are referred to the General Clinic in town.

Currently, the Outreach events conducted by KIHEFO are supported based on the availability of external funding and support; without USAID, these activities will cease. KIHEFO proposed to replace the Outreach events with “Mobile Clinics,” which would essentially be the same services that are provided at Outreach events, except not available for free. KIHEFO envisioned that people would either need to be enrolled in the KIHEFO health scheme or they will have to pay a flat rate (one proposed number was 10,000 UGX for adults and 5,000 UGX for children) in order to receive comprehensive services. Outreach events will continue in addition to any Mobile Clinics that are established if external funds are available to support those activities, but KIHEFO foresees most of the Outreach events will eventually become Mobile Clinics as the aid funding situation deteriorates.

3.3 Initial Financial Model

Though we initially assumed that work on the scheme structure would not begin until we arrived, we learned upon arrival that some work had previously been completed. A 2011 KIHEFO Financial Model (*Appendix 9.4.3*) had been created to show a template for KIHEFO’s future finances with the inclusion of a scheme arm. This model produced baseline pricing for individual coverage for four different healthcare packages, outlined below:

Original pricing for individual coverage plans proposed by Dr. G:

- Ambulance = 10,000 UGX
- Inpatient = 30,000 UGX
- Inpatient & Outpatient = 60,000 UGX
- Pregnancy (antenatal, delivery, postnatal until six weeks post-delivery) = 60,000 UGX

In addition, a life insurance model was suggested by Dr. G, the summary of which is listed below:

- Lowest = 5,000 UGX
- Moderate = 10,000 UGX

No specific information on the coverage of such life insurance plans was initially offered by KIHEFO, and due to the enormous scale of the health scheme project and the complexity of integrating it with Ngozi groups, who are already in charge of some of the costs associated with the death of a family member, it was deemed more pressing to focus on the health scheme and to leave consideration of a life insurance scheme for future work.

4. Project Management

Upon completion of initial research conducted through interviews and reviewing KIHEFO documents during the first two weeks, a brainstorming session was held to begin narrowing down the project direction. After much thought and debate, it was concluded that constructing a pilot Community-Based Health Scheme for KIHEFO to implement in the coming months using locally-derived resources and staff would involve three areas of execution: 1. Database Application, 2. Organizational Integration, and 3. Financial Model. The larger Stanford team was broken down into three groups to tackle each of these areas, with the divisions along each person's interests. The following is a summary of the responsibilities of each of the three groups.

4.1 Division of Labor

4.1.1 Group I - Database Application

Group I was in charge of creating the web-based database application that the social worker would interact with to enroll and check if a person had insurance, and also the back end database that would store the information and allow it to be accessed. We worked with Collins, who is an IT personnel for KIHEFO, to develop the user interface design and back end database functionality. We took into account the KIHEFO staff's limited exposure to computers and aimed to make a straightforward system and targeted the minimum viable product (MVP) which would allow us to enroll a new family, renew an existing family, find a patient and their coverage, and confirm payment.

4.1.2 Group II - Organizational Integration

Sustainability was a large concern as we approached implementing a CBHS. In order to ensure KIHEFO uses the system and it is effective for addressing their needs, we looked at how it should be integrated into their current workflow structure. Group II was responsible for addressing all concerns about integration, such as workflow, training, and supply acquisition.

4.1.3 Group III - Financial Model

Group III was in charge of the construction of the health scheme packages and ensuring that the pricing for such packages would be sustainable for KIHEFO long-term. To construct the packages, population demographics (family size, community and social ties, Ngozi group size, and organization of villages, parishes and districts) and adjustable pricing and levels of coverage were taken into account. Upon construction of a scheme of packages, a financial model was built to project costs up to four years into the future to establish the validity of the proposed health scheme package structure, and features were added so that KIHEFO employees could update premium prices for future years based on real data collected from the

current year's scheme. Finally, a strategy for marketing the scheme to reach target numbers of enrollees was created to guide KIHEFO in its goal of being self-sustaining by 2020.

5. Design Development

5.1 Database Application

5.1.1 Critical Features, Data, and Assumptions

We began by compiling a list of the features that we thought were important for our database application to have. These features were informed by the health scheme structure that the organization structure and financial model teams worked on, as well as the interviews we had with nurses and social workers at the clinics and Outreaches. We used this list to narrow down the features that we believed were crucial for the MVP and a list of assumptions that would make our database application work for this health scheme and the social workers and nurses at KIHEFO. The following is the list of required features for the system:

- Confirm Payment
 - Look up a household and mark the household has paid for the scheme (so that the household is marked valid for the scheme)
- Find Enrolled Patient and/or Household
 - See patient biographical information
 - See if a patient is valid for the scheme (if they are enrolled and have paid)
 - See and modify household biographical information
 - See what scheme package the patient and/or household has
- Enroll New Family
 - Input policyholder, household, and household member information
 - Add a dynamic number of family members
 - Select a plan for the household
- Renew Existing Family
 - Update household information and policyholder
 - Change scheme package for upcoming year
 - Delete member from household
 - Add member to household
- Generate Reports
 - In case of power outage, print out current year enrollment records
 - Generate monthly or yearly summary of enrollment numbers for each scheme package

The following is the critical data that needs to be stored in the database:

- Patient ID/Household ID: unique identifying number or value for each patient and/or household
- Policyholder ID: Individual ID of the policyholder
- Individual Demographics:
 - Surname (listed first)

- Given Name (listed last)
- Date of Birth (age)
 - The patients, especially elderly patients, in this area may or may not know their exact date of birth, but will know their age (year of birth). Therefore, patients that do not know their exact date will use January 1.
- National ID
 - Patients may or may not have a national ID number, which contains a unique code that identifies each individual in Uganda. The government plans to give every citizen this ID, but has not yet reached that goal.
- Gender
- Household Demographics
 - Policyholder phone number
 - Household address:
 - Village
 - Parrish
 - Subcounty
 - County
 - District
 - Ngozi group: name of their group
- Scheme Packages
 - Names
 - Price
 - Package details - minimum number of members, maximum number of members

The following are assumptions we made to ensure the simplicity and basic functionality of our system:

- There will be one enrollment period per year. Patients cannot add or change a scheme plan outside of this period. The scheme will last for one year unless renewed and paid for the following year.
- The listed phone number is main contact point for each household, and every household that signs up will have a phone number.
- Payments will be made in full per household group for scheme membership with either cash or through mobile money.

These features, data items, and assumptions guided us throughout the designing of our application: both the frontend UI and backend database portions, so that we could focus on identifying and developing the core functionality of the program.

5.1.2 Individual and Household Identification System

Early on, we realized that the system of identifying patients would be critically important in the fundamental design of our database application because the ability to uniquely identify individuals is the foundation of a sustainable recordkeeping system. After debating between a

system designed around individuals and a system designed around households (groups of family members), we developed a system that combines the two. Because family ties are such a huge part of the lifestyle in the Kabale region, we decided that being able to group family members was important in terms of fitting into the culture. On the other hand, we also needed a system of tracking individuals' participation in the healthcare scheme over time. The following is the identification system that we came up with:

- Each individual receives a randomly generated, 7 digit ID number between 1,000,000 and 9,999,999 (Individual ID). This number will never change, unless an existing patient wants to be a policyholder and enroll a new family (ex. a child is in his/her parent's household scheme, gets married, and wants to start his/her own family). Upon enrolling a new family as the policyholder, the patient will get a new Individual ID.
- Each household also receives a randomly generated, 7 digit ID number between 1,000,000 and 9,999,999 (Household ID), as families sign up together as a household. All family members are linked through this number.
- Each household has a policyholder designated at the time of enrollment, who is responsible for paying for the household's health care scheme and managing/renewing the household's scheme.

5.1.3 User Interface (UI) Design

In designing the user interface for our database application, we decided to model the design off of the EMR system that we observed at the HIV/AIDS Clinic because the KIHEFO staff members have experience using the system and it is well-designed. We designed a home screen for our UI with large buttons like the EMR in Figure 20 and referenced the biographical information collected in the EMR in Figure 21 to determine potentially useful pieces of information to collect for our own system. The main element that we added based on the EMR was the National ID number, a unique identifier that many people in Uganda now possess due to a government-led effort to uniquely identify its citizens.

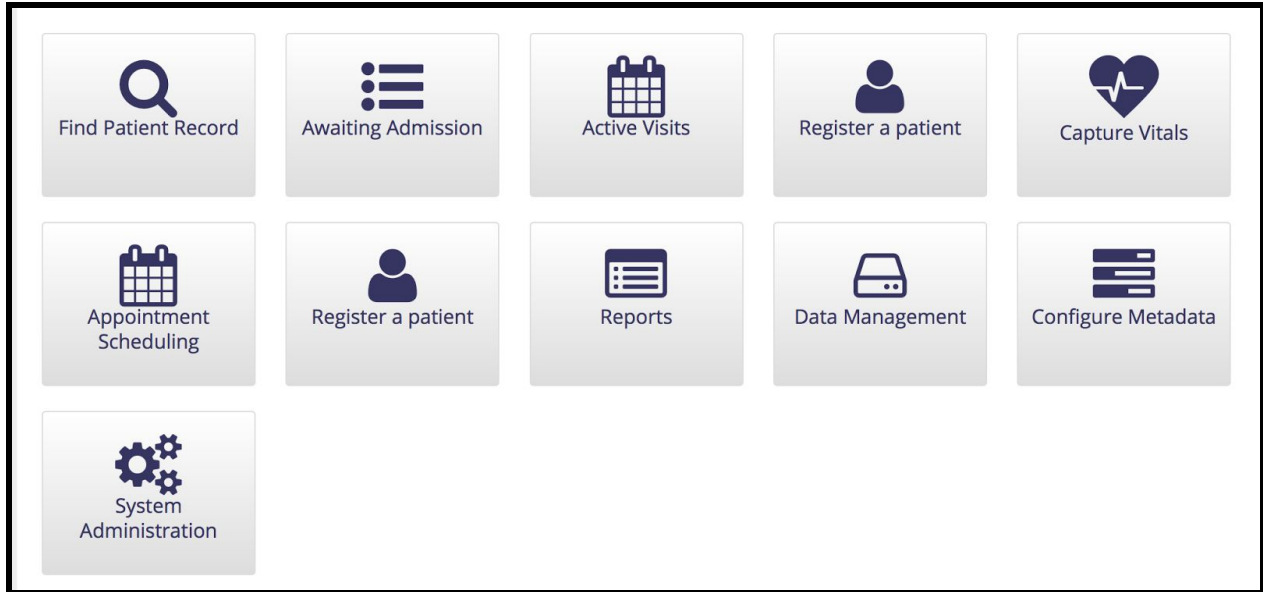


Figure 20: The EMR system home page for the HIV/AIDS Clinic system. The large buttons with clear options is what we initially decided to model our database after.

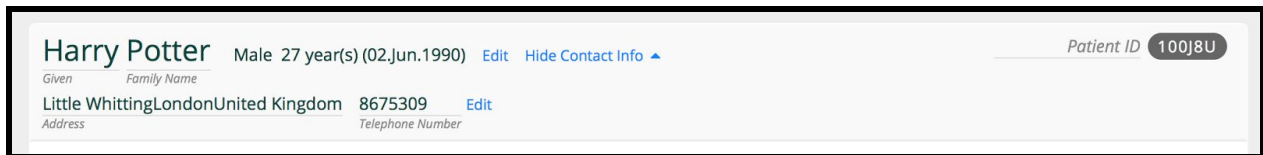


Figure 21: The EMR takes in the name, birthdate (or approximate age), address, and telephone number. It also assigns a patient ID in the system. We modeled our demographics to collect off this system and create an Individual ID for each patient.

5.1.4 UI Rapid Prototyping and User Testing

To prototype our UI, we used a software called Pencil, a GUI prototyping tool. Using our list of features and assumptions, we sketched out various pages of our database application using Pencil, and identified the four main components of our UI: Find Patient, Enroll Household, Renew Existing Household, and Confirm Payment. We were able to link pages through buttons, making it a really quick way to prototype our UI and test its core functionality on real users. We conducted user testing on Gift, a nurse at the General Clinic, and Alison, a Social Worker in the Nutrition Clinic to get feedback on the usability of the UI. These staff members will be end-users of the system, so we had them run through the process of enrolling a new family and looking up a patient by clicking through the Pencil UI. The critical points of feedback were:

- Keeping each page as simple as possible (least amount of buttons and text) helped users understand the function of each page and intuitively understand where to find different pieces of information. Therefore, we tried to streamline each page to its core functionality and minimize the number of website pages necessary.
- Patients may or may not know their exact birth-date, but will know their age. Therefore, we added instruction to input January 1 of their birth year as their birth date if unknown.

- Families do not share “last names”. Instead, each individual has a “surname” (last name) and “given name” (first name), and are used to seeing them in this order.
- Users wanted a way to keep track of which clinic the patient is using (nutrition, maternal, dentist, etc).
- The phone number is the best way to contact a household, so we needed to add the phone number to the confirm payment page, so that if anything is wrong with payment, the clinic can call the household and let them know.

Screenshots and descriptions of the final Pencil UI are in the *Appendix (9.1.1)*.

5.1.5 Database Table Organization

Our database is a relational database, which is a collection of data items organized as a set of formally-described tables so that data can be accessed or reassembled without reorganizing the tables [18]. To allow for the database information to be searchable and organized, we spent a few days carefully designing the structure of our database tables using a Google Sheets spreadsheet. Because many of us had not worked with databases in the past, we had to design several iterations of the tables, aiming to consolidate information in the clearest, simplest, and most efficient way possible, being sure to normalize the data (organizing the columns and tables of a relational database to reduce data redundancy). The final database tables are documented in the design specifications for the software (6.1.2). A website we found helpful for learning on databases was: https://www.tutorialspoint.com/dbms/dbms_overview.htm and to learn more about coding in SQL and practicing this we used: <https://www.w3schools.com/sql/default.asp>.

5.1.6 Joomla! CMS System and Extensions

We researched various tools for developers to build a website connected to a database in a user-friendly manner. We decided to use a CMS (Content Management System) program called Joomla! that is a free and open source content management system that has been used to create many professional websites that require UIs and backend databases. Joomla! already has PHP and MySQL installed, and supports the use of HTML. MySQL is a relational database management system that allows the developer to write queries to create tables, query for entries, insert entries into tables, and more. PHP is a scripting language that can be embedded into HTML, and has functions that can interface with MySQL to query databases. It is used as a link between the UI and the database -- to input functionality such as querying the table when a button is clicked. Joomla allows the developer to create a UI without having to code all of the HTML, provides helpful templates for page navigation and menu creation, and creates the environment in which to link the user interface to the database on the server in the back end.

Joomla! also has an extensive library of “extensions”. These extensions were developed by third party entities, and provide UI’s for us as developers for carrying out certain applications such as searching and displaying information from a database easily. Coding was made much easier with Joomla! extensions and packages we found online to make it easier to create the desired user interface. We installed and used the following extensions: Chronoforms (open source

form-building extension), JooDatabase (searching and displaying information from the database, and editing entries), CSV Export (generating tables and views as CSV reports), and MijoSQL (essentially accessing the database through the Joomla administrator tab instead of through the server terminal).

5.1.6.a JooDatabase Extension

To create the functionality and UI of the “Find Patient” and “Manage Household” tabs in our application, we used JooDatabase (<https://joodb.feenders.de>). JooDatabase is an extension that allowed us to display, search through, and edit our database tables on the front end of the application (in Joomla!). We used the catalog template in JooDatabase to generate a page that has a search bar feature built in. The developer can select the column in a database table that they want to filter over, and the extension will read data from that table and display the search results in a clear layout on the search page. The main table associated with the “Find Patient” tab was the individual biographical information (*Table 5 in 6.1.2*) table. JooDatabase also allows the user to select a name from the search results section and click on it to take the user to the individual information (patient profile) page. The main table for the “Manage Household” tab was the household biographical information table (*Table 7 in 6.1.2*). By setting the main table, JooDatabase allows the user to select (in a drop-down menu) the field within that table that is being searched. This dropdown is populated by the column names in the corresponding main table in the database. For example, patients can be searched by Individual ID, Given Name or Surname, all of which come from the individual biographical information table. JooDatabase is not able to search over integers, so Individual IDs and Household IDs were made into variable character fields (varchars) so they could be searched over.

JooDatabase handles the navigation between the pages. However, we customized the organization and appearance on the search page (catalog template) and the individual information page (single-entry template). We bought the pro version of JooDatabase for €49 because we had a relational database with multiple tables that needed to be linked. The free version only allowed data retrieval from the one table in a database. The pro version also included the ability to access and edit information, in any custom PHP code written in JooDatabase, about the particular record that was selected with an easier command. It also allowed us the ability to link and use multiple database tables rather than just one.

There are 5 main tabs in the JooDatabase interface which we could use to design each page in our database application: 1) the general options tab, which includes the name of the database, the main table, the title of pages, and index, 2) the catalog template tab, which was used to design the search page and modify how the resulting records were displayed (custom code was written for the “Manage Household” search page because we wanted to display information that is not in the main household biographical information table, such as displaying a payment confirmation link using information from the contract data table), 3) the single-entry template, which was used to display the individual information page (we also used custom PHP code to display information from multiple different tables once a person or household was selected,

such as individual and biographical information and package and pricing information), 4) the form template, which we used to allow the user to edit information about a selected household on the “Manage Household” tab (JooDatabase pro functionality), and 5) the subtemplates/subtables tab, which we used to display the package name when a household was selected to confirm payment, since the package name information was not in the main table directly linked with “Manage Household” search page (JooDatabase pro functionality). Using custom PHP, we wrote eight search functions to query information about multiple tables and return them efficiently. We also used HTML to format the pages for the catalog template, the single-entry template, and the form template.

We referenced many forums while using JooDatabase and the most helpful were:

<https://joodb.feenders.de/help.html>, <https://joodb.feenders.de/forum/>,
<https://joodb.feenders.de/support/documentation/catalog.html>.

5.1.6.b Chronoforms Extension

In order to create the “Enroll New Family” tab in our application, we used the Chronoforms Version 6 extension. Chronoforms was used because it is a widely used, high reputable open source extension that allowed us to create very customized forms easily within Joomla. We used the free version because it has the exact same functionality as the pro version, but has a 15 form field limit per form section, which was enough for us. In the future, the pro version may need to be purchased if the developer runs into problems with this limit.

There were many useful features in Chronoforms that allow the developer to create customized forms. We used Chronoforms’ input validation feature for every form field, so that we know that the user has inputted the correct information in the correct way (for example, that the date is in the right format for everyone (dd-mm-yyyy)). Other custom validations may be set. Also, we used both Chronoforms’ “Save Data” functionality as well as wrote custom PHP code to save the entered information into the correct location in our database tables. The Chronoforms v6 manual was used extensively to understand syntax and the features that we could use (contained in the folder attached to this document or available online to download).

We designed the enrollment process using one Chronoforms form with four pages. On the first page, the user can enter the existing policyholder ID and/or household ID information. If they do not have this information, they can leave these fields blank. On the next page, any ID’s entered are validated with custom PHP code that we wrote (if the ID’s do not exist in the database, we throw an error). If the ID’s cannot be found, the user is directed back to the first page to delete or fix the ID information. We used the “Event Switcher” feature and the “Display Section” feature to determine if an error message pops up or if the second page is displayed. On the second page, the policyholder information is entered, including individual information for the policyholder as well as household information (address, phone number, Ngozi group membership information). On the third page, household members are added using the “Repeater Area with a dynamic multiplier” feature in Chronoforms, which allows the user of the

system to click on a button to generate as many household member form fields as needed (according to how many household members they are signing up). The individual information for each household member is collected (name, birthday, gender). On the third page, the user selects the plan for the household. This page was created using the “Read Data” feature with a dropdown menu. The drop down menu filters the packages from the database table based on year (packages for the next year only are displayed) and number of members in the household (only packages that are available for the number of people entered are displayed). Although we used some custom PHP code for validation and some functionality, the full HTML code did not have to be written because we used a Chronoforms template, and many of the features we wanted to create could be done using existing Chronoforms features.

Once the submit button is clicked, the user can no longer go back and edit any information. The submit button serves as a way to store the entered information into the database as new entries (a combination of custom PHP and Chronoforms features was used). The new information is added in a series of steps:

1. A random, seven digit, Individual ID number is generated for the policyholder and checked against the database to confirm it is not previously used.
 1. This Individual ID number is used to create a new row in the individual biographical information table and the individual biographical information is added to this row. If the user inputted an Individual ID, their current row in the table is updated, a new row is not added.
2. A random, seven digit, Household ID number is then generated for the household and checked against the database to make sure it is unique. If the user inputted the Household ID and it is valid, we use this number.
3. A row is then added into the contract data table for the policyholder. Each year, a new contract (information about package and price) is added to this table for each member enrolling that year.
4. A new row for the household biographical data is then added. A new row for the household is added to the household biographical information table every year.
5. A “Loop Event” is then used to loop over all the household members that were added.
 1. First, a random, seven digit, Individual ID number is generated and checked for uniqueness. If the user inputter an ID, this number is used.
 2. This Individual ID is used to create a new row in the individual biographical information and this information is input in the row. The existing row is simply updated if the individual already exists.
 3. The individual then gets a new row in the contract data table with their corresponding Household ID and package information.
6. A form summary is then generated and displayed to the user. This summary lists all information that has been entered into the form and shows the randomly generated Individual IDs and Household ID, the selected package, and other information that is copied onto the receipt.

Originally, we planned to create a “Renew Existing Household” tab that was separate from the “Enroll New Household” tab; however, we realized that the two tabs can be combined because the functionality is identical except that in the renewing existing household case, the system should not generate new unique Individual and Household ID numbers. Our first page accounts for this feature. Essentially, if any of the ID fields (policyholder Individual ID, Household ID, household member Individual ID) are left blank, the system will generate a new ID for that field. To remove a previously enrolled family member from the following year’s package, the family would simply not include the member in the “add household members” section. To add a new family member to the next year’s package, the family would simply add that member and leave the Individual ID field blank. If an existing patient wants to start a new household, the user would fill in the policyholder Individual ID, but the user would leave the Household ID blank. If an existing household wants to have a new policyholder, the Household ID would be filled in, and the policyholder ID would either be populated by a different existing Individual ID or left blank (if the policyholder is a new patient). Each year, a new row for each family is generated in the household biographical information table so that if the address or phone number changes after one year, the change is reflected for the following year.

5.1.6.c DirectPHP Extension

This extension allowed us to write embedded custom PHP code inside Joomla! articles (webpage), categories, and JooDatabase.

5.1.6.d phpMyJoomla Extension

We used this extension initially to manage, search, and export database tables in Joomla!. However, this extension was too limited for our purposes. phpMyJoomla only allowed the user to visualize the tables, their content, and the general features of the database. However, it did not allow us to implement changes to the structure of the tables or directly insert, edit, or delete records in the tables. We then moved on to use phpMyAdmin.

5.1.6.e phpMyAdmin Software Tool

phpMyAdmin is a software tool and user interface for managing the database. It allows the user to create, update or delete database tables, change records in the tables, and change columns in the tables without executing any SQL statements. We used this tool in conjunction with the console terminal to manage (create, update, delete, edit) the database. The phpMyAdmin was used for prototyping and testing as it was easy to change tables’ structure and information.

5.1.6.d CSV Export Extension

The CSV Export Extension (was used to generate reports as .csv files. An administrator of the application can find a “Generate Reports” menu on the home page, and clicking on one of these links will generate the report. These reports were created based on information in our database tables or “views” that we created in the database. These “views” are virtual tables created based on information stored in the data tables. Views allow the developer to essentially save specific

queries in the database. For example, the packages table contains information about every package from every year. However, the developer can create a “view” that is a table of all packages only from the current year. These views are stored like database tables.

CSV Export allows the developer to generate a link that will display the information in a table or view in a .csv file. The documentation for how to generate this link can be found here:

5.1.6.e MijoSQL Extension

MijoSQL is an extension that allows the developer or an administrator to carry out SQL commands directly in the administrator page of the Joomla! Website or application, rather than having to go through the terminal on the server. Because of this, querying the database and maintaining the database are made simpler. The user can also save queries, export queries to .csv, or edit information in the database (amongst other commands) that regular users of the application or website cannot.

5.2 Organizational Integration

5.2.1 Required Equipment & Acquisition Plan

The following options are proposed for the creation of health scheme cards. Note all quoted prices and links are resale prices, not wholesale.

5.2.1.a Laminated Receipts

This method would rely on a small external receipt printer and lamination setup. One advantage of receipt printing over conventional printing is they use thermal printing, and do not require ink cartridges, only paper. One disadvantage is the paper itself is rather flimsy, so a person would need to laminate it to help it stand up to wear and tear. There are multiple options for receipt printers, some of which need an external power supply, and some of which can be plugged into a laptop for power. Externally powered printers run from about 70-200 USD and [USB printers](#) are around 70 USD. The [paper](#) itself is very cheap, as low as 0.50 or 0.80 USD per roll. This option will get more expensive once lamination is added in. Lamination sheets that do not require a lamination machine ([self-sealing sleeves](#)) are around 0.60 USD each. [Lamination machines](#) themselves are used to thermally seal plastic packages, and can cost as little as 20 USD. Thermally sealing [lamination sleeves](#) are even cheaper than self-sealing ones, at 0.03 USD each. The cost breakdown for the equipment and materials are as follows:

- USB printer + paper + self-sealing sleeves ~ 70 USD fixed cost, 0.63 USD per card
- USB printer + paper + laminator + thermal sleeves ~ 100 USD fixed cost, 0.03 USD per card

In this case it makes more sense to invest in the laminator, although bringing all of these devices may not be practical given all the power requirements for the various devices. A final alternative is to use clear packing tape as a lamination material.

5.2.1.b Stickers on card stock

This method relies on the printing of adhesive backed labels, that can be put on a cardstock paper backing to give them longevity. [Thermal printers](#) that do not rely on ink or external power are available for purchase, costing about 50 USD. The adhesive backed [label paper](#) itself costs about 0.03 USD per label, with [blank cards](#) costing about 0.06 USD per card. This method would be limited to creating one health scheme card at a time, with the total cost being about 50 USD fixed and about 0.10 USD per card. However, it can be operated off of a single laptop, and is only a single extra device, so it is somewhat simpler logistically for field enrollment events.

5.2.1.c Printed business cards

This option would rely on the use of a regular printer, of the type that KIHEFO already owns. Cards would be printed double sided on a [special type of paper](#) that cards can be torn out of. The cost per card is about ~0.04 USD, not including cost of ink for the printer. One logistic issue with this approach over the previous laminated version is cards must be produced in batches of eight (because of the type of paper), so some enrollees will likely have to wait while their cards are being set up and prepared. Furthermore, an external power supply for the printer will need to be supplied.

5.2.1.d Handwritten cards on a template

This case is similar to the last one, except instead of bringing a printer to the field, many cards would be pre-printed, with certain information (name, group number, Individual ID number) left blank. So, the cost would be similar ~0.04 USD per card plus printer ink, but without the logistical issues of powering a printer. The staff member in charge of enrollment would simply fill in the enrollee's name and ID numbers as reported by the health scheme system. However, this method is much more subject to human error, as writing down the person's ID number incorrectly or unclearly will create a lot of issues with using the health scheme system down the line, when enrollees return to claim healthcare services. Therefore, if at all possible, handwriting is not preferred.

5.2.1.e Stamped handwritten index cards

This is perhaps the simplest version for health scheme cards, where a KIHEFO staff member would handwrite all of the health scheme package information on an index card or blank business card. This option is not recommended given the lack of repeatability and standardization that will inevitably follow from using this method. This method is also vulnerable to fraud, and may cause problems with people trying to claim valid scheme membership when they have not enrolled. Therefore, some form of stamp or special marking is recommended to simplify the process of sifting through potentially fraudulent cases.

5.2.2 User Procedures

In order to understand how the insurance system would fit into the current KIHEFO workflow, interviews were conducted to understand the current workflow. From this basis, the insurance process was included in a way that would minimize the disruption to the current workflow. Once a draft was constructed, Hakim was interviewed to confirm the process presented in in the Design Specifications section.

5.3 Financial Model

In the initial health scheme model that KIHEFO proposed as a starting point (see *Section 3.3* for a complete description), each individual qualifies for individual coverage for her or himself, to be paid in full at the beginning of each year during KIHEFO's enrollment period. While we agree this is an excellent start, to give people more options to fit their scheme coverage needs, increase enrollment, and save families money, the structure and social capital of local Ngozi groups in the Kigezi region is leveraged in the following proposal to produce a more comprehensive scheme structure that includes individually-priced coverages bundled into discount packages for various sizes of families with a range of budgets.

5.3.1 Assumptions

Since we did not have any exact numbers of Ngozi groups or their members for some of our calculations, we made a series of assumptions based on the information we gathered from our field interviews, the Nyakiju village Ngozi group, and Peter. We laid them out here, with the assumptions highlighted.

In the Kabale District, there are:

- 8 sub counties
- 10 parishes per sub county
- 15 villages per parish
- 1 Ngozi group per village

From these assumptions*, we calculated that 8 subcounties * 10 parishes * 15 villages * 1 Ngozi group per village » **1200 Ngozi groups** in the Kabale District.

*These assumptions were rough estimates from Peter, one of KIHEFO's board members.

We also confirmed this assumption through the Land Conflict Mapping Tool, which says that there are 1336 villages in the Kabale District [19]. We decided to use our initial 1200 Ngozi group assumption so that our numbers would be an underestimate in case it is more difficult to register families.

*The Land Conflict Mapping Tool is run by the *Human Rights Focus*, which is an NGO funded and supported by The United Nations.

In each Ngozi group:

(Interviews/Peter)

- There is an average of 50 families
- 10-15% of families in each Ngozi group will sign up for the scheme system right away

From these assumptions, we calculated that 1200 Ngozi groups * 50 families per Ngozi group * .15 of each Ngozi group that buys in » **9000 families**. This is the number of families we think that KIHEFO can realistically get (as long as KIHEFO targets them and advertises the scheme plan options effectively to the Ngozi groups).

From the Uganda 2014 census data [20]:

- The average family size is about 5 people
- 60% of the population are children

This information was used to construct scheme packages and estimate the amount and scale of services families might expect to use in a year. Though KIHEFO has advised that coverage for children and adults for healthcare will be the same, for the sake of simplicity, it is helpful to know how big most families are, and how many members of a family are children to aid in predicting how costs of financing the proposed health scheme might change (or rise) over years to come..

5.3.2 Scheme Packages

Layout and basic calculations

The following is an explanation of two tables that outline the care covered by each package, the bundled price calculation, and a comparison of bundled prices to the costs of covering each member of a family individually based on the initial pricing from the 2011 KIHEFO Financial Model (*Appendix 9.4.3*) and suggestions from Dr. G. Table 1 outlines the different types of packages and the corresponding pricing, including basic calculations for each bundled price. An explanation of the calculations and their requisite risk-assumptions can be found in the passage following Table 1 (we assumed that not every member of a household would use or need all the services covered, so we would not need to charge them for each member's care – a financial model was created to confirm that reduced pricing is still a valid model for the scheme, shown in the Financial Sustainability section, below).

The top-most row of Table 1 describes the size of the Household to be enrolled: 1 is for an individual, 2 for two members, etc. Limitations on Household Size include 2 adult members per household, and the rest of the members in each household must be dependents. That is, the other members who are not adults must either be children, unmarried young adults who still live at home, or others who are legally dependent on the policy holder (who must be one of the two allowed adults). The leftmost column of Table 1 describes the five tiers of packages that families

and individuals can choose from and what is covered under each package for everyone on the plan: Ambulance covers ambulance, Basic covers outpatient and pregnancy for everyone, Basic + (Basic Plus) covers everything the Basic package covers, plus ambulance, Value covers inpatient, outpatient, and pregnancy care for everyone, and Premium covers everything that Value covers, plus ambulance. The black numbers in Table 1 are the calculations organized by type. The green numbers are the final, total costs for each package for each size family.

Household Size	1	2	3 – 5	6 – 8	9 +
Ambulance	10,000	20,000	40,000	70,000	100,000
Basic (O/P + preg. for everyone)	-	30,000 <u>+ 60,000</u>	2(30,000) <u>+ 60,000</u>	3(30,000) <u>+ 2(60,000)</u>	6(30,000) <u>+ 2(60,000)</u>
		90,000	120,000	210,000	300,000
Basic + (Basic + Ambulance)	-	10,000 <u>+ 90,000</u>	10,000 <u>+ 120,000</u>	2(10,000) <u>+ 210,000</u>	2(10,000) <u>+ 300,000</u>
		100,000	130,000	230,000	320,000
Value (I/P, O/P + preg for everyone)	60,000	60,000 <u>+ 60,000</u>	30,000 <u>+ 60,000</u> <u>+ 60,000</u>	3(30,000) <u>+ 60,000</u> <u>+ 2(60,000)</u>	3(30,000) <u>+ 3(60,000)</u> <u>+ 2(60,000)</u>
		120,000	150,000	270,000	390,000
Premium (Value + Ambulance)	10,000 <u>+ 60,000</u>	10,000 <u>+ 120,000</u>	10,000 <u>+ 150,000</u>	2(10,000) <u>+ 270,000</u>	2(10,000) <u>+ 390,000</u>
	70,000	130,000	160,000	290,000	410,000

Table 1: Scheme packages for families of varying size and with varying budgets.

For each package, the cost of anticipated care was weighed against what families could afford to pay. For example, for the Basic package for a Household Size 3-5, it was estimated that KIHEFO could expect to pay the expenses of outpatient care for two of the three-to-five members of the household and a single pregnancy, and thus the total charged to the family is enough to cover those expenses. But in the Value package for that same sized household, families will be charged for an additional individual's-worth of inpatient care, since everyone is covered for inpatient care under the Value plan. However, we expect that some families will require more services for their family members than the ones calculated in Table 1, and some will require fewer. By aiming to price the premium at an average between families on the extremes, we hope to minimize KIHEFO's losses while still providing families with scheme packages they can afford.

Table 2, below, summarizes the differences in prices between our proposed bundles and the prices of insuring every member in a family on their own plan. The green numbers are the total bundled prices (calculated in Table 1), and the red numbers are the price of insuring every member in a household individually. As the packages become more comprehensive and the

Household Size increases, families begin to see higher savings. This was done to incentivize families to insure as many members under the best package they can afford.

Household Size	1	2	3-5	6-8	9+
Ambulance	10,000 10,000	20,000 20,000	40,000 30-50,000	70,000 60-80,000	100,000 90,000 +
Basic (O/P + preg. for everyone)	-	90,000 90,000	120,000 120-180,000	210,000 210-270,000	300,000 300,000 +
Basic + (Basic + Ambulance)	-	100,000 110,000	130,000 150-230,000	230,000 270-350,000	320,000 390,000 +
Value (I/P, O/P + preg for everyone)	60,000 60,000	120,000 120,000	150,000 180-300,000	270,000 360-480,000	390,000 540,000 +
Premium (Value + Ambulance)	70,000 70,000	130,000 140,000	160,000 210-350,000	290,000 420-560,000	410,000 630,000 +

Table 2: Summary of pricing differences between bundles and individually enrolling each family member.

In the next section, a financial model will show how even with the price cuts for bundling, the range of packages provide the basis for a viable and stable financial situation for KIHEFO.

5.3.3 Financial Sustainability

Based on our analysis, a household-based health scheme is **equally financially viable** and **more resistant to cost shocks** than the initial assessment completed by the financial consultant in 2011, hence a household-based health scheme would be sustainable for KIHEFO in the long term. Note that we have used “family” and “household” interchangeably but in this section, we chose to use “household” to stay consistent with the programming team.

In benchmarking the financial model provided by Dr. Anguyo that focused on maternal health and the health scheme in 9.4.3 *KIHEFO Financial Model*, it was ascertained that **we need 11,718 individuals** (equivalent to 2,457 households with the demographic assumptions we delineate below) **in the first year** to *generate increasing cash flows by end of the 4th year that the health scheme is in place*. This is comparable (less than 12% deviation) to the 10,000-individual target originally outlined in the 2011 KIHEFO Financial Model (*Appendix 9.4.3*).

Demographic assumptions:

- Distribution of households in each category: In particular, it was guessed that 50% of households fall in the “1-3 dependents” category and 30% in the “4-6 dependents” category.
- Average number of members in each category: We assume the average number of dependents in each category. For example, two in “1-3 dependents” category totaling four, and five in “4-6 dependents” category totaling seven.
- Average household size is assumed to be 4.77. This is a result of the two assumptions above, and is consistent with the 2014 Uganda census data that the average household size in rural areas is 4.9 and that in Kabale district is 4.4 [20].
- The typical household has one male adult and one female adult.

	Individual	2 Members	1-3 Dependents	4-6 Dependents	7+ Dependents
% Population	13%	2%	50%	30%	5%
Avg. Size	1	2	4	7	10
Total average Household Size: 4.77 (= 13% x 1 + 2% x 2 + 50% x 4 + 30% x 7 + 5% x 10)					

Financial assumptions, different from original model:

- The adult-children composition of the total population is 40%-60%, respectively, because of the demographic assumptions above, consistent with the 2014 Uganda census data (Table A4.)
- Females represent 50% of the adult population, due to the last assumption above also consistent with the 2014 Uganda census data showing 51.8% of Kabale district being female and 50.7% nationally [11].
- The pregnancy rate of women is 30%, instead of the 15% assumed in the original KIHEFO financial model. This totals 6% of the population, instead of 4.5%. We believe this is a more conservative and realistic estimate. In addition, it accounts for the possibility of young girls in the household getting pregnant, which is likely given that more than 4 times of female children aged 12-17 years are married compared to male children in Kabale district, according to the 2014 Uganda census data [20].
- In each category, it was assumed that only 95.5% of the insured adopt the basic plan and 4.5% adopt the ambulance plan. This is the “worst-case scenario” for KIHEFO in that it generates the least amount of revenue but accounts for 30,000 UGS cost per individual in the scheme plan. The total revenue is comparable to that generated by the original plan.
- Growth rate of the scheme plan is consistently 20% starting from the second year. It was thought that a peak of 50% growth in the second year would be unreasonable.

- The personnel cost is scaled up in multiples of the number of pregnant patients (with a base of 450, as in the original individual-based plan.)

	Household-based	Individual-based
% Children	60% (mapping census data)	50%
% Adult Female	50% (mapping census data)	60%
% Women Who Will be Pregnant	30% (accounts for girl pregnancy)	15%
First-year Revenue	USD \$100,444 ("worst-case scenario")	USD \$100,000
Second-year Patient Volume Growth Rate	20% (less sudden)	50%
Personnel Expansion	Linear and in multiples ("worst-case scenario")	Less than proportional

Table 3: Differences of financial models' projections of population demographics

5.3.4 Sensitivity Analysis

Keeping in mind the goal to *generate increasing cash flows by end of the 4th year that the health scheme is in place*, we performed sensitivity analyses on both models. The table below shows three things:

1. The minimum number of enrollees needed for the 1st year;
2. The projected number of enrollees at the end of the 4th year;
3. Cash flow at the end of the 4th year.

The table progresses down, meaning each scenario (in a row) builds on the scenario above in terms of model inputs.

We explain the various scenarios below:

- Original: An initial guess of the required number of enrollees cited in the financial model given by Dr. Anguyo. It does not apply to our household-based model, since we do not have an initial guess.
- Baseline: this is the break-even point, i.e. for the 4th year cash flows to be USD \$1 more than that of the 3rd year. In addition, the cost structure in terms of personnel expansion for the individual-based model is changed to a linear relationship and in multiples to

match that of the household-based model, i.e. if there are twice as many pregnancies and deliveries, twice as many midwives are staffed.

- 30% pregnancy rate: to adopt the conservative assumption outlined above.
- +\$1 in average prenatal cost & +\$1 in average supply costs for delivery: based on an interview with Sylvia, we learned that a quality delivery costs on average \$25, instead of \$18 as assumed in the original model. We wanted to see how sensitive the models are to the cost increase, which is inevitable in the long term.
- +\$1 in average prenatal cost & +\$2 in average supply cost for delivery: we increase the delivery supply cost, which is likely to increase more than the prenatal cost.
- +\$1 in average prenatal cost & +\$3 in average supply cost for delivery: we further increase the delivery supply cost.

Table 4: *Household-based versus Individual-based health scheme sensitivity analysis*

As seen above, the individual-based model achieves higher levels of cash flows for the original, baseline, and 20% pregnancy rate scenarios. However, this model is much more sensitive to cost changes. The household-based model is recommended given it is less sensitive to

changes in costs and because KIHEFO is not profit seeking (therefore is not necessarily required to increase its cash flow).

At the baseline level, we set the number of enrollees in the 1st year to achieve the break-even point and set the cost structure to be multiples of the number of pregnancies and deliveries.

When the assumption of pregnancy rate is increased from 15% to 20%, the minimum number of enrollees needed for the 1st year doubles to almost 20,000. This results in a doubly projected enrollee number in the 4th year, with no significant addition to the cash flow, meaning a smaller cushion to accommodate pricing changes. The household-based model, on the other hand, requires fewer enrollees to achieve a similar cash flow. This is expected as the baseline assumption of pregnancy rate for the household-based model was higher (at 30%) to begin with.

Moreover, the individual-based model cannot sustain a further cost increase, expressed as an increase of pregnancy rate to 30%, increases in prenatal cost or delivery supply cost. “N/A” indicates that the model shows it cannot break even by end of the 4th year. This is concerning as Sylvia told us the average cost to KIHEFO for one delivery is \$25, which was inconsistent with the numbers included in the original financial model from 2011.

Note that “N/A” does not necessarily mean the model is invalid or wrong; it only indicates that four years may not be enough to break even. In addition, the household-based model returns “N/A” too, i.e. it shows that the model is unable to sustain further increases in delivery costs.

A rigorous explanation of the logistics of the financial model are outlined in *6.3 Financial Model*, where an explanation of our final deliverable to KIHEFO is detailed.

5.3.5 Sustainability through Claims


In order to ensure the health scheme system is sustainable it will need to be updated yearly, especially after the first year, once there is definitive data on how many people use the KIHEFO scheme and what they use the KIHEFO scheme for. In order to keep track of this, we have created a KIHEFO health scheme claim form shown in Figure 22 and added in the *Appendix 9.4.11* and KIHEFO health scheme tracking spreadsheet shown in Figure 23 and found in the *Appendix 9.4.9*.

Name: _____

Household ID: _____

Individual ID: _____

Date: _____



KIHEFO Community Health Scheme Claims

Procedure(s) _____

	Prescription	Quantity
Tablet	_____	_____
	_____	_____
Injection	_____	_____
	_____	_____
Syrup	_____	_____
	_____	_____
	_____	_____

Patient Signature: _____

Doctor Signature: _____

Figure 22: Shows the claim form.

	A	B	C	D	E	F
1	Prescription Tablets	Price	Count	Total Spent		
2	Aciclovir	500	0	0		
3	Albendazole	2000	0	0		
4	Amitriptylin	200	0	0		
5	Amlodipin	200	0	0		
6	Amoxycyclavir	2000	0	0		
7	Amoxyl	400	0	0		
8	Ampicillin	100	0	0		
9	Ampiclox	500	0	0		
10	Androz	4000	0	0		
11	Artenum	15000	0	0		
12	Artequin	20000	0	0		
13	Artesunate	15000	0	0		
14	Asa	100	0	0		
15	Ascobic Acid	100	0	0		
16	Ascoril	100	0	0		
17	Atenolol	300	0	0		
18	Azithromycin	3000	0	0		
19	Benzhexol	200	0	0		
20	Biscadoyl	100	0	0		
21	Brufen	100	0	0		
22	C/phencical	200	0	0		
23	Calciumlactate	100	0	0		
24	Captopril	300	0	0		
25	Carbamazepine	200	0	0		
26	Cardian Asa	1000	0	0		
27	Cefolaxine	500	0	0		
28	Cetamol	100	0	0		
29	Cetizine	500	0	0		
30	Charcoal	100	0	0		
31	Chlopramazine/largactil	200	0	0		
32	Cimetidine 200mg	200	0	0		
33	Cimetidine 400mg	300	0	0		

procedures **tablets** injections syrups lab tests +

Figure 23: Screenshot of the tracking spreadsheet

We recommend KIHEFO updates the tracking spreadsheet daily with the transactions from the day by updating the count column. Once the count column is updated, the total spent and total at the bottom of the document automatically update. The spreadsheet has five tabs: procedures, tablets, injections, syrups, and lab tests so all items are easy to find. Further, the spreadsheet

table can be filtered and organized to the user's preference using the options built into the first row. The results from this spreadsheet should be used in determining the following years costs.

5.3.6 Marketing Strategy

Because having KIHEFO go to every Ngozi group twice, once to explain the concept of a health scheme and second to sign people up, is unrealistic, we propose 5 steps for marketing the health scheme to prompt people to sign up:

1. KIHEFO should send out mass advertisements on the radio through all of Kabale.
2. KIHEFO should advertise at all of their clinics and Outreaches by handing out a flyer in *Appendix (9.3.2)* to each patient and explaining the new program.
3. KIHEFO should contact all affiliated parishes and any other parishes they may have a relationship with to advertise the new program after services and hand out flyers.
4. KIHEFO should advertise in any additional ways they think is best (local businesses, schools, officials).
5. KIHEFO should have enrollment sessions in each parish of Kabale.
 - a. Enrollment sessions should have staff available to answer questions and talk through package options with a pamphlet in *Appendix (9.3.1)* for each family as well as staff that will be responsible for enrolling and collecting payment.

Based on the target of reaching 2,500 families (about 12,500 people) by January 2018, based on the household model, and using the information we gathered from Peter, KIHEFO should have enrollment sessions at **3 parishes per week** from October-December 2017.

Assuming:

- Targeting 2,500 families
- 15% of families per Ngozi group will buy in » 5 families per Ngozi group
- 15 Ngozi groups per parish
- Enrollment sessions will happen for 12 weeks (October-December)

For these assumptions, we calculated that 2,500 families / 5 families per Ngozi group / 15 Ngozi groups per parish / 12 weeks » **3 parishes per week**. A monthly plan is described below.

August – September: Finalize Health Scheme

September: Marketing Period— Contact churches, start radio advertisements, distribute flyers at KIHEFO clinics and community Outreaches

October – December: Schedule and host enrollment/info sessions and continue to advertise in churches, on the radio, and at local clinics

5.3.7 Advertisements

We propose that KIHEFO reaches out to the community via two main means: paper and radio. We suggest the clinics, parishes, churches, etc. have copies of a simplified flyers while social workers conducting enrollment leverage a detailed pamphlet. In terms of radio, we suggest they

run advertisements along with radio talk shows. Below details our procedure for creating the paper materials and a draft of the radio advertisement.

5.3.7.a Pamphlet and Flyer

Originally, only one pamphlet was created. It was intended that this pamphlet would have all of the necessary information for a social worker to sit down with a community member, walk them through all of the information, and help them enroll. This pamphlet was presented to Peter, Dr. G, and Alison to iterate and create a final version that is usable by the social workers. Alison will translate the pamphlet to Rukiga so the social workers can interact directly with community members and so community members can take it with them and understand what they have purchased and the pamphlet can be seen in the *Appendix (9.3.1)*.

Along with the pamphlet, Dr. G suggested an additional document that would not require a social worker to walk a community member through. For this purpose we created a flyer that is highly icon driven with a subset of the total information. The flyer is intended to get the community members interested in the services provided and the Community-Based Health Scheme. The original flyer was presented to KIHEFO staff and their feedback was incorporated into the final version presented in *Appendix (9.3.2)*.

While creating the training, we also decided it would be good to have additional information available for the social workers. To do this we created a social worker handout that provided additional information that could be used when enrolling and answering questions. We used this handout when training KIHEFO staff and collected their questions. The final handout includes common questions and is available in *Appendix (9.3.3)*.

As mentioned above, a group of KIHEFO staff were trained on the Community-Based Health Scheme using the handout, flyer, and brochure. Doing this we were able to incorporate all additional questions, concerns, and suggestions. Further, this was some of the KIHEFO staff's first concrete introduction to the health scheme we are presenting to the community and we were able to answer any questions they had and give them the knowledge to enroll community members. To ensure all questions were answered, additional time for questions was given at a second training more focused on the software.

5.3.7.b Advertisement Script Draft

A script for a radio advertisement or skit to be acted out at community meetings, such as church services or Ngozi group meetings, is proposed to expand KIHEFO's reach into more rural communities. A transcript of the proposed skit is shown below.

“Are medical bills for your family getting to be too much? KIHEFO is starting a new Community-Based Health Scheme that will ensure your family can get whatever care they need no matter when they get sick during the year. The price of the health scheme packages are cheaper than it would cost if you have to pay for treatment out-of-pocket. The KIHEFO health

scheme has discounts on family plans so all of your children can be insured for a much lower cost than if you had to enroll them each individually. This program is designed so that any family should be able to pay! Fliers with more information, package options, and pricing can be found at all KIHEFO clinics, Outreaches, and some local churches. If you want to enroll, please come to one of KIHEFO's enrollment sessions in your parish. The following parish enrollment sessions will be on the following dates: ___ parish on October 23rd at _____, etc."

6. Design Specifications

6.1 Database Application

6.1.1 User Interface

Below is screenshots of the UI we created with Joomla! and descriptions of each page. A more detailed walk through can be found in the attached training manual (*Appendix 9.4.8*).

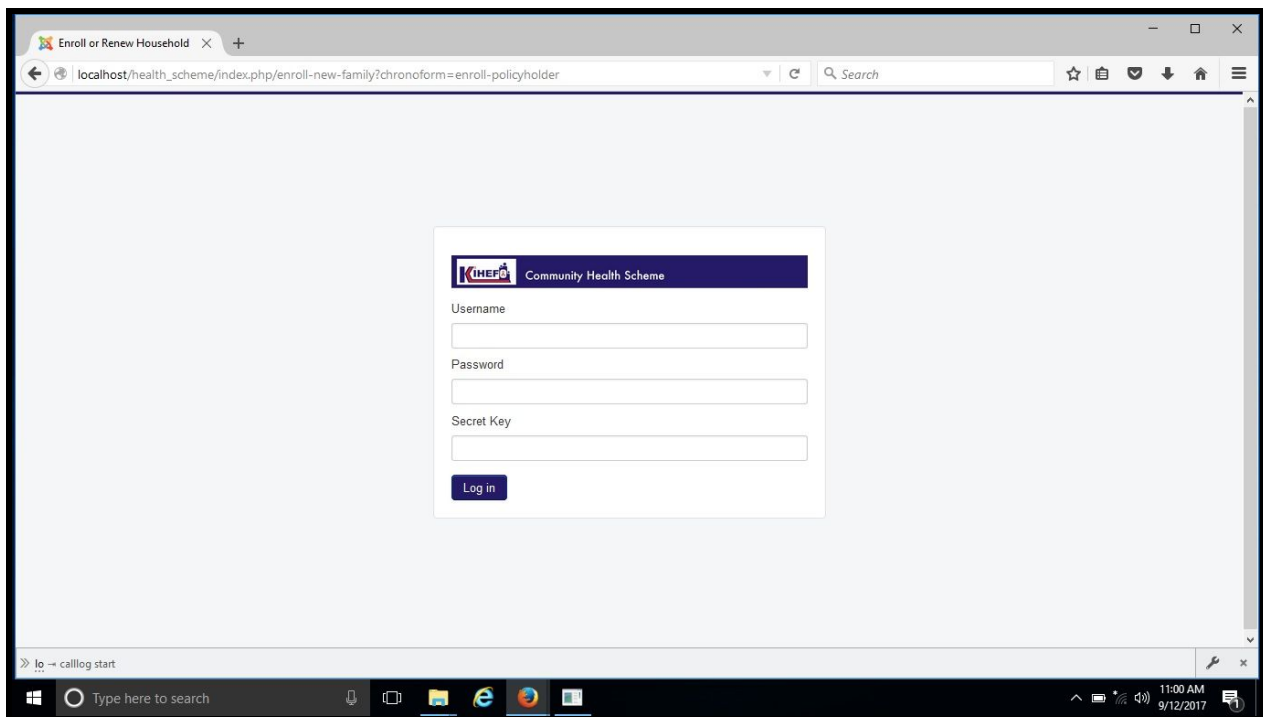


Figure 24: The login page for the system. The username and password will be assigned to each person who uses the system and the “Secret Key” is left blank. Users will have different permissions, and will be able to access different parts of the application or website.

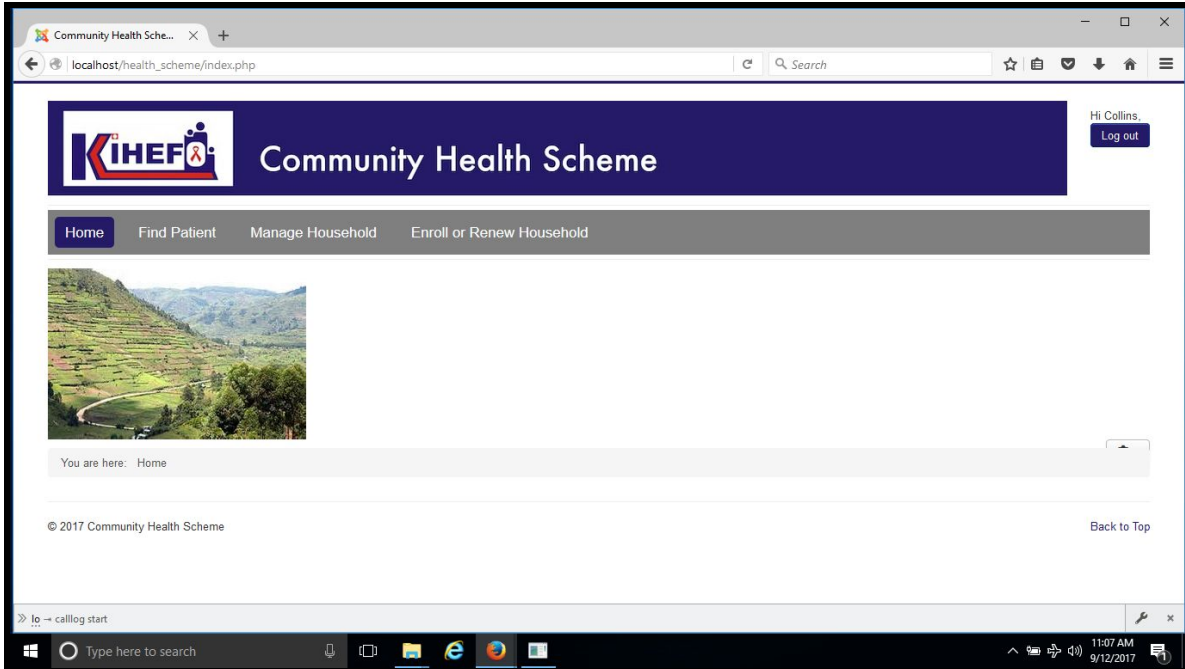


Figure 25: The home page of the application. The options bar across the top stays constant throughout the system as well as the “Log out” button. An administrator will also see a “Input New Packages” tab (input packages for the upcoming enrollment period), as well as a “Generate Reports” menu.

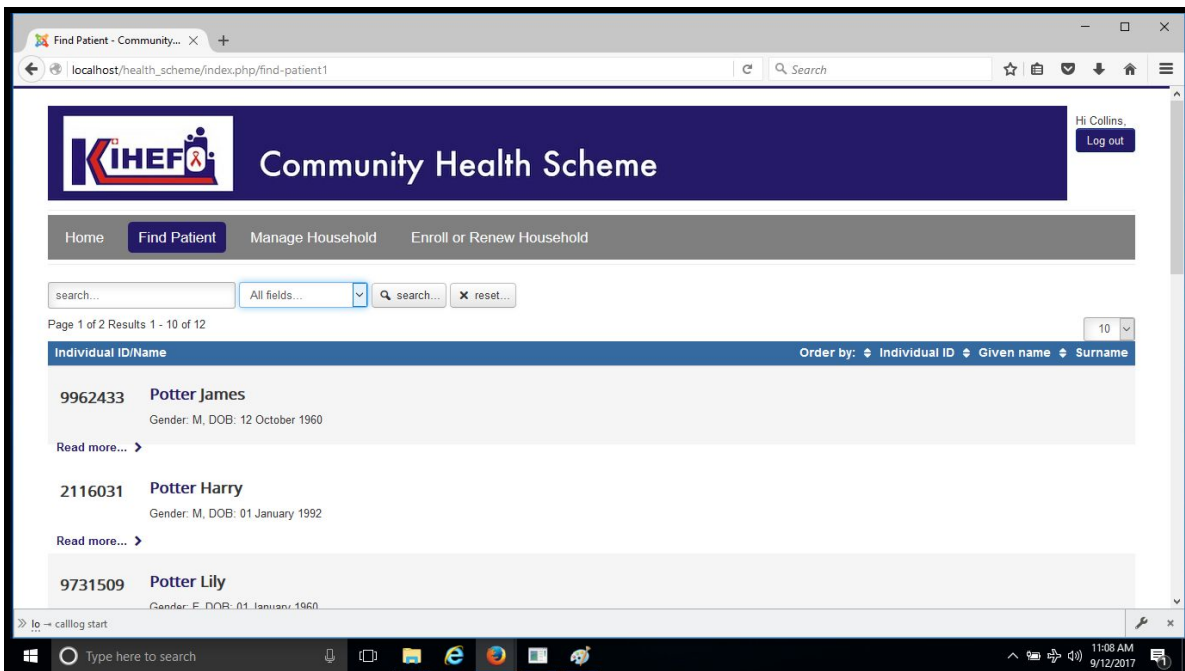


Figure 26: The “Find Patient” tab of the UI. The user can search by Individual ID, given name or surname using the dropdown menu. Once the patient is found, the “Read More” link will lead the user to the patient’s patient profile. The system will show an error if an invalid field is searched

for. If a search is not performed, then all patients will be listed under the search bar and the user can go through and find the specific patient.

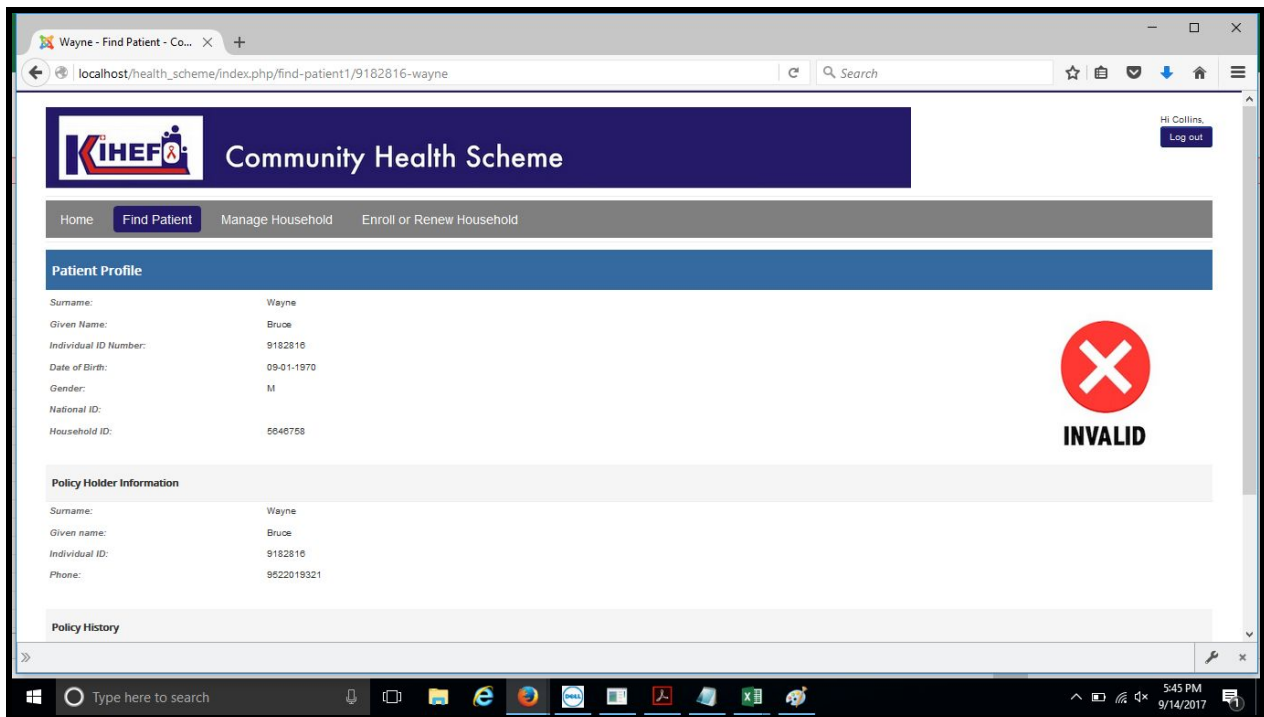


Figure 27: This patient profile is displayed when “Read more” is selected on a particular patient. The red x on the right shows that the current patient is invalid for the current year (either because they have not paid for their coverage or because they are not enrolled for the current year). This will be a green checkmark if the patient is valid. It also shows a summary of the patient information.

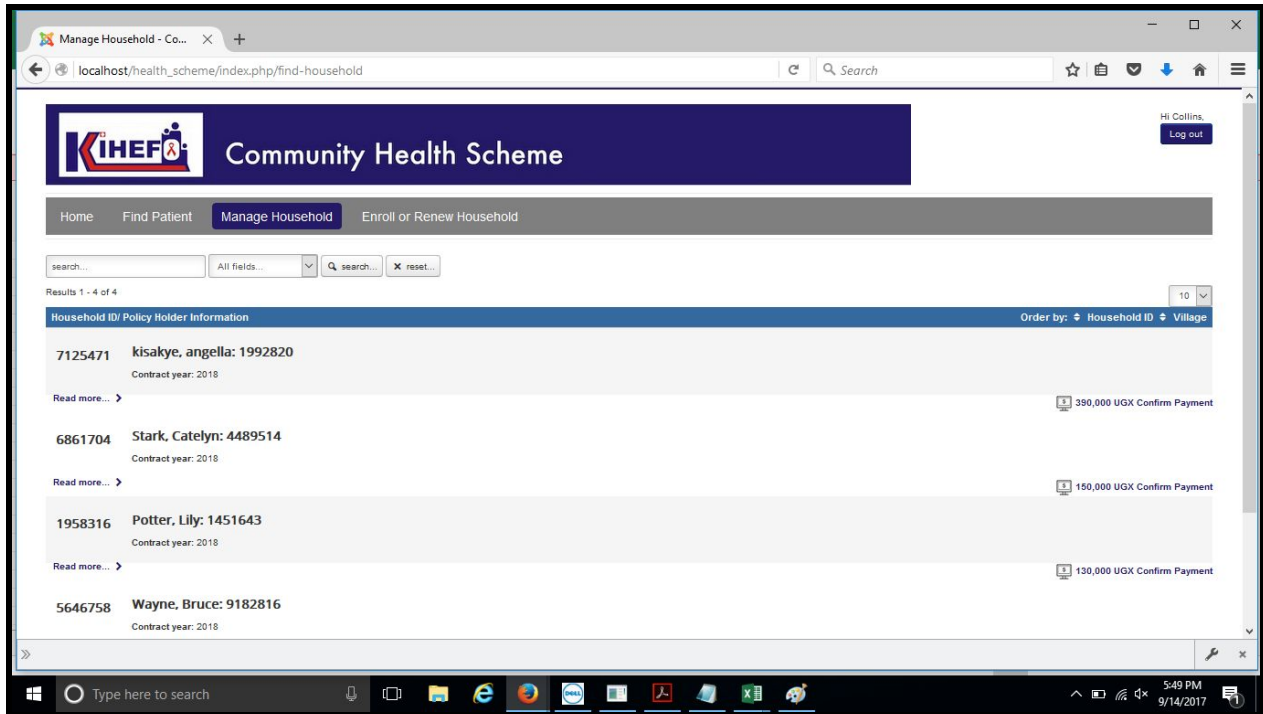


Figure 28: The “Manage Household” tab allows the user to search for a household by Household ID, Village, or Policyholder ID. Here, the user can confirm the payment of their plan, see the details of a household, and edit the details of the household. To confirm payment, (this happens once a family has enrolled), the user clicks on the “Confirm Payment” button on the right hand side under the specific family. This link shows the payment amount required. The “Confirm Payment” link will only be visible on families who have not paid yet for their plan.

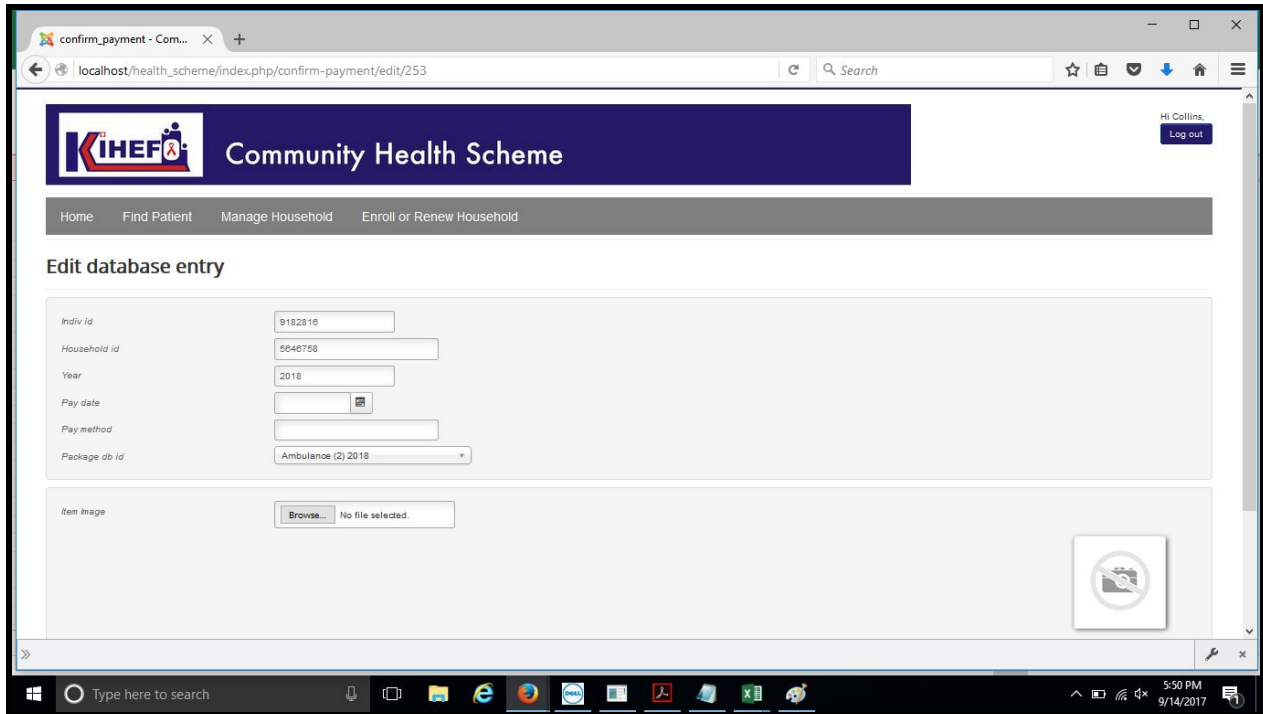


Figure 29: This page opens after the user clicks “Confirm Payment.” The user then selects the pay date and method (cash or mobile money) and has the option to upload a picture of a receipt if needed. The user then hits “Save” at the bottom of the page. Once the payment is confirmed, a household’s package is valid and each individual is valid in the system. The other fields are currently editable, but should not be edited by the user.

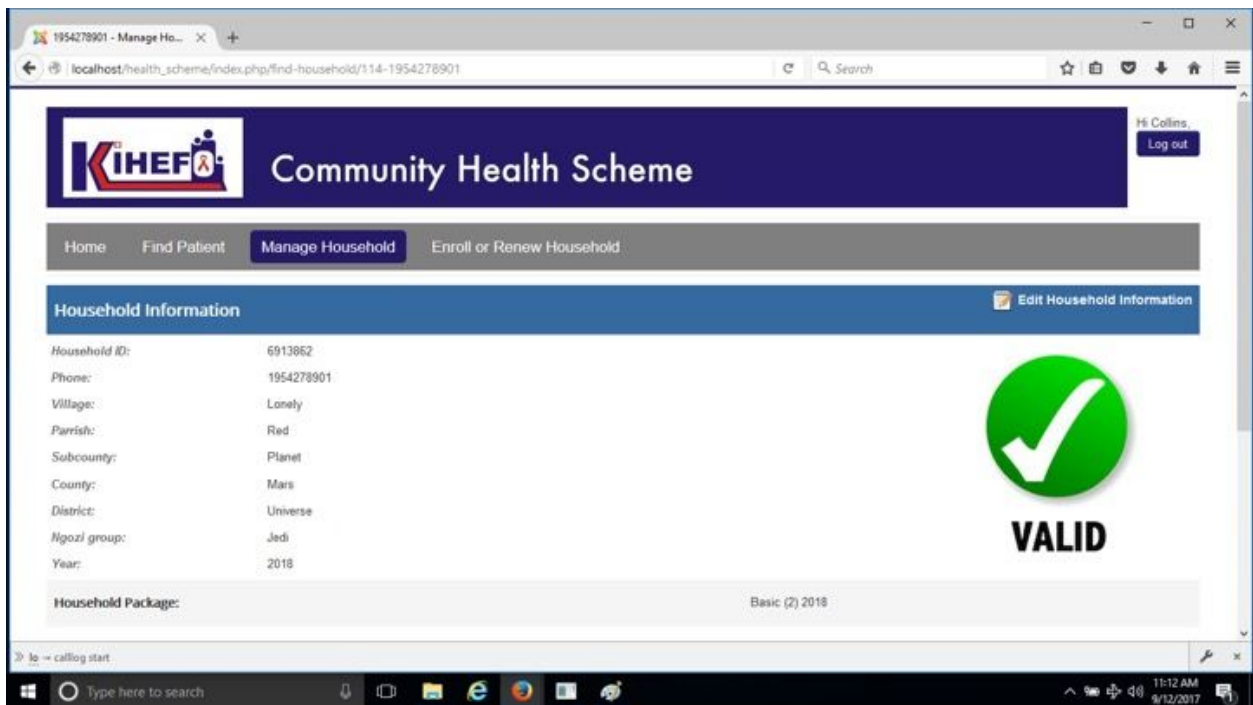


Figure 30: This window pops up when the user selects “Read more...” on a household. This shows the summary of the household and if their plan is currently invalid or valid with the red X or green checkmark. To edit the information for the household the user can hit “Edit Household Information” in the top right corner of the page.

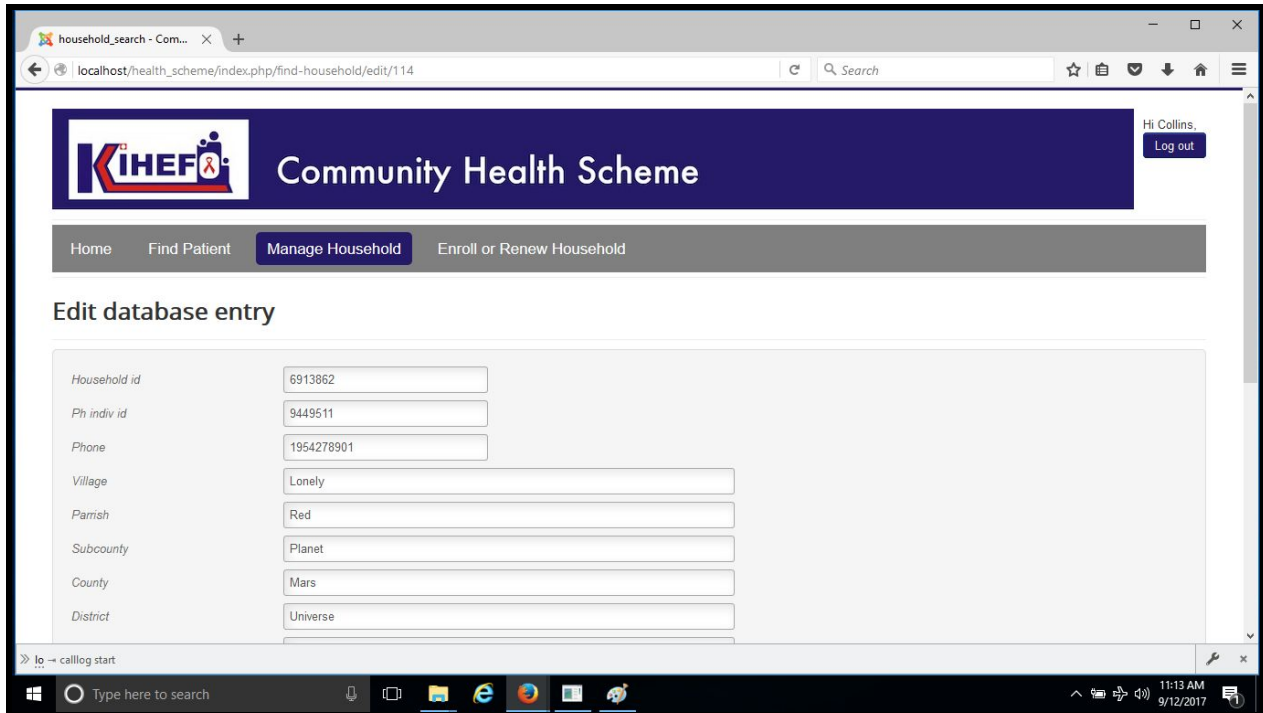


Figure 31: This page allows the user to edit the household information. The Household ID and Policyholder ID should not be changed, but the other fields can be. The user can then scroll down and hit “Save” once they have completed the necessary edits.

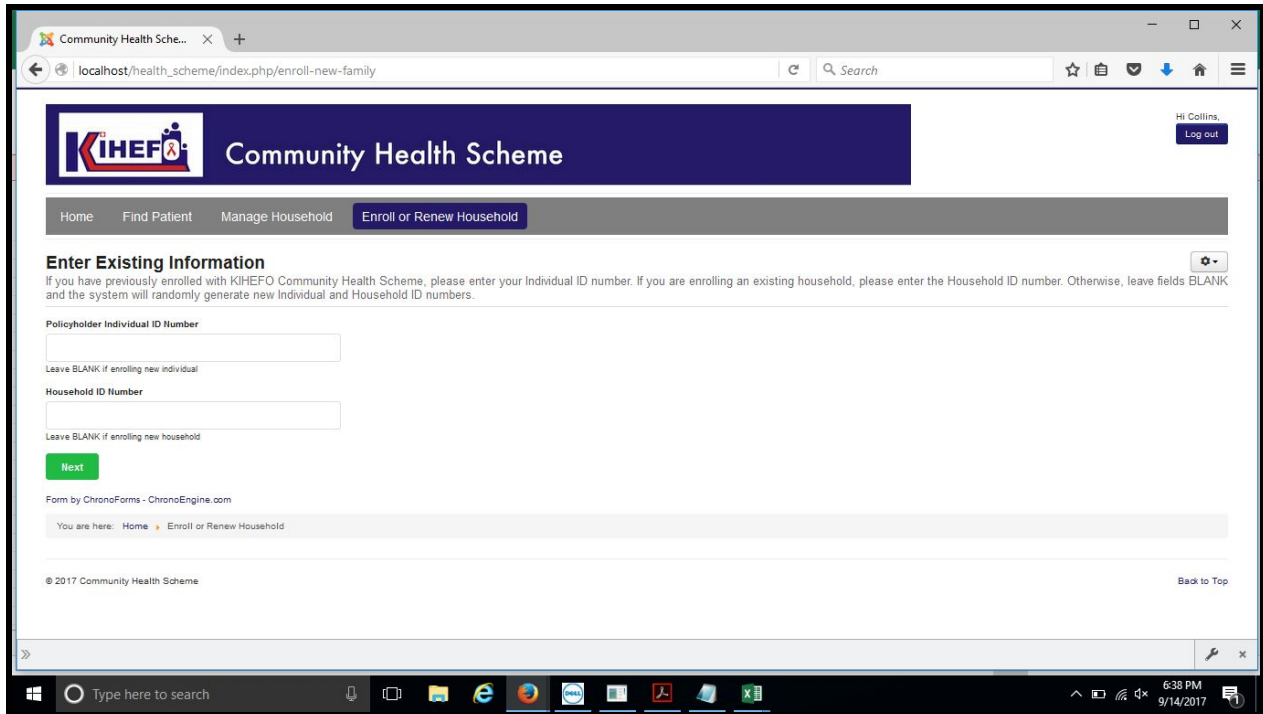


Figure 32: This is the first page of the “Enroll or Renew Household” tab. If the household has already been enrolled in the health scheme and is renewing their policy, then the Policyholder Individual ID number and Household ID Number should be input here. If not, they should be left blank. If a field on this page is left blank, the system will automatically generate a new random ID for that field. If not, the system will use the user-input information. This page does error checking to make sure that the entered ID numbers actually exist in the system. If it doesn't the system does not let the user proceed until they fix the number or leave the field blank.

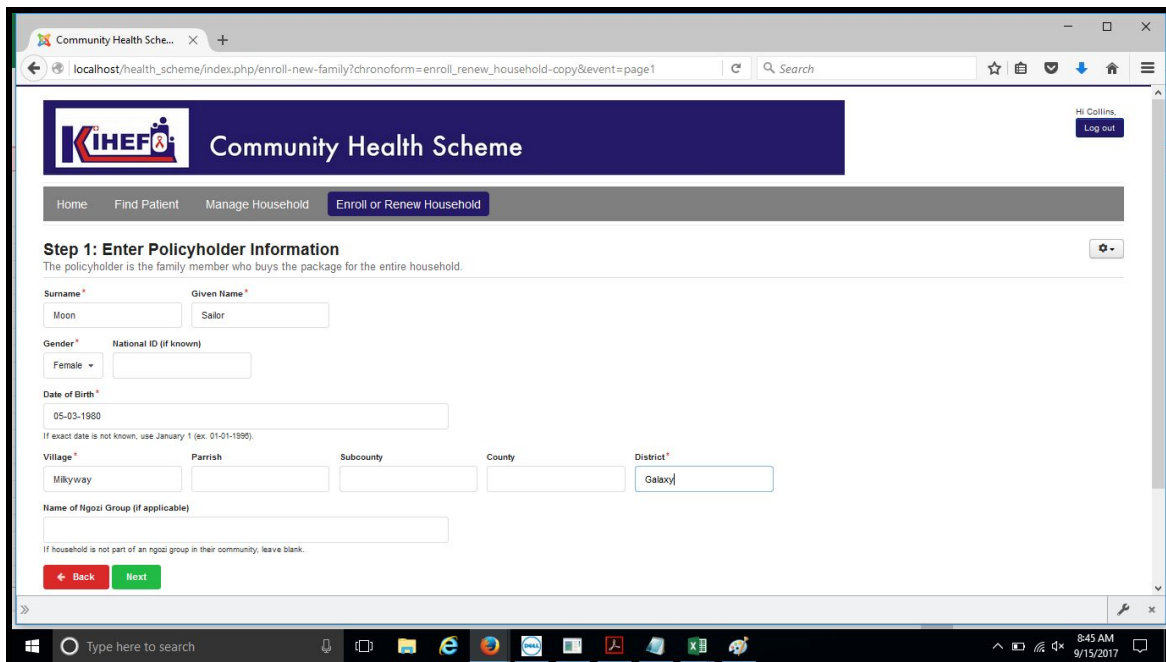


Figure 33: Here, the user enters the policyholder information into the system. The fields with red asterisks next to them are required and will give an error message if the user tries to advance without filling them in.

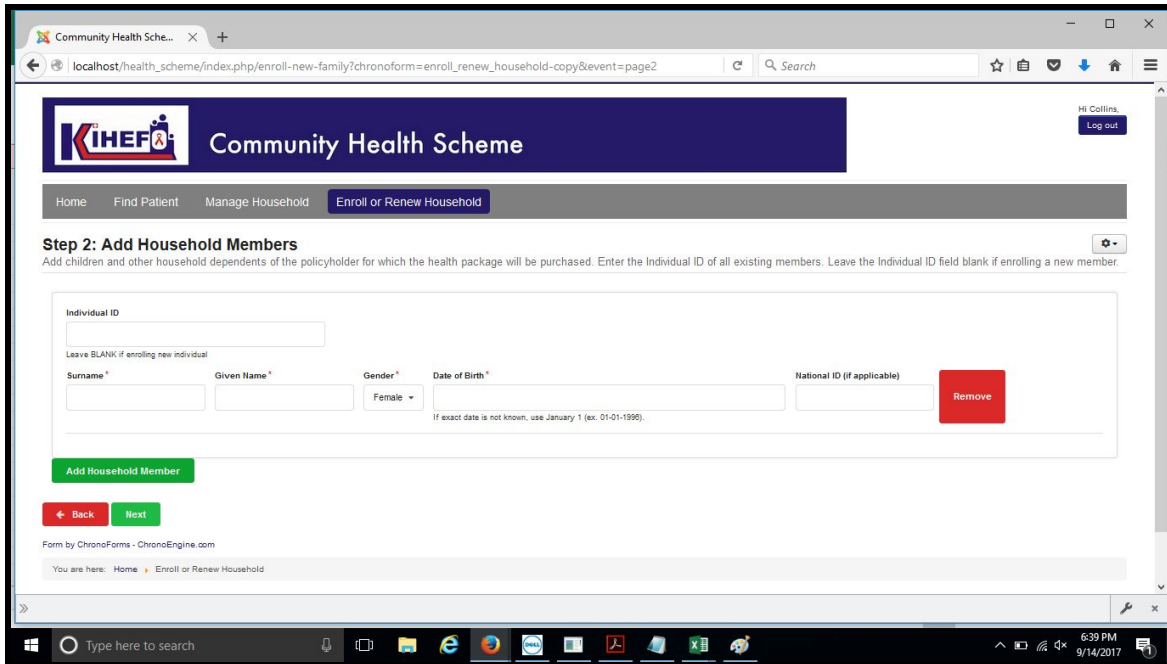


Figure 34: The user now inputs household members and their information into the system. The user hits the “Add Household Member” button to add more household members and can hit “Remove” if they add too many fields. To renew a member, the user can input the previous Individual ID into the system or else a new ID number will be generated. The user then hits “Next” to advance the page.

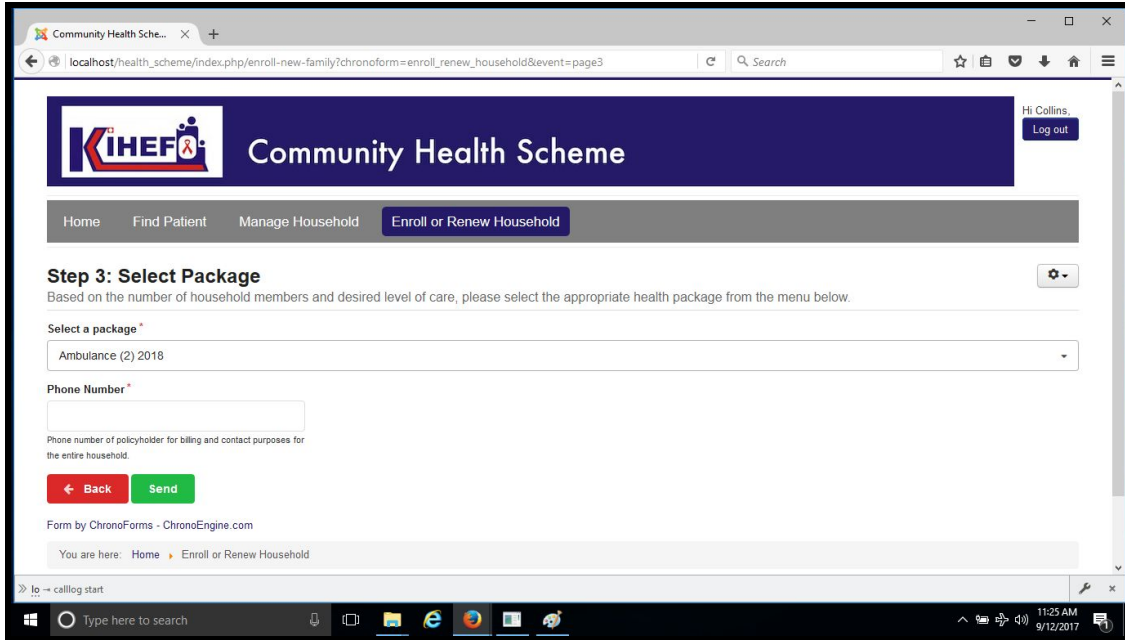


Figure 35: The user now selects a package for the coming year. The user then inputs the household’s phone number and hits “Send.” Once sent, the user cannot go back and change anything so they should be sure they input everything correctly.

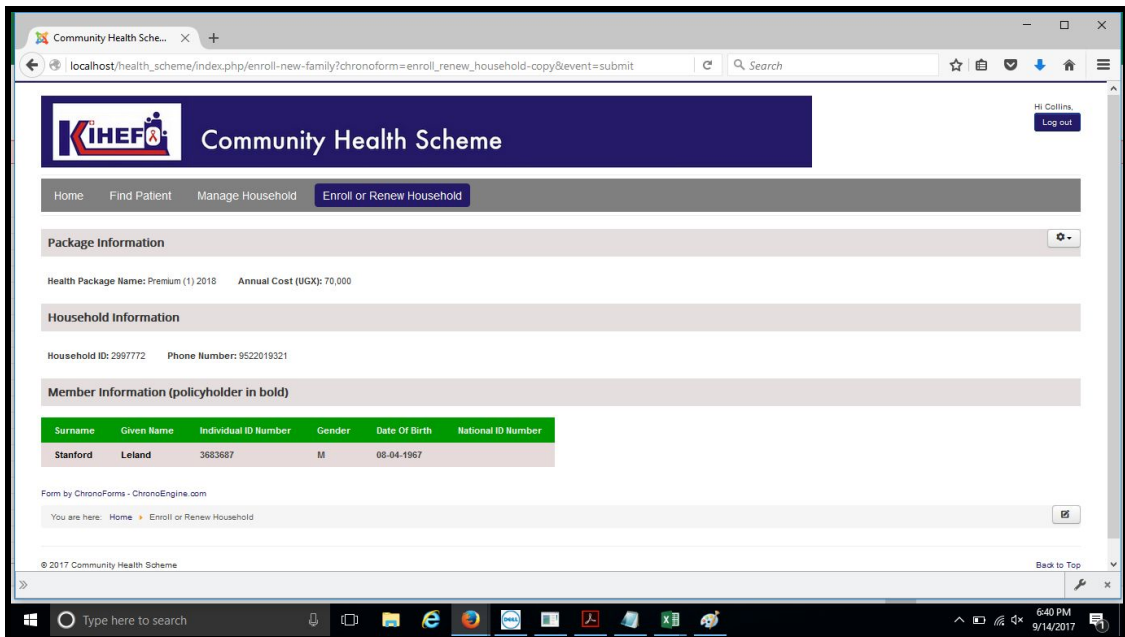


Figure 36: This is the summary page that opens once the user hits “Send” in Figure 35. This summary page matches the receipt that the KIHEFO staff will fill out for each family once they enroll. When the KIHEFO staff gets to this page, they will fill out the health scheme cards (6.2.1.a) for each person enrolled in the household and the receipt (6.2.1.b).

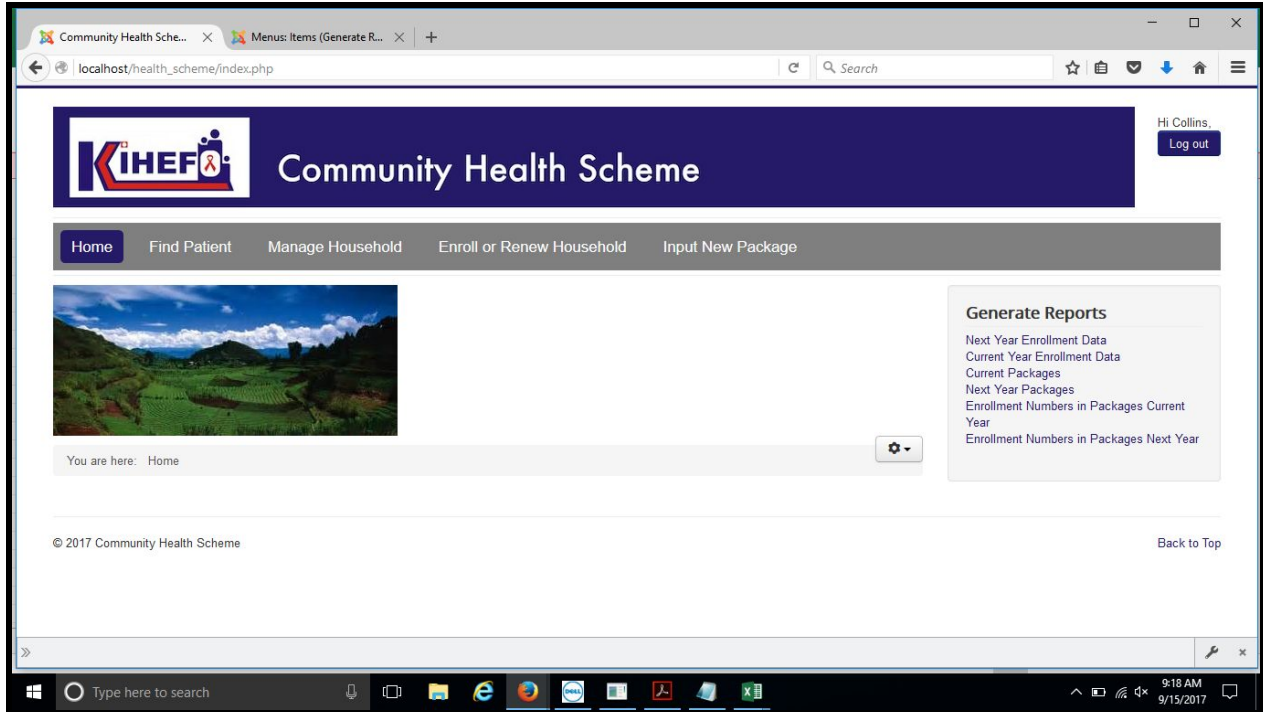


Figure 37: This screen is the home screen for a user who has administrative privileges. The tabs from a normal user are still present. Additionally, “Input New Package” is in the options bar and there is a “Generate Reports” box on the right hand side.

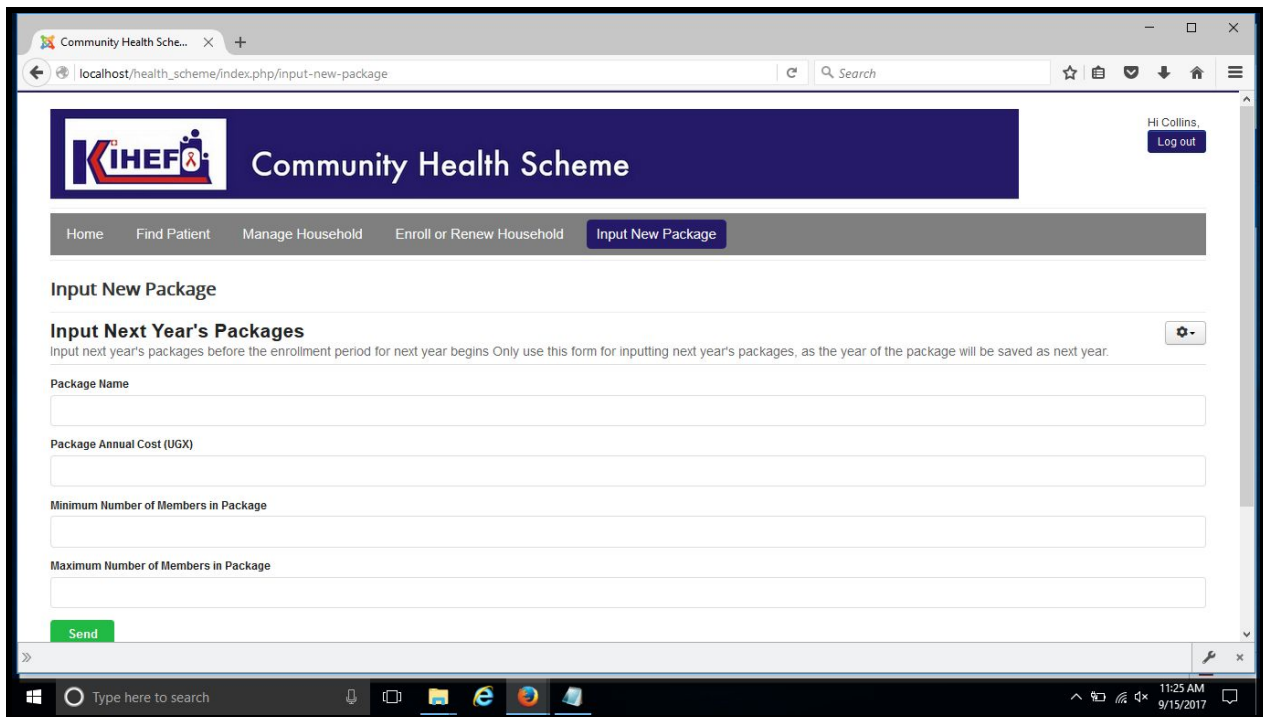


Figure 38: This screen appears when “Input New Package” is selected. This page allows the administrator to add the packages for the upcoming enrollment period for next year. These

packages will then be added to the database. These packages will be the options when enrolling or renewing households for the coming year. These packages should be added before the enrollment period for the next year. NOTE: for the maximum number of members in package for the plan with unlimited children should be set to 99. When “Send” is selected the page goes to a blank page.

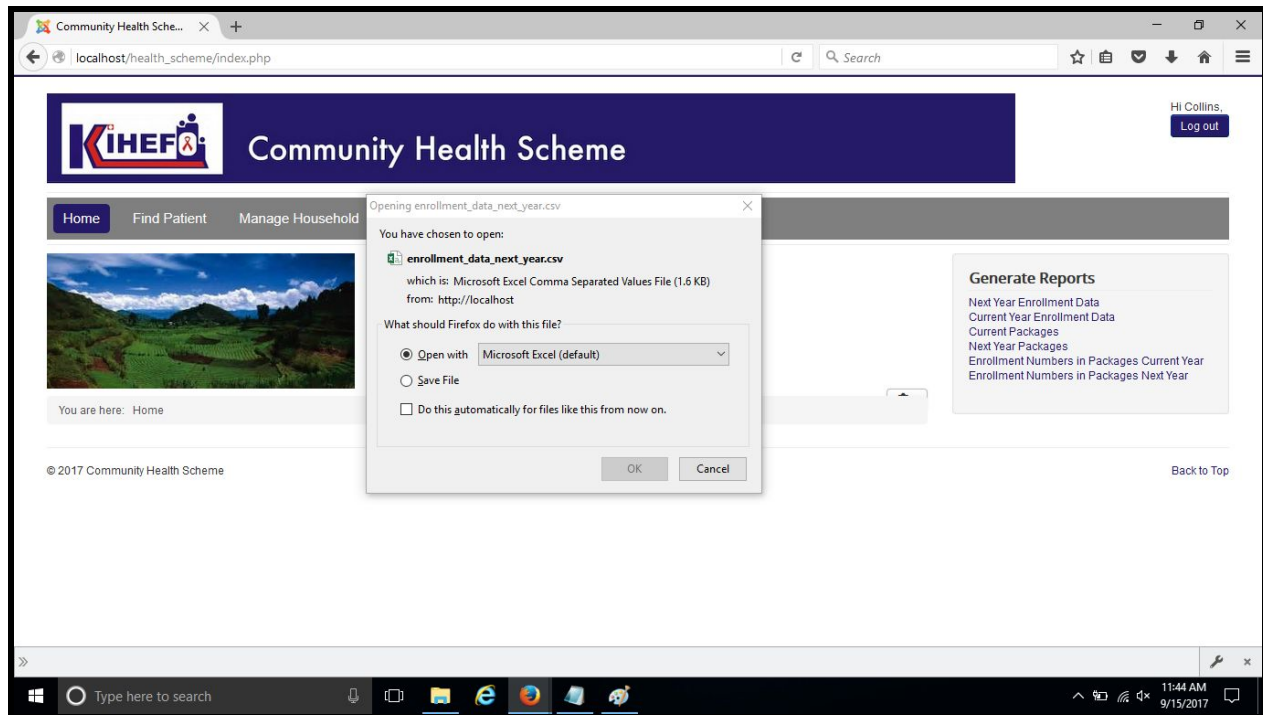


Figure 39: When one of the links is selected within “Generate Reports”, this pop up shows up. The user should select “Open With Microsoft Excel” and then save the report locally on the computer. This will allow KIHEFO to have a paper copy of all necessary information if needed due to power outages, as well as a local copy of historical data of their CBHS. The enrollment data from the reports can also be used to influence package prices for the next year.

6.1.2 Back-End Database

The tables below were designed to easily store, search, and organize the data we would be collecting in our user interface. The table numbers at the top are the table numbers used within our database application. Basic knowledge of database table structure is helpful to understand the following descriptions.

TABLE 1: indiv_bio_info (never changes)					
indiv_id	given_name	surname	dob**	gender	national_id
9346231	Harry	Potter	1990-01-21	M	null
6783231	Arthur	Weasley	1990-01-21	M	
2434577	Ron	Weasley	1990-01-22	M	
8393413	Ginny	Weasley	1990-01-23	F	
7234109	Lord	Voldemort	1990-01-24	M	

Table 5: This table contains all of the individual biographical information that will never change for an individual. The *indiv_id* (Individual ID) is the primary key for this table, and is placed into the database along with given name, surname, date of birth (if known, if not put January 1st as date of birth and year), gender, and national ID if known. All of these columns are not null fields except for the national ID, as everyone may not have this information. The entries can be updated except for Individual ID.

TABLE 2: contract_data (always add a new contract per individual enrolled each year)						
contract_db_id (autoincrement)	indiv_id	household_id	year	pay_date*	pay_method*	package_db_id
0001	6783231	7532	2018	1990-01-21	MTN	18
0002	2434577	7532	2018	1990-01-22	MTN	18
0003	8393413	7532	2018	1990-01-23	MTN	18
0004	9346231	2221	2018	1990-01-24	Bank	16
0005	6783231	7532	2019	NULL	NULL	23
0006	2434577	7532	2019	NULL	NULL	23

Table 6: This table is responsible for organizing the health scheme contract for each individual. Each individual will get a new contract for each year that they enroll in the health scheme. The *contract_db_id* is the primary key, but isn't used for anything else. This means that every year, an individual can change to a different family (different Household ID) but is still be maintained in the system as one individual. Additionally, an individual that doesn't enroll in the scheme for a year will not have a contract for that year, and therefore will not be valid for that year. However, their previous contracts and individual information will still be maintained in the system. This way, KIHEFO can have a historical record of all enrollment data for every year.

Each individual (Individual ID) is also linked to their household (Household ID). If payment for the household has not been made, the default value for pay date and payment method is null. Once paid, these columns will be filled. To check if an individual has a valid scheme membership for a particular year, the database will sort by year, and if the Individual ID is not present in the database for the given year, then the individual is not valid for that year. Additionally, If there is no confirmation of payment (*pay_date* and *pay_method* are NULL) then the individual is invalid. To be valid, the Individual ID must exist for the given year, and the pay date and pay method must both not be null. Using this table, it is possible from the back end to determine if a person is invalid.

TABLE 3: household_bio_info (add new row for each household for each year)										
household_db_id (autoincrement)	household_id	ph_indiv_id	phone	village	parrish	subcounty	county	district	ngozi_group	year
0001	7532	6783231	867-5309	Little Whinging	Surrey	Hamptonshire	Wizardtown	London	Little Whinging	2018

Table 7: This table holds the biographical information for each household. Because families enroll in the scheme by household, we assume that the information contained in this table is the same for everyone in this household. Each year, a new row for a family that is renewing their membership is added along with the year, so that the policyholder can be changed from year to year and there is still a record of these changes.

TABLE 4: packages (new packages each year)					
package_db_id (autoincrement)	package_name	package_price	min_mem	max_mem	year
1	Ambulance (1) 2018	10,000	1	1	2018
2	Ambulance (2) 2018	20,000	2	2	2018
3	Ambulance (3-5) 2018	40,000	3	5	2018
4	Ambulance (6-8) 2018	70,000	6	8	2018
5	Ambulance (9+) 2018	100,000	9	NULL	2018
7	Basic (2) 2018	90,000	2	2	2018
8	Basic (3-5) 2018	120,000	3	5	2018
9	Basic (6-8) 2018	210,000	6	8	2018
10	Basic (9+) 2018	300,00	9	NULL	2018
12	Basic+ (2) 2018	110,000	2	2	2018
13	Basic+ (3-5) 2018	130,000	3	5	2018
14	Basic+ (6-8) 2018	230,000	6	8	2018
15	Basic+ (9+) 2018	320,000	9	NULL	2018
16	Value (1) 2018	60,000	1	1	2018
17	Value (2) 2018	120,000	2	2	2018
18	Value (3-5) 2018	150,000	3	5	2018
19	Value (6-8) 2018	270,000	6	8	2018
20	Value (9+) 2018	390,000	9	NULL	2018
21	Premium (1) 2018	70,000	1	1	2018
22	Premium (2) 2018	140,000	2	2	2018
23	Premium (3-5) 2018	160,000	3	5	2018
24	Premium (6-8) 2018	290,000	6	8	2018
25	Premium (9+) 2018	410,000	9	NULL	2018

Table 8: This table holds all of the package information for all years. Each year, all new packages are added with their price, minimum number of members, maximum number of members, and year. The UI will display only packages valid for the current year. This way, KIHEFO has a historical record of the price and package changes from year to year.

We decided to add entries by year wherever possible, rather than ever remove or update entries from the tables in order to keep a history of all information. The one exception to this is updating contract data entries to mark payment. In addition, we assume that the entries in the individual biographical information table will never be updated or removed. Using the 'WHERE YEAR =

YEAR(CURRENT_TIMESTAMP)' clause in MySQL, we can easily filter the database information by current year. If the database becomes too large and storage room runs out on the server, either the server can be updated or the database can be filtered by year, and past years can be exported as a .csv (comma separated values file format), and deleted from the database.

6.1.3 Webhosting and Equipment Requirements for Database Application

6.1.3.a Background

In designing the database application for the KIHEFO Community Health Scheme, we had two options: an offline version of the application that would be locally hosted on the General Clinic server, and an online version that would be hosted by a web-hosting service and accessible in all locations by Wi-Fi or mobile data.

To ensure the sustainability and utility of the system, we propose that KIHEFO deploys the system as a web-hosted online application. The rationale, requirements, logistics, and cost of system setup and upkeep are detailed below.

Drawbacks of Offline Version

In the offline version of the database application, the General Clinic would be the only place that can digitally enroll patients into the system. No other computers can connect to the server that contains the database. Social workers would take paper enrollment forms into the field, enroll people on paper, return the forms to the General Clinic for information to be inputted by hand into the computer application, print and make identification cards, then return to deliver the cards to the patients and collect payment. This route is by far the less viable option for many reasons:

- Staff would need to visit Outreach locations twice (once to enroll, and once to deliver cards and collect payment)
- Cost of mass printing enrollment forms
- Personnel cost for staff member to input data collected via paper forms in the field into the computer system in the General Clinic
- To look up a patient at an Outreach or a Mobile Clinic, would need to print out all records and carry a hard copy of all enrolled patients into the field
 - Alternatively, worker in the field phone calls a worker in the General Clinic to look up whether a patient has valid membership
 - Looking up whether a patient is valid will take a long time by sorting through paper, and communicating important information over the phone results in miscommunications
- Paper-based systems have collapsed in past experience because data lacks organization and fails to enter data in proper places, or fails to enter data at all (forms lost, forms left not inputted, etc...)

Rationale for Online Version

The online version of the database application would be hosted as a website by a web-hosting service. The web-based database application would be accessible by any device at any location as long as there is Internet access, and enrollment could occur using the two laptops KIHEFO already possesses (in the field) or on the computer in the General Clinic. The advantages of this setup are many:

- No syncing of the database is required as enrollment data would only be entered once and be instantaneously saved into the database hosted by the web-hosting service across any computer
- No need for a KIHEFO staff member to manually re-enter data that has been collected in the field. No loss of information due to paper handling.
- In case of power outage, all system data would be preserved and still accessible by Wi-Fi (e.g. Africell mobile broadband USB Internet sticks on a charged laptop)
- Same database can be edited and accessed in multiple locations at the same time
- Does not require large Wi-Fi footprint outside of the enrollment period
 - Low bandwidth requirement for looking up whether patient is valid
 - No downloading/uploading required for any operations
- Should KIHEFO choose to invest in tablets in the future, a web-based application can be accessible by any kind of device, such as tablets or smartphones

6.1.3.b Equipment and Logistics

Equipment Requirements

The equipment requirements to set up the online web-based database application and make it accessible both in the field as well as in all the KIHEFO clinics are as follows:

Preferred Case:

- Four computers/laptops: one computer in General Clinic, one computer in Maternal Clinic, two field laptops for enrolling in the field or in the clinics
- One router with WiFi connection at General Clinic
- Three mobile broadband USB Internet sticks (e.g. Africell) with adequate data plans for two field laptops and computer at Maternal Clinic
- Back-up electricity generators for power outages in both General and Maternal Clinics

Minimum Case:

- Three computers/laptops: one computer in General Clinic, one laptop in Maternal Clinic, one field laptop
- One router with WiFi connection at General Clinic
- Two mobile broadband USB Internet sticks (e.g. Africell) with adequate data plans for laptops
- Back-up electricity generator for power outages in General Clinic

Logistics and Power Outage Plan

At the end of each enrollment period, a .csv file containing all the enrollment data for the year should be generated and download onto each laptop and computer in case of power outages. The .csv file can be searched offline by Microsoft Excel or printed out in hard copy for use in looking up patients during electricity shortages. In addition, both field laptops should be stored and connected to power in the General Clinic at all times (outside of field trips).

To enroll a household in the field, the two field laptops would be connected to the Internet using the USB Internet sticks. Social workers operating the laptops would navigate to the website hosting the database application in a web browser, login to the system, and directly enroll the patients via the website. If there is no electricity and the laptop batteries are not charged, traveling to the field can be delayed until there is power. To enroll a household or lookup a patient in a clinic, the same process is used except that the computers are connected via the router instead of mobile stick. In case of power outage, the generators should be turned on, or the patient lookups should be done using excel or hard copies of enrollment data.

6.1.3.c Potential Vendors

Web Hosting (vs. Locally Hosting vs. Cloud Hosting)

Web-hosting the database application is the most reliable and sustainable option. Putting our database application online involves: 1) buying and maintaining a domain name and 2) hosting our database on a server (data storage), whether local, on the web, or cloud-based.

Web-hosting the application involves buying space on a web-hosting company's server, which is managed and upkept by the company, making it very reliable. Locally hosting the database application would involve depending entirely on the local server in the General Clinic. In case of power outages (leaving the server without WiFi) and server breakdowns or failures, the whole scheme would be paralyzed. Cloud-hosting is very similar to web-hosting, but is a more powerful and reliable service for very high-traffic and intensive applications, in addition to being more expensive. Since our website will not be a high-traffic site, web-hosting is the most cost-effective and functional option.

Web Hosting & Website Domain Vendor

After much research, we believe that 1&1 (<https://www.1and1.com/>) is the best vendor to host our database application. It is very well rated to host CMS system (like Joomla! which we use) websites, and provides full support for Joomla! on its servers. 1&1 even manages and auto-updates the system (installs the most recent versions). In addition, we are able to buy and maintain the website's domain name as well as the web-hosting subscription through 1&1. Finally, it provides 24/7 service. In Figure 40 the packages offered by 1&1 can be seen.

Full performance scalability!




BASIC	UNLIMITED PLUS Recommended	UNLIMITED PRO
Perfect for dynamic web projects	Ideal for one or several big projects	Ideal for resource intensive web projects or online shops
12 months 7.99 \$0.99 /month ¹ then \$7.99/month	12 months 9.99 \$4.99 /month ² then \$9.99/month	12 months 14.99 \$8.99 /month ³ then \$14.99/month
Continue >	Continue >	Continue >
<ul style="list-style-type: none"> ✓ Scalable Performance - Level 1 included  Up to 2.5 GB RAM 	<ul style="list-style-type: none"> ✓ Scalable Performance - Level 2 included  Up to 6 GB RAM 	<ul style="list-style-type: none"> ✓ Scalable Performance - Level 3 included  Up to 9 GB RAM
✓ 100 GB Storage	✓ Unlimited Storage	✓ Unlimited Storage
✓ 1 Website	✓ Unlimited Websites	✓ Unlimited Websites
✓ 25 Databases (1 GB SSD)	✓ Unlimited Databases (1 GB SSD)	✓ Unlimited Databases (1 GB SSD)
✓ 500 E-mail Accounts	✓ Unlimited E-mail Accounts	✓ Unlimited E-mail Accounts
✓ 1 Domain	✓ 1 Domain	✓ 1 Domain
* Free for the first 12 months (com, net, org, info, biz, website, club, me)	* Free for the first 12 months (com, net, org, info, biz, website, club, me)	* Free for the first 12 months (com, net, org, info, biz, website, club, me)
✓ SSL Certificate	✓ SSL Certificate	✓ SSL Certificate
✓ 24/7 Service Only at 1&1	✓ 24/7 Service Only at 1&1	✓ 24/7 Service Only at 1&1
Continue >	Continue >	Continue >
		<ul style="list-style-type: none"> ✓ SiteLock Basic ✓ CDN with Railgun™
		Continue >

Figure 40: A description of the three web-hosting packages offered by 1&1

We believe that the BASIC membership fully satisfies KIHEFO's needs at a low price (\$7.99/month). We believe that 100GB of data storage is enough for KIHEFO's CBHS, and the membership comes with one domain name (an additional \$19.99/year), which is required for our database application. In the event that KIHEFO needs more data storage room, the membership can be upgraded to UNLIMITED PLUS.

Hardware & Data Plans Vendor

As suggested above, KIHEFO must buy and maintain a set of laptops, computers, mobile data sticks, WiFi routers, and data plans in order to ensure that every computer has internet as reliably as possible. Please refer to the Equipment Requirements section above for more details on recommended equipment that KIHEFO must buy and/or maintain.

We believe that the Africell mobile data internet sticks and mobile plans are the most cost-effective and readily available option for providing internet to laptops for outreaches and the computer in the Maternal Health Clinic. A mobile data router with a mobile plan would be most effective in the General Clinic, as this is our main homebase. Africell provides 4G coverage. We hope that pricing can be further improved if a business relationship is set up between Africell and KIHEFO. If better or faster internet is required, Smile Uganda provides 4G/LTE service, but is more expensive. Please check <https://smile.co.ug/data-bundles/> for pricing information.

Validity	Amount (UGX)	Data Volume
Weekly	1,750	50 MB
	2,500	80 MB
	5,500	200 MB
	21,900	800 MB
Monthly	1,450	25 MB
	4,400	100 MB
	4,900	125 MB
	9,750	250 MB
	13,500	350 MB
	19,500	500 MB
	34,500	1 GB
	44,500	1.5 GB
	49,850	2 GB
	59,500	3 GB
	75,000	3.5 GB
	89,000	5 GB
	104,000	7 GB New Bundle
	124,850	10 GB
	199,000	15 GB New Bundle
	210,000	20 GB New Bundle
	284,900	30 GB
315,000	40 GB New Bundle	
330,000	50 GB New Bundle	
430,000	80 GB New Bundle	
480,000	100 GB New Bundle	

3 Months	45,000	1 GB
	50,000	1.5 GB
	64,900	2 GB
	77,500	3 GB
	116,500	5 GB
	129,000	6.5 GB
	160,000	10 GB
	300,000	20 GB
	370,000	30 GB
	600,000	45 GB
6 Months	500,000	30 GB
12 Months	900,000	100 GB

Figure 41: Price list of Africell data packages


Activity	volume of data estimate (1MB = 1024KB)
100 emails without an attachment	1MB
3 emails with an attachment	1MB
1 email with 3 photo attachments	1 MB
1 hour spent chatting online	1 MB
1 hour web browsing	20MB
downloading one 3-minute MP3	4MB
1 minute whatsapp call	1 MB

Figure 42: Volume of data estimate from Africell

We estimate that each device (laptop, computer) will use basic web browsing to access the database application for a total of 1 hour a day on average. This translates to (5 hours/week x 4 weeks/month) 20 hours a month. Based on Figure 42, this means that each device would require ~400MB/month on average. We expect that enrollment periods will require more data, and slower months will require less, hence the average estimate. Therefore, the data required may be lower or potentially higher than the estimate and will vary over time, but KIHEFO can pay for data as it is used. Based on this estimate, we recommend the 1.5GB/3 months package (400MB/month x 3 months = 1.2GB/3 months) as shown in Figure 41, to be renewed as needed (assume every 3 months) on all devices.


We also recommend the Africell 4G MiFi Router to use in the General Clinic with an Africell mobile data plan. This is the most cost-effective router that provides 4G functionality, and allows up to 10 devices to be connected.

Routers




Alcatel OneTouch Link 3G MiFi Router
~~124,000/-~~ **118,000/-**
 + 3.5GB data for 1 month

- 3G HSPA+ up to 21Mbps
- Connects Up to 10 devices
- 1500mAh battery



Africell 4G MiFi Router
149,000/-
 + FREE 5GB Valid for a Month

- Seamlessly connects to 4G LTE & 3G when in given coverage area
- 4G LTE up to 150Mbps
- Connects Up to 10 devices
- 2050mAh battery



D-link DWR-921 4G LTE Router
~~360,000/-~~ **275,000/-**
 + FREE 5GB Valid for a month

- Seamlessly connects to 4G LTE & 3G when in given coverage area
- 4G Internet speeds up to 150Mbps
- Upto 32 users via WiFi
- 4 LAN ports
- Supported operating systems: Windows XP/Vista/Win7/Win8/Win10, MacOS, Linux

Figure 43: Available Africell routers for the General Clinic

6.1.3.d Budget

For detailed explanation of the choices expressed in the budget below in Table 9, please read the Cost Estimates and Potential Vendors section entirely. This budget represents the ideal scenario (3 devices with 3 mobile sticks and a MiFi router in General Clinic). However, the budget can change based on KIHEFO's budget limitations (ie. only get 2 mobile sticks or supply less data to each stick per month). The excel document containing the budget is included in this folder.

	Description	Vendor	Qty.	First Year		Every Subsequent Year	
				Startup Cost	First Year	Per Month	Per Year
Web-hosting**	Web-hosting the database application	www.1&1.com	1	0	12	8	96
Domain Name**	Buying the website domain name	www.1&1.com	1	0	0	0	20
Mobile Data Sticks*	WiFi to the field laptops and Maternal Clinic	Africell	3	0	0	0	0
Mobile Data Router	Router for WiFi in General Clinic	Africell 4G MiFi Router	1	41			
Data Plans	1.5GB/3 months plan - see Hardware & Data Plans Vendor section for more details.	Africell	4	0	222	19	222
TOTAL (dollars)				41	234		338
\$1=3600 Shillings *Stanford will be leaving 3 mobile sticks with KIHEFO, hence no cost (\$75) **Possible that Stanford can pay for the 1st year							

Table 9: The initial budget proposed to web-host the database application and provide WiFi to all clinics

Because of this web-hosted system, in the future, KIHEFO could buy tablets and/or smartphones that will easily be able to access the healthcare scheme website as an app.

6.1.4 Training and Future Management of Database

To help train KIHEFO staff on our system after we leave, we created a training manual for our database application and the functions within it and this is discussed more in 6.2.2.c. At the end of our project, we also briefed Collins, who will be the main manager and IT support of the database application once the current project is done. Collins worked with us throughout the creation of the database application, and he has a great understanding of the end product. At the end of the project each group briefed Collins about the more detailed features of the design, like where a specific piece of PHP code is, so he would be able to easily maintain, improve, and adjust the system. The major administrative duties left for the future are adding users, specifying the privileges for those users, and making the system accessible on other computers, either through a web host or a local server, as well as troubleshooting.

6.1.4.a Task List to Begin New Enrollment Period

When the time comes to begin a new enrollment period for the next year (for example, if it is October 2018 and KIHEFO would like to begin accepting enrollments for 2019 plans), a series of events in the system need to occur.

To add new packages:

1. Administrator navigates to Input New Packages tab and inputs new packages for the next year. Package information is saved to the database table called “packages” with price, minimum number of members, maximum number of members, and year.
2. Once the administrator inputs new packages, the “Select package” section of the “Enroll / Renew Household” tab will be populated with the new package.

End of enrollment period action items:

1. Administrator should use the Generate Reports menu to generate .csv files of all database tables to save as a backup on all computers (saved locally).

6.2 Organizational Integration

6.2.1 Required Equipment & Acquisition Plan

In order to fulfill our goal of beginning to enroll people by our last week on-site, we began investigating ways to sustainably produce and design Individual ID cards and household receipts. Below, we have organized several options that were verified by several stationary/printing shops in the Kabale downtown area. The most expensive option is to print colored traditional ID cards at 7,000 UGX each while the least expensive (sustainable option)

would be to “laminare” black and white copies of the cards using clear tape at 74 UGX each (nearly a 100x difference). Clearly, the final decision will be up to KIHEFO to weigh all of the different options and determining if it is in their best interest to invest in some of this equipment or build partnerships with printing services in town and utilize their expertise.

6.2.1.a Costs for Making KIHEFO Health Scheme Cards

Option Name	Description	Color vs. B+W	Cost per sheet (UGX)	Cost per card (UGX)	Cost for 100 people (UGX)
**Plastic ID Cards	Traditional plastic ID cards	Color	--	7,000	700,000 (\$194)
Paper Cut-Outs	Single sheet contains 5 cards	Color	600	120	12,000 (\$3.36)
""	...if 2-sided, could be 10	B+W	300	60	6,000 (\$1.68)
Clear Tape + Paper	Assume tape is 4" x 200'	Color	70 + 600	134	13,400 (\$3.75)
** ""		B+W	70 +300	74	7,400 (\$2.07)
Laminating + Paper	Normal 1500, 1000 if bulk	Color	1,000+600	320	32,000 (\$8.96)
""		B+W	1,000+300	260	26,000 (\$7.28)
Plastic Card Sleeves	Cards go in individual sleeve	Color	10,000+600	2,000+120	21,200 (\$5.94)
""		B+W	10,000+300	2,000+60	20,600 (\$5.77)

Table 10: Associated Costs for CBHS Card Methods

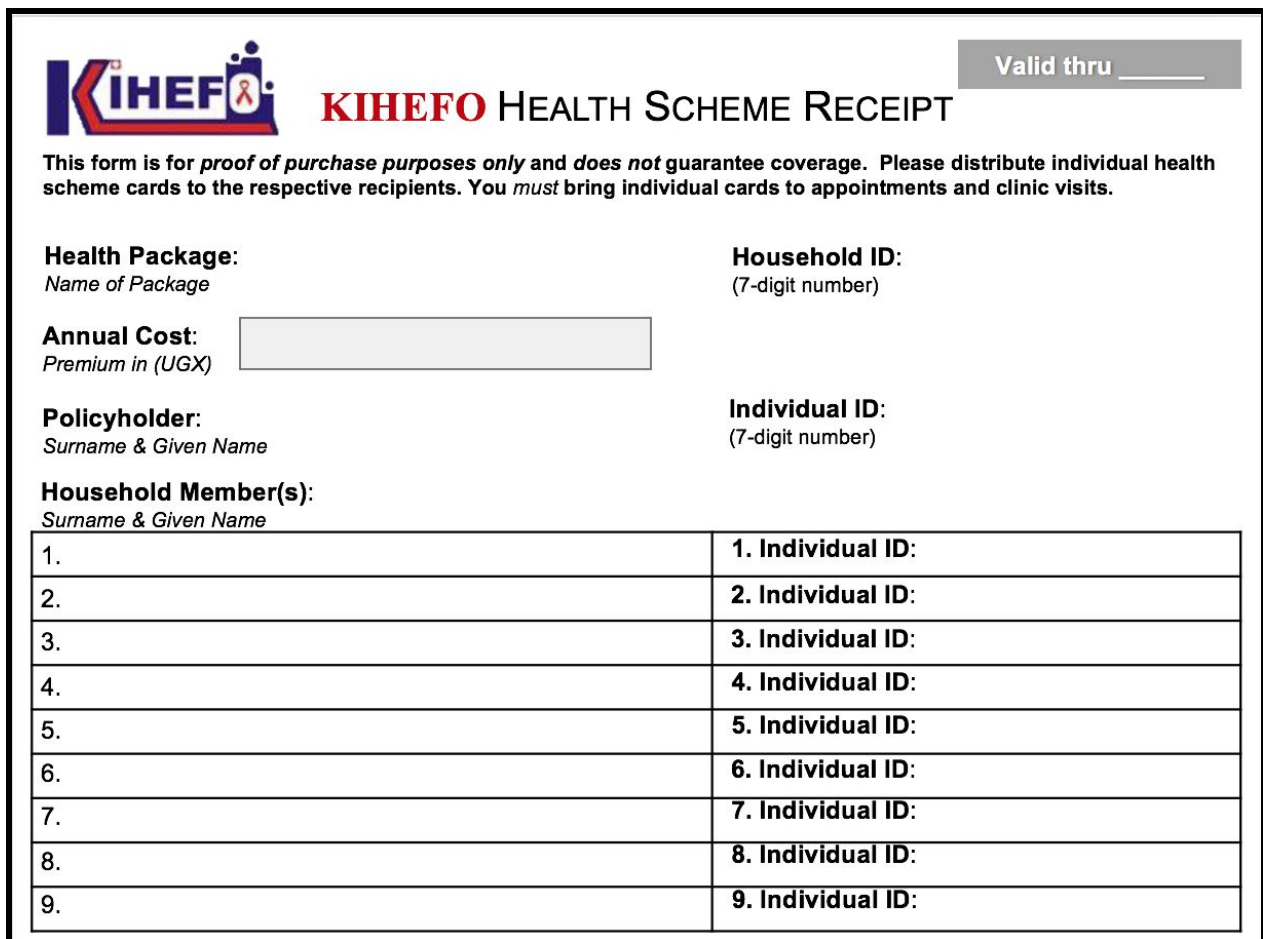
Given the multitude of locally sustainable ways there are to produce the card, the team also explored options for potential design layouts. Below is an example KIHEFO Community-Based Health Scheme Card that will be given to enrollees in the program. Each person covered under the Community-Based Health Scheme will be given an Individual ID that will not change and that information (along with other personal identifiers that most likely would not change) will be included on the card the enrollees will keep throughout their enrollment within the Community-Based Health Scheme. Information included on the card is: The person’s full name, Individual ID, Year of Birth, and Sex. Each card will also be signed by the Policyholder to ensure validity of the card. On the back of the card, are areas of resources for more information in case the enrollees have questions or want to follow-up about their coverage and what services/medicines they will have access to.

 KIHEFO HEALTH SCHEME CARD		 Joined 2017
Surname:		<p>This card is for <i>identification purposes only</i> and does not guarantee coverage. To verify benefits or ask questions, call a KIHEFO Health Agent.</p> <p>For Members www.kihefo.org 0486-435-347</p> <p>Mobile Money MTN and airtel: TBD</p> <p>Medical Claims P.O. Box 1127 Kabale, Uganda</p> <p>Email: kihefo@kihefo.org or visit us at Kabale Office: Plot 16 Kigongi Road</p>
Given Name:		
Individual ID:		
Household ID:		
Date of Birth:	Gender: M or F	

Figure 44: Front (left) and back (right) of the individual health scheme cards used to identify enrolled participants

6.2.1.b Receipts

Multiple stages of the enrollment process and providing care throughout the year will require receipts. Additionally, the team decided to create a Community-Based Health Scheme receipt that would include all pertinent information to the enrolled household and the plan the Policyholder chose. On the form below, a KIHEFO social worker would fill out this form twice (one is an office copy and the other is for the client). This receipt would be given on an annual basis as additional members in a household are added, people covered under the policy may choose to unenroll or enroll themselves, and price points for different plans change year to year. This form will include information for every enrollee under a household's plan including Individual IDs and the Household ID in case of lost Individual ID cards.



The form is titled "KIHEFO HEALTH SCHEME RECEIPT" and includes a logo for KIHEFO on the left. A "Valid thru" field is located in the top right corner. Below the title, a disclaimer states: "This form is for proof of purchase purposes only and does not guarantee coverage. Please distribute individual health scheme cards to the respective recipients. You must bring individual cards to appointments and clinic visits." The form contains several input fields: "Health Package: Name of Package", "Annual Cost: Premium in (UGX)", "Policyholder: Surname & Given Name", "Household ID: (7-digit number)", and "Individual ID: (7-digit number)". At the bottom, there is a table with 9 rows, each with a number (1-9) in the first column and a corresponding "Individual ID:" label in the second column.

1.	1. Individual ID:
2.	2. Individual ID:
3.	3. Individual ID:
4.	4. Individual ID:
5.	5. Individual ID:
6.	6. Individual ID:
7.	7. Individual ID:
8.	8. Individual ID:
9.	9. Individual ID:

Figure 45: Health scheme receipt that includes household information and individual information. This will be an annual document that is subject to change year to year.

6.2.2 Training

To ensure the system runs smoothly, multiple trainings were completed. Each training had a specific target audience and specific goal. Below details the various trainings.

6.2.2.a Community Health Scheme and Financial Model Training

This training was conducted for all of the social workers and all other available KIHEFO staff. The training was given based on the following outline and was aided with the training handout in the *Appendix (9.3.3)*, flyer in the *Appendix (9.3.2)*, and pamphlet in the *Appendix (9.3.1)*.

- Introduction
 - Community-Based Health Scheme Creation Team
 - KIHEFO has been working on setting up a scheme for the past 3 years to help secure KIHEFO's financial stability in case of lack of funding
 - A Stanford team has helped develop the logistics of a community health scheme, an enrollment system, and an implementation plan
 - Social Workers
 - Name
 - General roles and responsibilities
- Community-Based Health Schemes versus Insurance
 - We are looking for a nonprofit system that will break even in providing care for the people of Kigali compared to insurance that provides care while making a profit
 - Structured to be ideal for families and incentivize families to join
- Our Family Structure
 - We are really invested in getting coverage for everyone and a great way to do this is via family packages
 - We offer packages that encompass various family sizes to reduce the price and have incentives to enroll the entire family
 - We do have options for individuals as well because we want to make sure that anyone who wants coverage can enroll
- Base Numbers
 - Inpatient 30,000 UGX
 - Outpatient 60,000 UGX
 - Pregnancy 60,000 UGX
 - Ambulance 10,000 UGX
- Tables
 - Table showing family pricing versus individual pricing
 - This table was generated based on the fact that we believe not all family members will get sick so we made approximations for how many members will get sick to calculate reasonable prices

- A community scheme ensures that the entire community has coverage and in doing this, it is understood that some community members will use the system more and some will use the system less
- Kigali has a very high fertility and maternal/infant mortality rate, therefore, including pregnancy in all packages ensures that anyone who gets pregnant has the recommended care that will in turn hopefully lower the mortality rate
- Explain Financial Sustainability
 - Currently, our model is a pilot program that will be employed this next year. Using data from this pilot year, we can calculate premium changes for subsequent years.
 - The main thing we will track to create new premiums is the expenses that KIHEFO incurs. These expenses will be able to account for wrong assumptions, actual patient uses, and inflation.
 - In order to keep track of these expenses, we have developed a tracking system that includes a claim process and a tracking spreadsheet. The cashier is responsible for ensuring that all patients complete a claim form with their treatment and then a KIHEFO staff member will be in charge of inputting the services in a tracking spreadsheet
- Enrollment System
 - We have also created a custom enrollment and tracking system
 - This system will be briefed later this week and then we will enroll individuals later this week as well
- Questions

6.2.2.a.a Community Health Scheme Training Feedback

Judith, the KIHEFO assistant accountant, and Lillian, a member of the finance team and Dr. G's daughter, gave a recommendation of how to pitch the insurance system to families. "KIHEFO is starting a new thing called a healthcare scheme. It is a similar idea to a Ngozi group. You put money into the system and then you will get health care services out of the system. At the beginning of each year, you will pay a one-time fee, and then for the rest of the year all healthcare services that are part of the package you chose will be free for every single member of the your family whenever you want or need to use them. After you pay at the beginning of the year, you do not have to pay again for the entire year. We know sometimes if someone in your family gets very sick, health costs are often too high for your family to pay. If you join the insurance scheme, you pay the one-time fee at the beginning of the year and then no matter how sick anyone gets, they can get whatever care they need and your family will not have to suffer because you cannot pay for their health services. We made family plans so that your entire family pays one price and everyone is covered and it is much cheaper than paying for each member of your family individually."

Judith and Lillian expressed concern that families will not understand the purpose or benefit of the insurance scheme and so it must be explained in a very straightforward way, like above. Families may be turned off by the initial shock of the high yearly prices, so it would be important

to show them what that breaks down to monthly, so that they understand how cheap it is in comparison to normal health fees.

The feedback from Judith and Lillian was used to update the training handout sheets, again shown in the *Appendix (9.3)*.

6.2.2.b Price Forecasting

These notes were written with the intention of having Judith the account, or other KIHEFO employees, continue to train future staff to figure out pricing options for the future year.

Overview:

This document is an estimate of all of the money coming in and out of KIHEFO. We used this to figure out our pricing options for each package and made a simple 4-step process to update the new prices for each year.

Steps:

- **Step 1:** Press the “Update Enrollee Information” Button. The *NUMBERS* Chart and the *Expenses* Box should be highlighted.
- **Step 2:** As explained by the instructions that should appear, fill out the chart with the number of households who purchased each size and package option for the past year.
- **Step 3:** As explained by the instructions that should appear, fill out the *Expenses* box with the total costs KIHEFO had for the past year.
- **Step 4:** Press the “See New Prices” Button. The *PRICES* Chart should be highlighted with all of the new prices.

Tab Explanations:

- **Summary:** Shows all of the cash coming into KIHEFO during the year, coming out of KIHEFO during the year, and the amount of cash KIHEFO has left over at the end of each year.
- **Patient Volume:** Estimates the number of people who will need care in different categories and the number of visits they will have in different categories.
- **Revenue Details:** Estimates the cost for each type of visit for KIHEFO and the total cost for KIHEFO’s services per year.
- **Cost Detail FTEs:** Estimates how much it will cost KIHEFO to pay all of their full time employees per year.
- **Cost Detail Supplies & Other:** Estimates how much it will cost KIHEFO to pay for all clinic supplies, utilities, community mobilization, and equipment maintenance.

6.2.2.b.a Price Forecasting Training Feedback

The KIHEFO Yearly Price Update Sheet was also explained to Judith and Lillian. They understood the simple 4-step price update buttons very well. The rest of the tabs were also

explained to them, but they did not seem to understand all of the details and it seems like it would be best for them to just use the price update buttons and left the rest alone.

6.2.2.c Database Application and Enrollment

We used the completed database application to create a step-by-step training laying out how to work with the software to interact with the health scheme. We placed boxes on screenshots of the UI with corresponding numbers to the step in the training manual. We showed the steps to logging in, enroll or renew an existing household, find a patient record, manage a household, and the additional administrative options. We also included enrollment materials like the health scheme cards and receipts for the insurance. This enrollment training manual is attached to this document and can be referred to as needed (*Appendix 9.4.8*).

6.2.2.c.a Database Application and Enrollment Feedback

The initial training session conducted at the beginning of week five resulted in highly variant levels of understanding of the scheme structure. As a result, scheme structure and enrollment training later in week five was highly individualized - one Stanford team member talked to one KIHEFO staff member on an individual basis to limit miscommunications and give personalized training. The staff member was first training on the scheme in general and package structure (Figure 46) and then was trained on the UI after (Figure 47). Having personalized training was important as it allowed the staff member to feel comfortable enough to ask questions. This method was successful on multiple fronts, most especially on achieving higher levels of understanding of the new health scheme system and user procedures for the UI for the database application and in revealing small errors and gaps in the training materials and small bugs in the database application.

The major questions asked that we added answers to in our training materials for the future were:

- What is the age cutoff for dependents?
- Can different family members enroll in different packages?
- Can people pay in multiple installments?
- What if no one uses the services?
- Does KIHEFO staff get free services for their family?
- Is there a limit to how many times a person can be seen in a year?



Figure 46: The general scheme and package training done one on one with KIHEFO staff

For the UI part of the training it was done so the KIHEFO worker could walk through the UI with the training manual we created. While walking through the enrollment, confirmation of payment, and looking up of patients and households within our database application with the KIHEFO workers we were able to see how the system worked and in what ways it could be improved. We compiled a list of database application improvements that we were able to change and the ones we were not able to change we placed into future works:

- Fixed wording on application so it matches on receipts and insurance cards
- Made wording consistent throughout application
- Added in more descriptions on text fields to make more user friendly and for better understanding
- Changed some fields so they were not required because people in training did not always know their county, sub county, and parish
- Made fields and dropdown menus more intuitive for user



Figure 47: The database application computer training done after general scheme training. Also, done in small groups.

6.2.2.d Organizational Integration

There are two main sources of training for the organizational integration: the cashier and reception. All of these trainings happened on a 1:1 basis with the hopes that the current staff would train future staff. The cashier was shown the CBHS claim form (see *Appendix 9.4.11*) and the excel spreadsheet that tracks the information from claim forms (see *Appendix 9.4.9*). While talking to the cashier she suggested the claim form be in a carbon copy booklet so that KIHEFO staff would not need to fill forms twice. The team contacted Martin to acquire a copy before the health scheme starts (January 1). Using this method, both KIHEFO and the patient would have records of what the health scheme paid for. It was recommended that the cashier update the tracking spreadsheet daily and give monthly reports to the accountant (Martin). The accountant would use these reports to calculate the yearly expenses for future price forecasting. To update the excel spreadsheet, the cashier should add the quantity to the current count number for each procedure, tablet, injection, syrup, or lab test completed. This will automatically update the total spent on that item and the total spent for that spreadsheet. The different tabs and the spreadsheet table features were explained as well as how to add new rows to the table to the cashier. It is expected that all services, prescriptions, and tests will be tracked. Price changes should be tracked by adding additional rows to the current tables reflecting the new prices.

Reception training--receiving patients, checking their health scheme membership status, and recording services and expenses accumulated during patient visits--was done through the health scheme structure and software training and through integrating the workflow charts (*Section 6.2.3.a*) into each clinic that will receive patients with KIHEFO - CBHS coverage. Much of this was done with the help of Alison and will continue after our departure. A checklist of needed tasks to tie up loose ends has been created and will be left with Alison and Peter, two of the most reliable and accessible people at KIHEFO.

6.2.3 User Procedure

The following sections describe the workflow of the various clinics that will interact with the health scheme as well as the health scheme enrollment process.

6.2.3.a Workflow at the General Clinic

1. Receptionist
 - a. Has computer to check health scheme status and list doctor fees
 - i. If power is out, printed copies are available based on Individual ID number and health scheme member name
 - ii. Queues patients (first come, first serve basis)
2. Doctor
 - a. Initial diagnosis
3. Cashier
 - a. Uses health scheme coverage to negotiate further services
 - b. Health scheme claim filing (if using the health scheme) or billing
4. Lab (if necessary)
 - a. Doctor provides additional diagnosis
5. Cashier (if necessary)
 - a. If prescriptions are required, additional health scheme claim filing (if using health scheme) or billing
6. Pharmacy (if necessary)
 - a. Collect prescriptions

At a predetermined interval of time, the different services and prescriptions provided with and without health scheme should be tallied as well as the health scheme claims filed and fees collected. A new workflow chart for the General Clinic including the health scheme is in Figure 48 below.

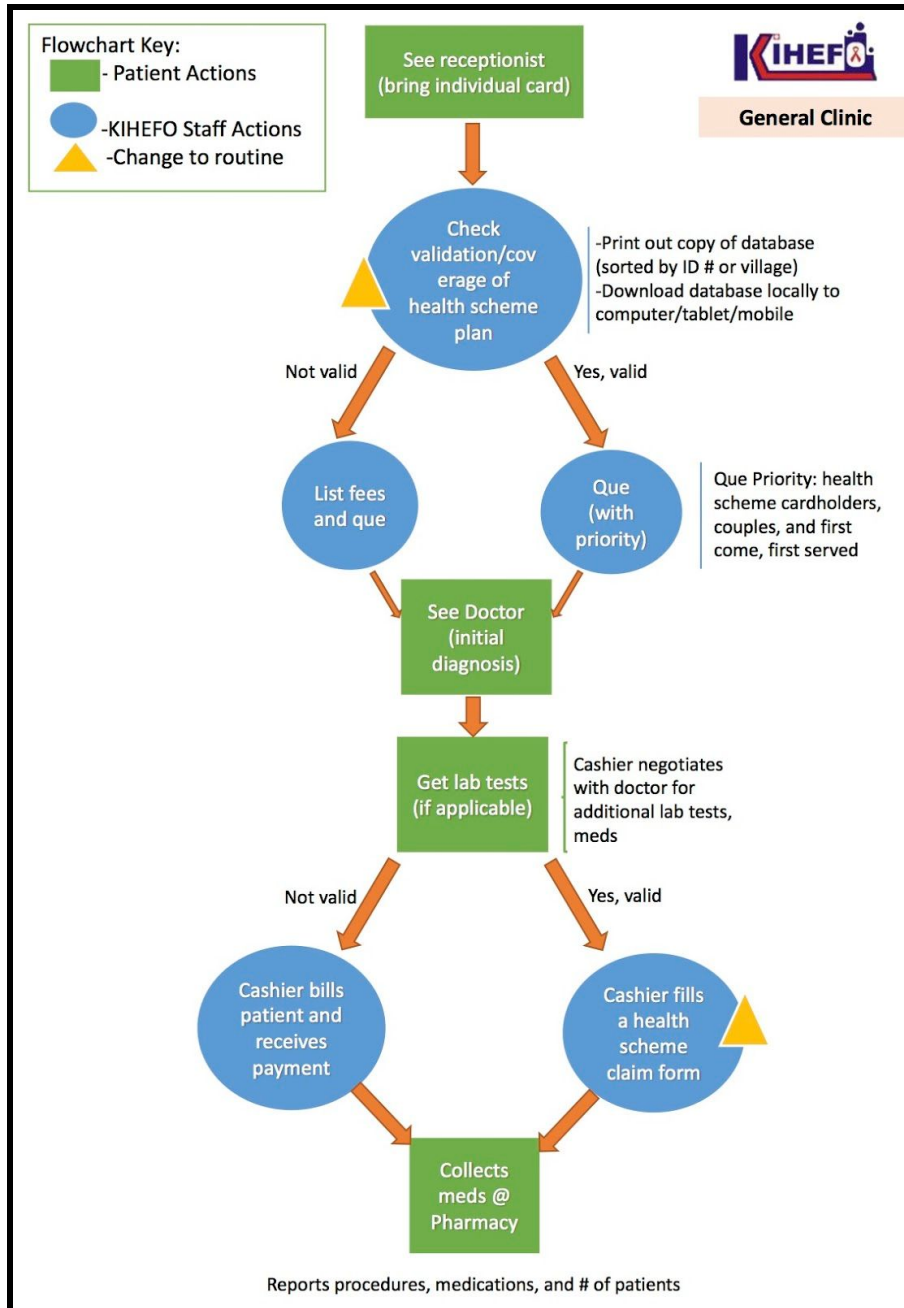


Figure 48: New workflow for the General Clinic which includes checking of health scheme coverage.

6.2.3.b Workflow at the Maternal Clinic

1. Receptionist

- a. Has computer to check health scheme membership and list doctor fees
 - i. If power is out, printed copies are available based on Individual ID and health scheme member name

- b. Queues patients (based on health scheme membership, spouse's presence, and first come, first served basis)
- 2. Midwife
 - a. Exam
 - i. Initial diagnosis
 - b. Lab (if necessary)
 - i. Midwives provides additional diagnosis
 - c. Scans (if necessary)
 - i. Technician provides additional diagnosis
- 3. Runner
 - a. Collects health scheme claims files (if using health scheme) or fees
 - b. Takes claims and fees to the cashier at General Clinic(if necessary)
 - c. Picks up medicine from pharmacy and returns to Maternal Clinic (if necessary)

At a predetermined interval of time, the different services and prescriptions provided with and without health scheme coverage should be tallied as well as the health scheme claims filed and fees collected. A new workflow chart including the health scheme is in Figure 49 below.

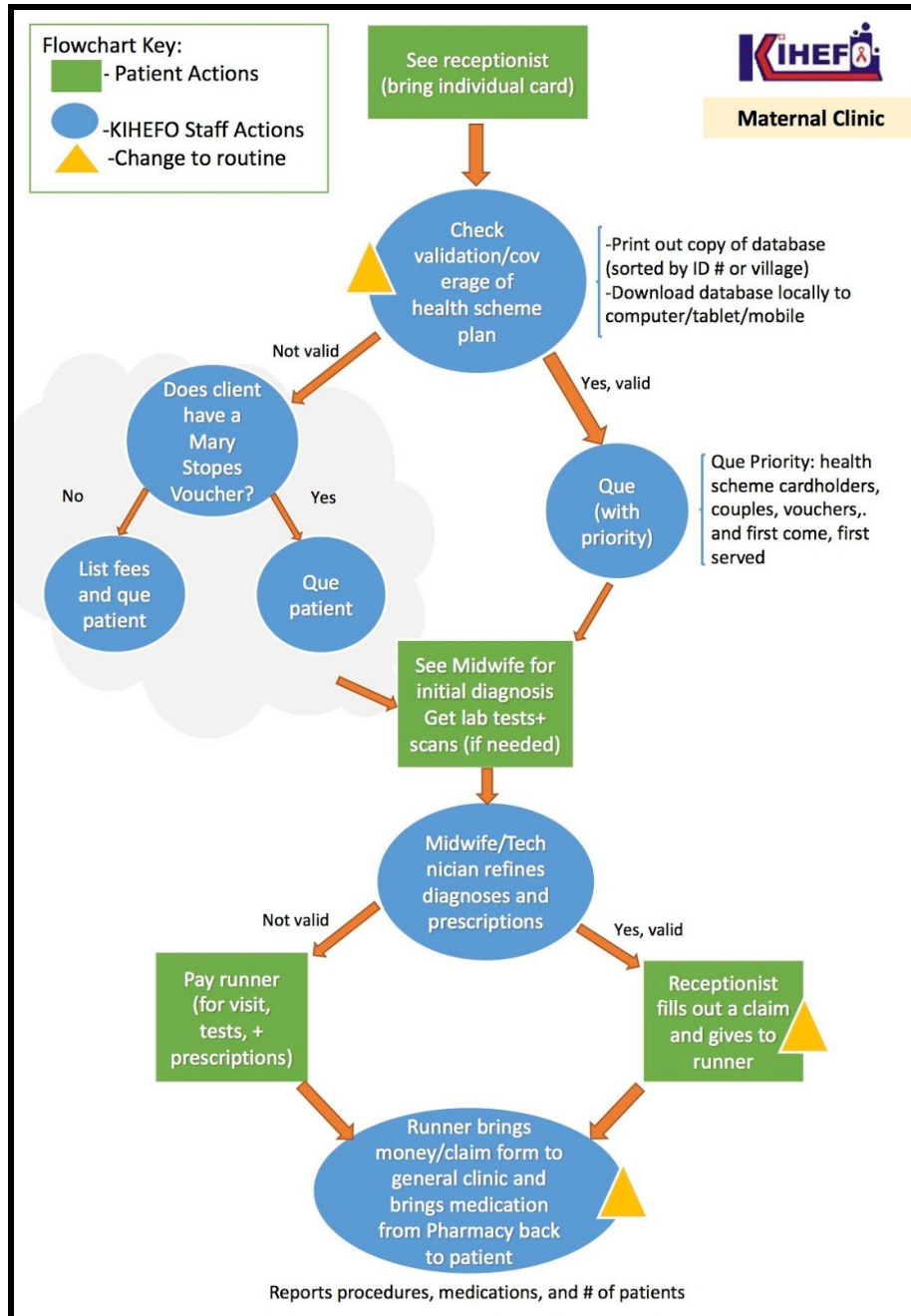


Figure 49: New workflow for the maternal clinic that incorporates the new health scheme and checking of validation of coverage.

6.2.3.c Workflow at the Mobile Clinic

1. Receptionist
 - a. Has computer to check health scheme status and list doctor fees
 - i. If power is out, printed copies are available based on Individual ID and health scheme member name

- b. Queues patients (based on health scheme membership, spouse's presence, and then first come, first serve basis)
2. Doctor
 - a. Initial diagnosis
3. Lab (if necessary)
 - a. Doctor provides additional diagnosis
4. Cashier
 - a. Health scheme claim filing (if using health scheme) or billing
5. Pharmacy (if necessary)
 - a. Collect prescriptions

At the end of the event, the different services and prescriptions provided with and without health scheme coverage should be tallied as well as the health scheme claims filed and fees collected. A workflow procedure is included below in Figure 50 for the Mobile Clinics.

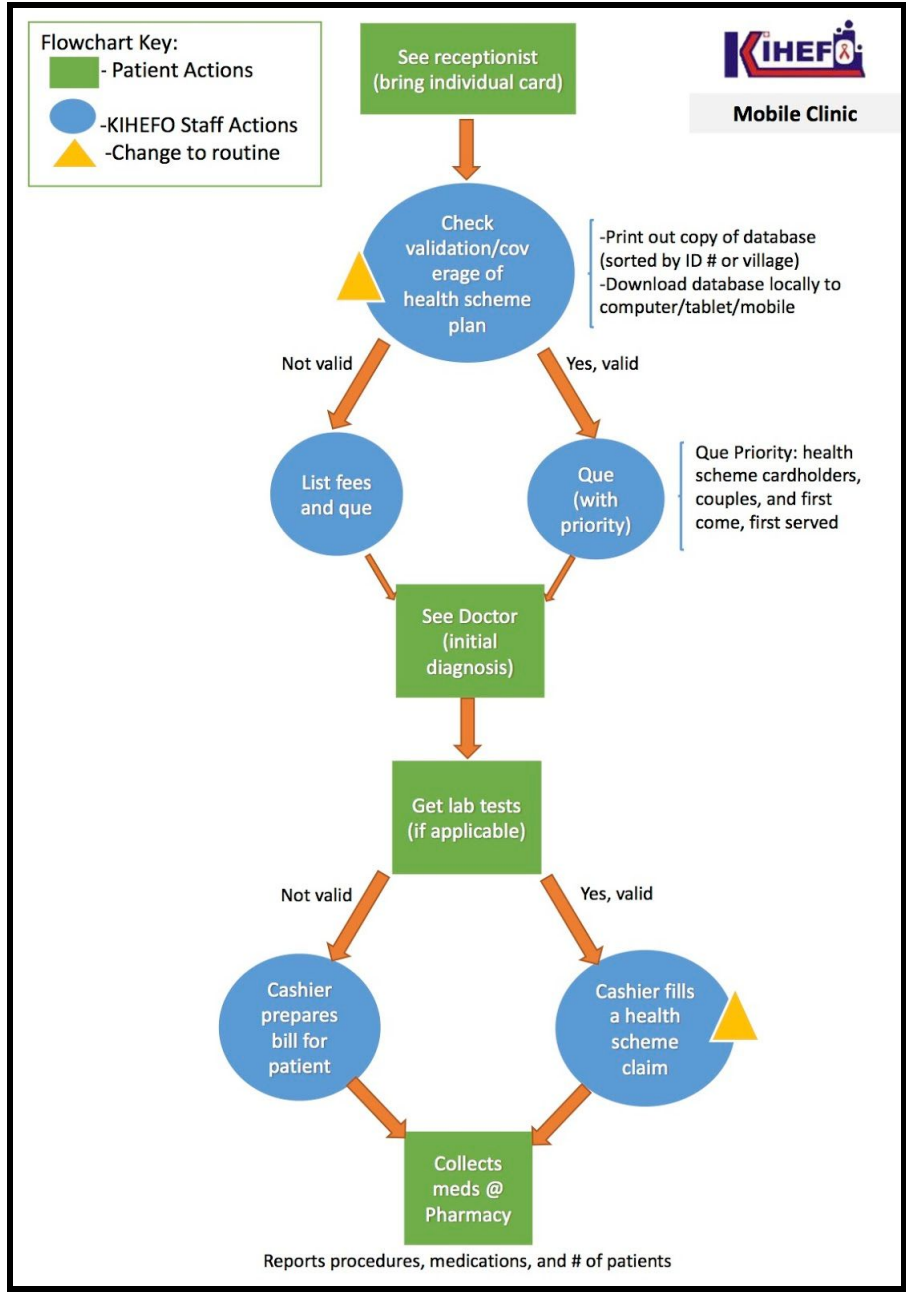


Figure 50: Workflow for the Mobile Clinics including checking of coverage through health scheme.

6.2.3.d The Enrollment Procedure

1. Information Rollout
 - a. Radio informational shows/interviews
 - b. Ads
 - c. Pamphlets
 - d. Church and Parish announcements
2. Enrollment Event

- a. Brief informational session for lingering questions
- b. Enroll KIHEFO health scheme representative
 - i. Receive health scheme card
- c. Pay
 - i. Cash – receive receipt
 - ii. Mobile Money – before January 1st for timely activation

Finally, in terms of personnel, we suggest that KIHEFO uses a mix of existing staff and hiring additional help. Table 11 is the proposed personnel needed to sustain the Community-Based Health Scheme.

ROLE	RESPONSIBILITIES	WHO
<p style="text-align: center;">Medical Team</p> <ul style="list-style-type: none"> - Medical Officer - Clinical Officer - Midwives - Nurses - Laboratory Technician - Dental Officer 	<ul style="list-style-type: none"> - Collect patient information - Patient diagnosis and treatments - Patient record keeping - Patient education - Community education - Social marketing of the program 	<p>Use existing staff</p>
<p>Systems Administrator/IT</p>	<ul style="list-style-type: none"> - Input outstanding data into the system (in case of power outages) - Maintenance of the system - Yearly data processing - Staff training on systems usage/data entry - Use administration (setup & account maintenance) - Quickly arrange for hardware repair if any failures - Monitor system performance - Create backup & recovery policy - Setup security policies for users - Password and identity management - Monitor network communication - System updates and improvements - Future admin/IT training 	<p>Use Collins and Hakim to start but should recruit a full time member</p>

Cashier	<ul style="list-style-type: none"> - Conduct MTN payment checks - Collect payment - Verify policy payment on the system - Issue and maintain claim forms and tracker - Prepare financial statements and reports 	Use existing staff
Social Workers	<ul style="list-style-type: none"> - Community awareness creation and execution - Social marketing of the program - Counseling support at enrollment events - Patients' education - Community mobilization - Policy enrollment 	Use existing staff but plan to acquire more
Drivers	<ul style="list-style-type: none"> - Drive team to all locations of the Mobile Clinics - Drive the ambulance 	Use existing staff

Table 11: Personnel needed to sustain Community-Based Health Scheme

6.3 Financial Model

6.3.1 Assumptions

Assumptions outlined in *Design Development section 5.3.1* are unchanged in the final version of the financial model. An updated census (the most recent census data available that was used in the development of the financial model was from 2014) could be used in future years to make adjustments to the financial model based on updated population demographics of the Kigezi region as KIHEFO Community-Based Health Scheme grows and more people join.

6.3.2 Scheme Packages

Based on feedback from Peter, Dr. G., and Alison, the pricing structure for the packages proposed in *Design Development section 5.3.2* in Table 1 and Table 2 is unchanged. Some changes involving the phrasing used to explain the package structure, such as referring to children or young people on a policyholder's family plan as "dependents" rather than "children," was suggested by Peter. Alison asked many questions about how the pricing structure was made, and this resulted in an updated and reformatted training plan and handout for the social workers, which can be found in *Design Specifications section 6.2.2.a*.

6.3.3 Financial Sustainability

Though most aspects of the financial sustainability analysis outlined in *Design Development section 5.3.3* are unchanged, new features were added to the Excel financial model to make it easier for Judith, the accountant, to make package premium price changes at the beginning of each year using updated health scheme information from the previous year. The prices for services and projected costs for each type of coverage were borrowed from KIHEFO's original 2011 Financial Model, just as they were in the version outlined in the Design Development section. Updated prices for pregnancies and births were collected from Sylvia, Dr. G's wife, and incorporated into the new model. These showed an increase in costs from the 2011 model, so it is assumed that the other costs listed in the current financial model may also be underestimated.

In order to calculate the suggested prices for next year, we updated our modeled based on the previous years enrollment and expenses. The first step was to make an equation based on the unit value of care, the family size-dependent package assumptions, and the percent enrollment in each family - size dependent package. To define the unit value of care, we considered Dr. G's initially presented values (outpatient: 30,000 UGX, inpatient: 60,000 UGX, pregnancy: 60,000 UGX and ambulance: 10,000 UGX) to create the unit value, X, where outpatient = X, inpatient = 2X, pregnancy = 2X, and ambulance = X/3. These values were substituted in as the assumptions for the individual size dependent packages. Then, these values are multiplied by the percent enrollment for each size dependent package. This equation is set equal to the expenses from the previous year and solved for X. The unit value, X, is then used to calculate the suggested inpatient, outpatient, pregnancy, and ambulance values, which in turn, are used in calculating updated premiums for the next year.

To make updating the prices of package premiums at the start of each calendar year more user-friendly, a button system was developed using the Developer tab in Excel that outlines directions for the user through four separate steps. The steps involve inputting new package information about the numbers and sizes of families that purchased each type of package and the total expenses incurred by KIHEFO to treat all the patients covered under the health scheme. Using the equation outlined above, the final step in the button system calculates the new premium prices for the new year. A screenshot of the button system is shown in Figure 51, below.

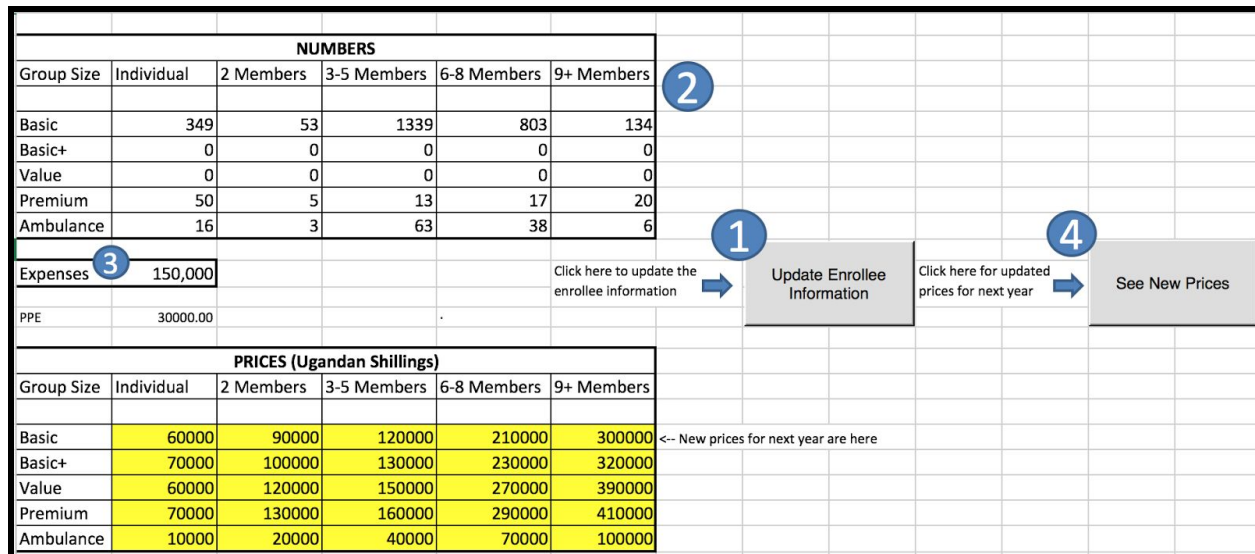


Figure 51: Screenshot of the Excel button system used to calculate updated package premiums.

Due to the nature of the estimated costs for the pilot year’s package premiums, it is expected that pricing in future years will increase as costs for providing care are updated. Changes in future package premiums will also occur based on the behavior of patients covered by the scheme - will they come to KIHEFO seeking care more often than is expected to increase the perceived value of purchasing health scheme packages (use-it or lose-it mentality)? Will treating patients for preventative care result in higher short-term expenses but level out and produce lower long-term expenses as the insured population becomes more healthy? Will enough healthy people sign up for insurance to balance out the higher costs-of-care for sicker people, even though cultural norms in the region suggest they may hesitate to purchase insurance for treatments they do not anticipate needing? Such phenomena have been observed in the insurance markets of developed nations, and it is assumed that KIHEFO’s Community-Based Health Scheme will not be immune to similar issues.

6.3.4 Sensitivity Analysis

Because additions to the final financial model did not affect the sensitivity analysis performed in *Design Development section 5.3.4*, a new sensitivity analysis was not performed for the final financial model. For the final sensitivity analysis, please refer to *Design Development section 5.3.4*.

6.3.5 Sustainability through Claims

The format of the claim form and the system for recording claims has not changed from *Design Development section 5.3.5*, but a binder was created with forms pre-printed and given to the cashier in KIHEFO’s General Clinic so as to jumpstart the process. Now that the financial sustainability of the health scheme incorporates the previous year’s expenses to generate

updated premium prices for the new year, keeping track of expenses from treating patients on the new health scheme will be especially important as the program grows. A special training for the General Clinic cashier was instituted to ensure that the cashier would be able to incorporate the new claims forms into her daily schedule.

6.3.6 Marketing Strategy

Alison provided feedback on the proposed marketing strategy outlined in *Design Development sections 5.3.6 and 5.3.7*, and the following changes were made:

6.3.7 Advertisements

In addition to the updated marketing structure, new, simpler flyers were made to convey the basic structure of the new health scheme to potential enrollees and final edits were made to the more complex pamphlet.

6.3.7.a Pamphlet and Flyer

The updated flyer involved a simplified pricing structure and infographics about the coverage in each package to improve accessibility for more community members. The final versions of the information pamphlet and flyer for potential enrollees can be found in the *Appendix 9.3.1 and 9.3.2*. These changes are the result of feedback from Dr. G, Peter, and Alison. Final versions of the pamphlet and flyer were printed in advance for KIHEFO to use at Outreaches and in other forms of advertising, and final versions of each were laminated for KIHEFO to keep as hard copies in case the digital copies are lost.

6.3.7.b Advertisement Script Draft

The advertisement script draft has remained unchanged from *Design Development section 5.3.7.b* and can be seen there.

6.4 Enrollment Session

After completion of necessary training to inform key KIHEFO staff of background information and structure of the health scheme packages, software training was performed to ensure KIHEFO staff can enroll and find future patients. Upon completion of this software training and after answering any lingering questions, an enrollment session was held at the conclusion of the program. A KIHEFO staff member, Alison, was charged with teaching a family of nine about the new KIHEFO - CBHS, helping them select a package suitable for their family composition and financial situation, and then officially enrolling them into the health scheme using the software outlined in *Design Specifications section 6.1*. Figure 52 below shows the enrollment process, which took place in KIHEFO's Nutrition Clinic, due to the number of people involved. The enrollment session, while slow, proved to be a success, and members of the SSLP Uganda team stood in the background offering support when Alison needed it, and entertaining the

smaller children while the family's information was documented in the software. The family ended up choosing the "Value" package.



Figure 52: Alison, right, enrolls a family of nine, left, in KIHEFO - CBHS as SSLP Uganda team members provide any necessary background support.

Alison provided some feedback about the enrollment process, as follows: She would like to see a date of enrollment somewhere on the family's profile, and she is concerned about families bigger than nine. It is important to note that this family's composition was technically not exactly in line with the household restrictions we outlined in this document. That is, the family had more than 2 adults, and there were additional members who were not dependents of the two adults. We attempted to clarify the discrepancy, but decided that it would be beneficial for Alison to have final discretionary powers on how to enroll the family as Stanford's direct involvement with the project comes to a close. In the future, families such as these should be enrolled as multiple households.

Though the enrollment session did not go explicitly according to plan, it was deemed a success due to the amount of improvement that was achieved in the level of understand of both KIHEFO staff and the family at the end of the day.

7. Continuing Work

7.1 Suggestions for Future Work within the Health Scheme

7.1.1 Database Application

7.1.1.a Security and Fraud Prevention

With this first iteration of the database and the focus on creating the MVP (minimum viable product), many of the improvements in the future could and should be related to the security and fraud prevention of the system. The Individual and Household ID numbers are randomly generated, which helps create security so that people cannot copy ID numbers easily, but if a person comes into the clinic and does not have their ID with them and they have to be searched for by name, this could lead to fraud. There is no identification through picture, fingerprint, or any other method, which would add another layer to the security to the system. Also, with the household based pricing and the 9+ family member option, nothing stops a household from absorbing a lot of other kids from a different household because after 9 kids the pricing is at its max possible value, and adding more children does not increase the price.

7.1.1.b Database Application Features

While creating the MVP, we came up with many ideas and heard many others from potential users that would be great add-ons and additional features to our database application. Below is a list of features that potentially could be added in the future:

Flexibility of Scheme within the Year:

- Allowing enrollment in special plans outside of the enrollment period (e.g. pregnancy plan so patients can enroll only when pregnant)
- Options to modify packages outside of the enrollment period (currently cannot cancel health scheme membership halfway through the year, cannot add health scheme membership halfway through the year, etc.)
 - Way to prorate health scheme membership based on enrollment date
- Savings option so a household can pay for the yearly rate in portions throughout the year
 - Way to record how much the household has saved toward their plan (date and amount for each payment) and when they become valid

Analytics:

- Recording the number of people in a specific Ngozi group that have signed up (having more members of an ngozi group enrolled can provide discounts for the group)
- Generating reports:

- Who has not paid fully and telephone numbers of those people
- Summary statistics (number of households, number of households paid, possibly which clinics/how many appointments they went to)

Security:

- Verification checkpoints of head of household (e.g. fingerprint or picture) if someone would like to change or add things to plan
- On "Manage Household" tab, being able to edit only certain fields when selecting "Edit household information". Currently, the user can edit the Individual ID and Household ID, which would break the system. Locking these fields from being editable would be more user friendly.
- Adding headshot photos to verify identity when presenting ID card.
- When confirming payment, the user must enter both a pay date and method to mark someone as valid. Right now, nothing prevents the user from entering only one and saving the page. If this happens, the individual will still be marked as invalid. A security check to make sure the user has updated both fields would help this problem.

Miscellaneous:

- Way to take someone out of the database if they die, or to mark them as deceased
- Notification system for when a household's scheme package is about to expire and they have not renewed (e.g. by text message)
- In the "Find Patient" and "Manage Household" pages, add a functionality of being able to search by two fields such as year and family name
- Auto capitalization of fields input by the social workers (some staff uses all lower case, some use all caps)
- Displaying the price within the dropdown menu when selecting plan on "Enroll/Renew Household" tab
- Adding the date of enrollment into the database in the contract data table when a household renews or enrolls

We had initially designed, but eventually took out an appointment logging feature when making our UI, because we did not have time to implement this feature. Table 12 is the table that we set up in the database, but do not use in the UI, that we would have used to store this data. Many KIHEFO staff agree that this feature would be useful to add in the future on the Patient Profile page (after looking up a patient to see whether they have insurance or not, it would be useful to be able to mark which clinic they are visiting and what services they used for analytics).

TABLE 5: appt_log (add row every time a patient comes in to the clinic)				
appt_db_id (autoincrement)	indiv_id	appt_date	appt_kind	appt_note
1	9346231	10/20/2017	Maternal	antenatal
2	6783231	10/20/2017	Dentist	extraction
3	2434577	10/20/2017	General	
4	8393413	11/05/2017	HIV	

Table 12: *This table holds the information for appointments of each individual who comes to KIHEFO. Every time a patient visits a clinic, a row is added to this table, along with the patient's Individual ID, appointment date, appointment kind, and an optional note. For each visit to a separate clinic an appointment for the individual will be input.*

7.1.2 Organizational Integration

7.1.2.a Workflow Diagrams

After a meeting with Dr. G, the students learned that the entire current workflow and structural organization of KIHEFO will change as of January 1st. Thus, additional work and reformatting will need to be done to the "Updated Workflow" diagrams. For example, we learned that because of the greater capacity for patients, the Maternal Clinic will be the central location for patients to filter through. However, the current model assumed that the General Clinic would be the main point of contact for patients. This made sense due to the General Clinic's computer fluency, proximity to the Pharmacy/Lab, and inclusion of a cashier. With a restructuring of KIHEFO staff, resources, and a push towards more heavily utilizing the Maternal Clinic, additional considerations and workflow changes will need to be considered and incorporated into the diagrams for the CBHS.

7.1.2.b Supporting Materials

The current method for producing the CBHS Claim Forms, CBHS Receipts, and CBHS Individual ID Cards, are all printed on regular paper in black and white. It would be ideal for a future team to investigate ways that KIHEFO can partner with local stationery and printing services to acquire better deals for printing these materials, or to acquire equipment so that they can make them themselves and in the field. The Individual ID Cards are laminated using a yellow-tinted clear tape, which could be replaced with a laminating machine that would ensure the cards could go through more rigorous use and harsher conditions. It would also save the staff time trying to manually laminate the cards themselves. Additionally, the team was interested in the use of Carbon-Copy books to avoid KIHEFO staff having to write two paper copies of Claim Forms and CBHS Receipts. Looking into alternative ways to create and safe-keep these documents will go towards promoting sustainability and reducing the amount of time wasted in tending to patients.

7.1.2.c Community and Training Materials

Each year, the community materials will have to be updated to reflect price, package, and coverage changes. This includes the flyer and pamphlet. Training materials should also be updated with any price, package, coverage, and software changes. This includes the Basic KIHEFO - CBHS Training Handout and the overall training manual.

7.1.3 Financial Model

Challenges and problems with current model:

- Explore more ways for families to be able to pay (rabbits? Generate savings?)
- Update census figures to track KIHEFO CBHS penetration into local population and generate new targets for signing people up
- Update prices for care as KIHEFO discovers what true costs of care are
- Update enrollee package percentages (who got what and how big the families are) with real enrollment data
- Fraud/security challenges with the health scheme system
- How to prevent people from overusing the system (copays or yearly appointment or price for services caps)
- Offer the option to families of monthly payments

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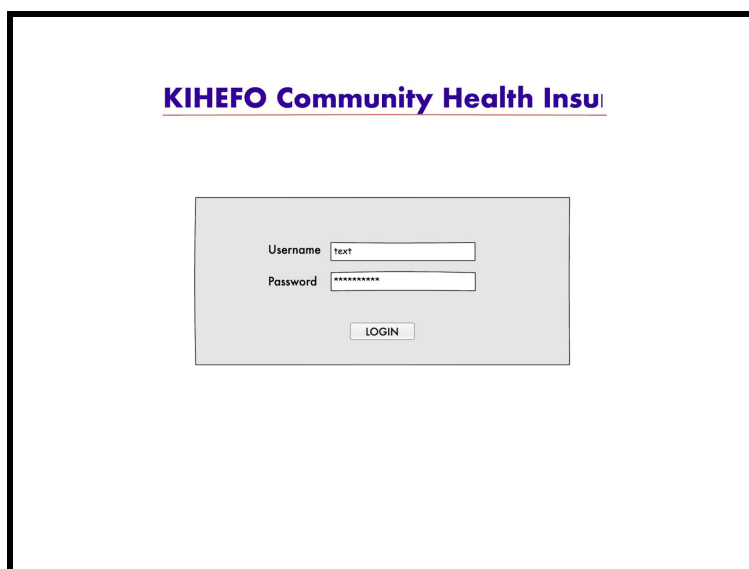
[20] Uganda Bureau of Statistics. 2014. National population and housing census 2014: Provisional results. Republic of Uganda.

9. Appendix

9.1 Database Application

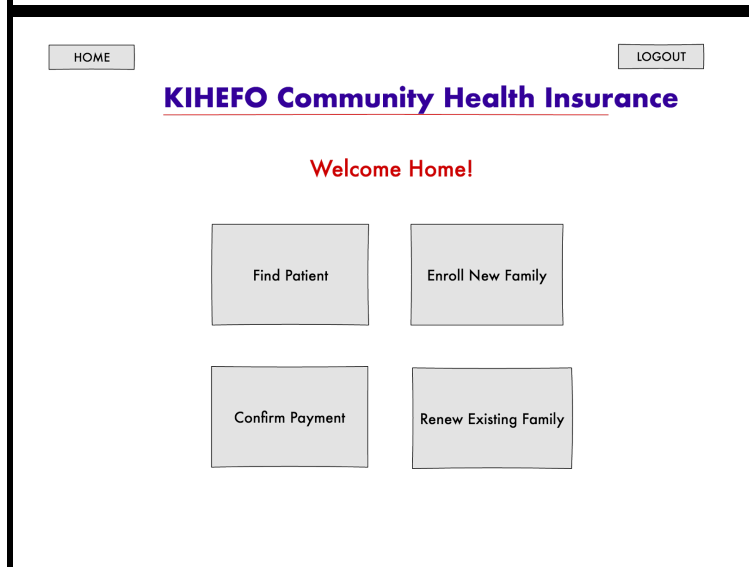
9.1.1 Pencil UI Screenshots and Explanations

The screenshots below are from our Pencil UI. We used these to model our UI after. While some parts of it changed while creating our UI this served as a valuable model to test on people and get feedback. We did not follow these screenshots exactly once we coded our database application, but it was a starting point. Any gray boxes are popups that will come up once the search is performed.



The screenshot shows the login page for KIHEFO Community Health Insurance. At the top, the title "KIHEFO Community Health Insurance" is displayed in blue. Below the title is a gray rectangular box containing a login form. The form has two input fields: "Username" with a placeholder "text" and "Password" with a placeholder "*****". Below the password field is a "LOGIN" button.

This is the main login page where a user of the system would login with a username and password.



The screenshot shows the home page for KIHEFO Community Health Insurance. At the top, there are two buttons: "HOME" on the left and "LOGOUT" on the right. Below these buttons is the title "KIHEFO Community Health Insurance" in blue. Underneath the title is the text "Welcome Home!" in red. The main content area contains four gray rectangular buttons arranged in a 2x2 grid: "Find Patient" (top-left), "Enroll New Family" (top-right), "Confirm Payment" (bottom-left), and "Renew Existing Family" (bottom-right).

This page is the home page which allows the user to select one of four options for looking up a patient and their coverage, enrolling a new family in insurance, confirming payment for insurance, or renewing an existing family in the insurance. There is also the option to logout or go home (which would be back to this page).

HOME LOGOUT

KIHEFO Community Health Insu

Find Patient

Individual ID#

When the “Find Patient” button is clicked on it brings the user to this page. The user has the option of looking up the patient based on the Individual ID, the Household ID, or the name if the person forgets their ID card. Once “Search” is selected it takes the user to the patient profile.

HOME LOGOUT

KIHEFO Community Health Insu

Patient Profile

Name

Age Gender

Package

Individual ID # Family ID #

VALID

Add Visit

Clinic

Optional Note

AUG - 2016

S	M	T	W	T	F	Sa
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3
4	5	6	7	8	9	10

This page shows the patient profile for the patient the user looked up. Visually on the right it is easy to see if the patient’s insurance is valid or invalid and this shows the main details about the person the user would need to see. At the bottom is the way to add the current visit for tracking purposes and what clinic the person visited. There is an option to “Manage Family.”

HOME LOGOUT

KIHEFO Community Health Insu

Family Plan

Family ID # Plan

[Manage Family](#) [Edit](#)

Policyholder

Village County

Parrish District

Subcounty Phone #

Valid Family Members

Name	Individual ID #	DOB	Policyholder?
Theresa Sievert	123456	06/02/96	No
Joyce Kang	134587	07/26/92	Yes

This page opens when “Manage Family” is clicked on from the Patient Profile. Because the address, and phone number details for a family, are the same across the family they show up on this page along with the policyholder name. It also shows the family members and their Individual IDs and information. There is an option to edit the family information and then confirm. Once “Confirm” is clicked it takes the user back to the patient profile and there is also a back button to the patient profile.

HOME LOGOUT

KIHEFO Community Health Insu

Enroll New Family

Find Existing Individual to be New Family Policyholder

Individual ID#

New Policyholder Information

First Name District
 Last Name Date of Birth
 Village Phone number
 Parrish Gender Male Female
 Subcounty National ID
 County Ngozi group

First Name Date of Birth Gender Male Female
 Last Name National ID

This page comes up when the “Enroll New Family” button on the home page is selected. It allows the user to enter the information for a current individual and make them the policyholder or create the policyholder of the household and then add family members. The only information additional family members need are name, date of birth, national ID (if they have), and gender. The user then hits “Next: Select Plans” once they have added all members.

HOME LOGOUT

KIHEFO Community Health Insu

Select Plan

Family (6-8 members)

Select	Plan	Price
<input type="radio"/>	Basic 2017: Pregnancy, Outpatient	210,000
<input type="radio"/>	Basic+ 2017: Pregnancy, Outpatient, Ambulance	230,000
<input checked="" type="radio"/>	Value 2017: Pregnancy, Inpatient/Outpatient	270,000
<input type="radio"/>	Premium 2017: Pregnancy, Outpatient, Inpatient, Ambulance	290,000
<input type="radio"/>	Ambulance 2017: Ambulance Only	70,000

This page comes up once “Next: Select Plans” is selected. The box under Select Plan shows the number of family members are accounted for in the insurance and then gives a table of the different insurance plans for the year, services they include, and cost of each plan. The user selects the plan the family wants and then hits “Confirm.”

HOME LOGOUT

KIHEFO Community Health Insu

Confirmation Card

Plan: Expiry Date:

Family ID #

Name	Individual ID #	DOB	Policyholder?
Theresa Sievert	123456	06/02/96	No
Joyce Kang	134587	07/28/92	Yes

Payment Validation Date

This page pops up once “Confirm” is clicked on from the Select Plans page. The plan selected and its expiry date is shown along with the Household ID number. The family members and their information is also shown and there is a place for payment validation and date for the validation. There is an option to print and return home.

HOME LOGOUT

KIHEFO Community Health Insu

Find Family

Family ID#

Family ID#	# of Members	Plan	Amount Required
123456	8	Platinum 2017	30,000

Payment Method

Cash (In Person)

Once "Confirm Payment" is clicked on, it takes the user to this page. The user can then type in the Household ID and search for the family and see the number of members in the family, the plan they are enrolled in, and the amount required. The user then selects the payment method used and activates the insurance. Once the "Activate Insurance" is clicked the user is routed back to the home page.

HOME LOGOUT

KIHEFO Community Health Insu

Renew Existing Family

Family ID#

Plan: Expiry Date:

Family ID #

Name	Individual ID #	DOB	Policyholder?
Theresa Sievert	123456	06/02/96	No
Joyce Kang	134587	07/26/92	Yes

This page pops up when "Renew Existing Family" is clicked on from the home screen. There is a search option based on Household ID number, Individual ID number, or name. A pop up then shows the family and the current plan, expiry date, Household ID number, and members. There is then an option to modify family members and then select the new plan.

HOME LOGOUT

KIHEFO Community Health Insu

Modify Family Members

Select (1) New Policyholder
 Select (All) Members to Delete

Select	Name	Individual ID #	DOB	Policyholder?
<input type="radio"/>	Theresa Sievert	123456	06/02/96	No
<input checked="" type="radio"/>	Joyce Kang	134587	07/26/92	Yes

Add Member

First Name Date of Birth Gender Male Female
 Last Name National ID

This screen comes up when "Modify Family Members" is selected within renewing existing family. There is an option to select new policyholder, delete members from an insurance household, or add members. The user then can select "Next: Select Plan." This page will be the same as the enrolling a new family and selecting a plan and allows an existing family to renew in the next year of a plan or select a different plan. Once selecting the plan, the user will then be sent to the confirmation page again like in enrolling a new family.

9.2 Organizational Integration

9.3 Financial Model

9.3.1 Pamphlet

The following pamphlet is supposed to be given to community members when they enroll for the KIHEFO's CBHS. This pamphlet ensures the community member understands what they have enrolled for, what care they will receive, and what price they have paid or will pay. A soft copy is available in the files to reference, entitled pamphlet.docx. This document will have to be updated yearly to reflect any package, coverage, or price changes.

Payment Instructions

Yay! You are enrolled, now for your plan to be valid you need to process your payment. There are two payment options: **cash** or **mobile money**.

Cash Instructions

Meet with a KIHEFO Community Health Scheme Representative. Once you pay with cash, they will provide you with a receipt, mark you valid, and your package will be activated on January 1 (for one year).

Mobile Money Instructions

Using your mobile money phone:

1. Dial *165 #
2. Select 4 – Payments
3. Select 4 – Payments for goods and services
4. Enter Merchant Code – KIHEFO
5. Enter Payment Reference – Household ID
6. Enter Amount to be paid – Your yearly payment
7. Click Send

Within 1 week, KIHEFO will mark you valid and your package will be activated on January 1 (for one year).

KIHEFO
PO Box 1127 Phone: 0486-435-347
Kabale, Uganda Website: www.kihefo.org



2017

KIHEFO
Community Health Scheme

Care and Coverage

KIHEFO Community Health Scheme is aimed at empowering community members to access quality healthcare services by mobilizing financial resources to strengthen the community health system.

Types of Care

Pregnancy	prenatal care, delivery, and 6 weeks postnatal care
Outpatient	mobile clinic and clinic visits, basic testing and prescriptions
Inpatient	overnight clinic visits, monitoring, and basic testing and prescriptions
Ambulance	ambulance transportation to KIHEFO health facilities

KIHEFO Packages and Coverage

KIHEFO offers 5 packages:

Basic, Basic +, Value, Premium, and Ambulance

With the following coverage:

		Type of Care			
		Pregnancy	Outpatient	Inpatient	Ambulance
Packages	Basic	X	X		
	Basic +	X	X		X
	Value	X	X	X	
	Premium	X	X	X	X
	Ambulance				X

Pricing and Procedure

Pricing Structure (in Ugandan Shillings/year)

		Number of Member(s)				
		1	2	3-5	6-8	9+
Packages	Basic	--	90,000	120,000	210,000	300,000
	Basic +	--	110,000	130,000	230,000	320,000
	Value	60,000	120,000	150,000	270,000	390,000
	Premium	70,000	140,000	160,000	290,000	410,000
	Ambulance	10,000	20,000	40,000	70,000	100,000

* each plan includes up to 2 adults and all others must be dependents *
While screening is available, treatment for the following is not included: diabetes, hypertension, cancer, dental (besides extractions), chronic allergies, HIV/AIDS (assistance available through HIV clinic), eyeglasses, and all outside referrals (this may include lab tests) and surgeries

Enrollment Procedure

- Gather the following:
 - Personal information for all Members
 - Phone number for policy holder
 - National ID number for all members (if applicable)
 - Chronic condition paperwork
- Meet with a KIHEFO Community Health Scheme Representative
- Enroll
- Receive your KIHEFO card that will be activated on January 1 (for one year) with valid payment
- Payment (see reverse for detailed directions)

9.3.2 Flyer

The following flyer is supposed to be given to community members as a stand alone document to introduce them to KIHEFO's CBHS. This document tells them the basics of the care provided and the prices for different packages and family sizes. A soft copy is available in the files to reference, entitled quickFlyer.docx. This document will have to be updated yearly to reflect any package, coverage, or price changes.



KIHEFO's 2017 Community Health Scheme

KIHEFO Community Health Scheme is empowering community members to access quality healthcare services. This scheme allows members to purchase a package for a yearly fee that provides a combination of the following care:



Pregnancy



Outpatient



Inpatient
















Ambulance

KIHEFO Community Health Scheme offers 5 packages:

Family of 3-5

Family of 6-8

Basic	 	120,000 UGX	210,000 UGX
Basic +	  	130,000 UGX	230,000 UGX
Value	  	150,000 UGX	270,000 UGX
Premium	   	160,000 UGX	290,000 UGX
Ambulance		40,000 UGX	70,000 UGX

Please talk to a KIHEFO Community Health Scheme Representative to enroll or for more information and package sizes. Phone: 0486-435-347

9.3.3 Basic KIHEFO - CBHS Training Handout

Introduction to KIHEFO Community-Based Health Scheme (KIHEFO - CBHS)

What is the KIHEFO Community-Based Health Scheme?

Similar to Ngozi groups, community members will save money to pay a yearly fee to KIHEFO to become a member of the health scheme, and they will be covered to receive certain KIHEFO health services in return. The level of care they receive will be dependent on which health scheme package they choose.

How is KIHEFO Community-Based Health Scheme different from other types of health insurance?

<u>KIHEFO - CBHS</u>	VS.	<u>Health Insurance</u>
<ul style="list-style-type: none"> • Not-for-profit • <u>Structured to incentivize families</u> • Community-based 		<ul style="list-style-type: none"> • For-profit • Structured to minimize costs incurred by insurance companies

Yearly KIHEFO – CBHS package rates in UGX

Household Size	1	2	3-5	6-8	9+
Ambulance	<u>10,000</u>	<u>20,000</u>	<u>40,000</u>	<u>70,000</u>	<u>100,000</u>
Basic (O/P + preg. for everyone)	-	<u>90,000</u>	<u>120,000</u>	<u>210,000</u>	<u>300,000</u>
Basic + (Basic + Ambulance)	-	<u>100,000</u>	<u>130,000</u>	<u>230,000</u>	<u>320,000</u>
Value (I/P, O/P + preg for everyone)	<u>60,000</u>	<u>120,000</u>	<u>150,000</u>	<u>270,000</u>	<u>390,000</u>
Premium (Value + Ambulance)	<u>70,000</u>	<u>130,000</u>	<u>160,000</u>	<u>290,000</u>	<u>410,000</u>

Why are there different household sizes?

The new KIHEFO– CBHS household size packages are structured to incentivize and benefit families – people save money by signing up their entire household for insurance instead of choosing individuals.

Who is included in a household?

A household includes either one (1) or two (2) adults, and the rest of the household members must be dependents. Dependents are young children or young adults under the age of 26 who are unmarried and dependent on one or both adults in the household for food and shelter. If a situation is unclear, use your own discretion!

How is the pricing for the different packages for different household sizes calculated?

The basic costs for care, per patient, per year, were used to make the larger household packages. These are summarized in the list below.

- Outpatient 30,000 UGX
- Inpatient 60,000 UGX
- Pregnancy 60,000 UGX
- Ambulance 10,000 UGX

What is the equivalent per-month price that a family would need to save if they want to purchase insurance?

Monthly savings required for each KIHEFO - CBHS package in UGX

Household Size	1	2	3-5	6-8	9+
Ambulance	<u>833</u>	<u>1,667</u>	<u>3,333</u>	<u>5,833</u>	<u>8,333</u>
Basic	-	<u>7,500</u>	<u>10,000</u>	<u>17,500</u>	<u>25,000</u>
Basic +	-	<u>8,333</u>	<u>5,909</u>	<u>19,167</u>	<u>26,667</u>
Value	<u>5,000</u>	<u>10,000</u>	<u>12,500</u>	<u>22,500</u>	<u>32,500</u>
Premium	<u>5,833</u>	<u>10,833</u>	<u>13,333</u>	<u>24,167</u>	<u>34,167</u>

Why do families have to pay for their KIHEFO – CBHS household package on a yearly basis instead of a monthly basis?

For the sake of simplicity, it was determined that the pilot program would include only yearly payments, made at the start of each calendar year. Perhaps future versions of KIHEFO – CBHS may include options for households to make payments on a monthly basis.

Can families cancel their package before the year ends?

Again, to keep the system simple, households cannot cancel their package in the middle of the year, nor can they receive a refund if they end up not needing medical care.

What if people don't want to sign up for something they might not use?

Similar to the way Ngozi groups function, we want to explain to people that they should purchase a KIHEFO – CBHS package even if they don't anticipate needing the services because they *MIGHT* need them later. This concept is similar to the structure of Ngozi groups – people contribute money to the Ngozi group even if they don't anticipate a family member dying in the near future.

What about end-of-life and burial coverage?

Because KIHEFO – CBHS wants to partner with Ngozi groups, end-of-life coverage and burial coverage are not available to purchase. The goal is to spread the word about KIHEFO – CBHS through KIHEFO's relationships with Ngozi groups, without replacing Ngozi groups or pushing them out. Perhaps future versions of KIHEFO – CBHS may include life and burial coverage once the system is widely accepted in the community.

How will families pay for their KIHEFO – CBHS household packages?

Families can pay for their KIHEFO – CBHS household packages either at the time of enrollment, or by the beginning of the calendar year in one (1) total payment, either in cash, or through mobile money. The mobile money system for KIHEFO has not been set up as of the writing of this document, but it will be in place before the first official enrollment period in January 2018. Instructions for mobile money payments can be found in the KIHEFO – CBHS pamphlet.

What treatments and conditions are not included?

Treatment and drugs associated with diabetes, dental (extractions covered), hypertension, cancer, chronic allergies, HIV/AIDS (assistance available through HIV Clinic), eyeglasses, and all outside referrals (which may include lab tests) and surgeries.

This file is uploaded to the "Files Referenced in Final Report" file in Google Drive, as a PowerPoint file and titles "KIHEFO - CBHS Basic Training Handout Final."

9.4 Papers to Reference

9.4.1 2007 CHI Paper

This paper gives background on Community Health Insurance schemes in Uganda that came to rise in the 1990's and the underlying causes for their failures and the policy implications for moving forward. The most common and prominent issues appear to be a lack of community engagement in the health schemes due to limited knowledge and understanding of their structure and services, a lack of ability to pay the premiums associated with the health schemes, and a lack of trust in the organizations carrying out the implementation of health schemes and administering the care. This paper aided in identifying areas of potential problems with implementing a community health scheme (CHS) during this program and spurred discussions for solutions to similar problems KIHEFO is anticipated to face with the implementation of the KIHEFO - CBHS in January 2018.

9.4.2 2011 KIHEFO Community Insurance Concept

This document outlines the common healthcare issues the population of the rural Kabale district and Kigezi region faces and how KIHEFO envisions a community health scheme could alleviate some of these problems. It lists specific objectives for the CHS, a brief summary of a needs assessment conducted by KIHEFO, an outline of a proposal for such a system, and the implications for long-term sustainability. Though it may have originally been intended as a prompt, or a description of the problem space, it reads more like a list of to-dos. Due to the intended structure of the Stanford GEP program, which is meant to be a more broad investigation, the final health scheme product differs, in some ways slightly and in others significantly, from this original proposal.

9.4.3 2011 KIHEFO Financial Model

This model was created by a consultant as a model to the minimum number of people needed to enroll in insurance to make it self sustaining. This cost structure was used as a skeleton for modeling the financial sustainability of the new KIHEFO - CBHS and informed the pricing structure of the various proposed health care packages.

9.4.4 Class Schedule/ Syllabus

This schedule and syllabus guided the ENGR 119 class in spring quarter, which was required preparation for coming to Uganda.

9.4.5 KIHEFO Financial Model SSLP FINAL

This was the financial model we created to model our health scheme structure. This version is not locked so it can be changed if needed. We used information from *9.4.3 KIHEFO Financial Model* and the information laid out in *5.3 Financial Model* to create this document.

9.4.6 KIHEFO Insurance ID and Receipt

This powerpoint includes the insurance ID card templates along with the receipts used when enrolling a household. Although the preview shows the powerpoint as being blue, once downloaded the powerpoint has an all white background. Needed updates will be the Mobile Money payment information currently listed as “TBD.”

9.4.7 KIHEFO Workflow Charts for Clinics

This PDF contains the workflow charts seen earlier in the document in *section 6.2.3* and is the current workflow for the General Clinic, Maternal Clinic, and (future) Mobile Clinics if they wish to implement our CBHS starting January 1st.

9.4.8 KIHEFO Health Scheme Training Manual

This training manual was used when training the social workers (discussed in *Section 6.2.2.c*) and was given to KIHEFO so they would have a way to use the system without our team being there to walk them through it.

9.4.9 KIHEFO CBHS Tracker

This tracker is an excel spreadsheet used by the cashier to log the expenses that KIHEFO incurs due to KIHEFO’s CBHS. Using this sheet, KIHEFO can calculate the total expenses and project future premium costs. This tracker is discussed more in *Section 6.3.5*.

9.4.10 KIHEFO Nutrition Questionnaire

We used this questionnaire to model the questions we asked during interviews at Outreach events (*Section 3.1.3*). Our main objective was to determine income level and stratify the different levels of poverty. We accomplished this using direct questions from this questionnaire.

9.4.11 Claim Form

This claim form is seen in *Section 6.3.5* and KIHEFO is encouraged to use it in order to create sustainability of this CBHS and keep track of how much the scheme is paying for and what services people are over/under-utilizing.

9.4.12 Yearly Price Update Sheet

This sheet will be used by KIHEFO staff (Judith or Lillian is recommended since both have been trained) to update the prices for packages each year. This sheet is discussed in *Section 6.3.3*.

9.4.13 Pencil File

This is the full Pencil file of our UI discussed in *section 9.1.1*. If the user exports it as a HTML then they can click through it like an actual website.

9.4.14 Web Hosting and Equipment for KIHEFO Health Scheme Database Application

This document gives more information on the web hosting and equipment needed for KIHEFO to sustain the database application and a summary is found in *Section 6.1.3*.

9.4.15 Web Hosting and Equipment Budget

The excel spreadsheet which lays out the budget for our proposed system in the *Section 9.4.14* document and *Section 6.1.3*.

9.4.16 SSLP 2016 MH Final Report

This is the final documentation from last year's group and was a helpful document to reference during the trip.

9.4.17 SSLP 2016 MH Financial Model

This financial model was created by the team last year and was referenced for help.

9.4.18 KIHEFO Exit Checklist

This checklist was given to KIHEFO as a recommendation as to what steps to take in the future.

9.4.19 Technical Resources Folder

This folder contains three documents we used when creating our database application (*Section 5.1* for specifics).

9.4.20 Interview Transcripts Folder

This folder contains all the interview notes from the interviews we conducted (discussed in *Section 3.1*).