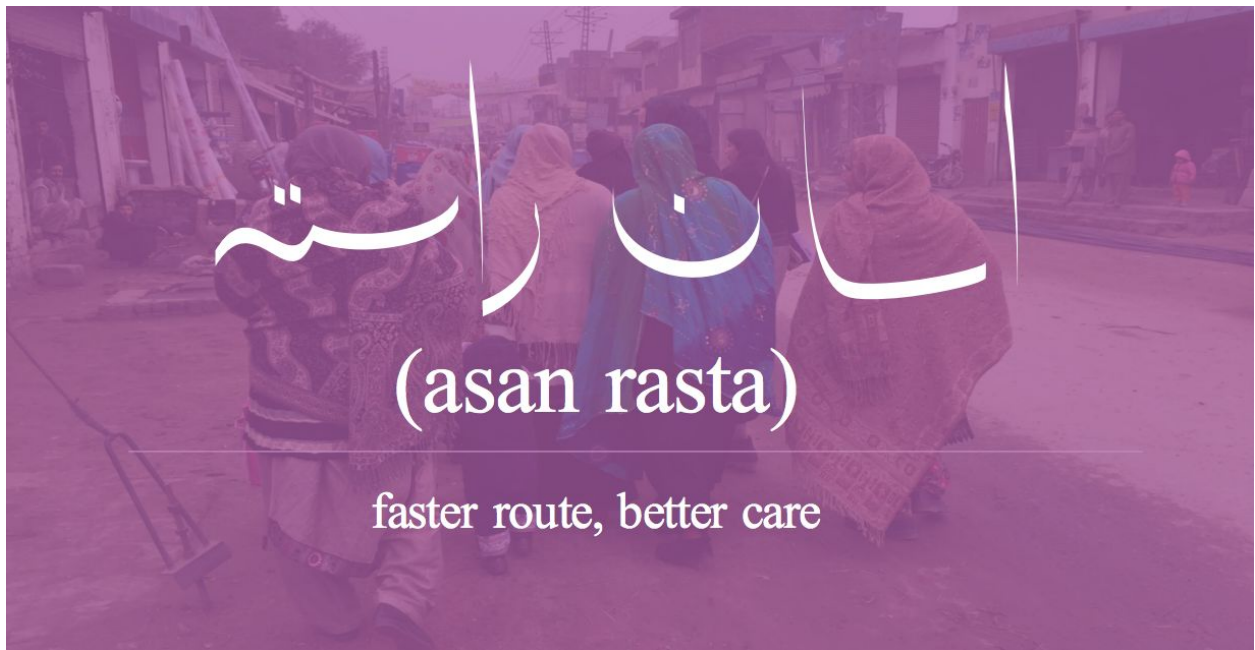


International Development Design Summit Lahore 2016



Team Spicy Hath is

Rachel Powers, Nickson Nyakambi, Umer Asif, Dodji Honou, Hareem Cheema, & Amna Batool (DF)

Table of Contents

Background

Design Process

Information and Insight

Ideas and Approaches

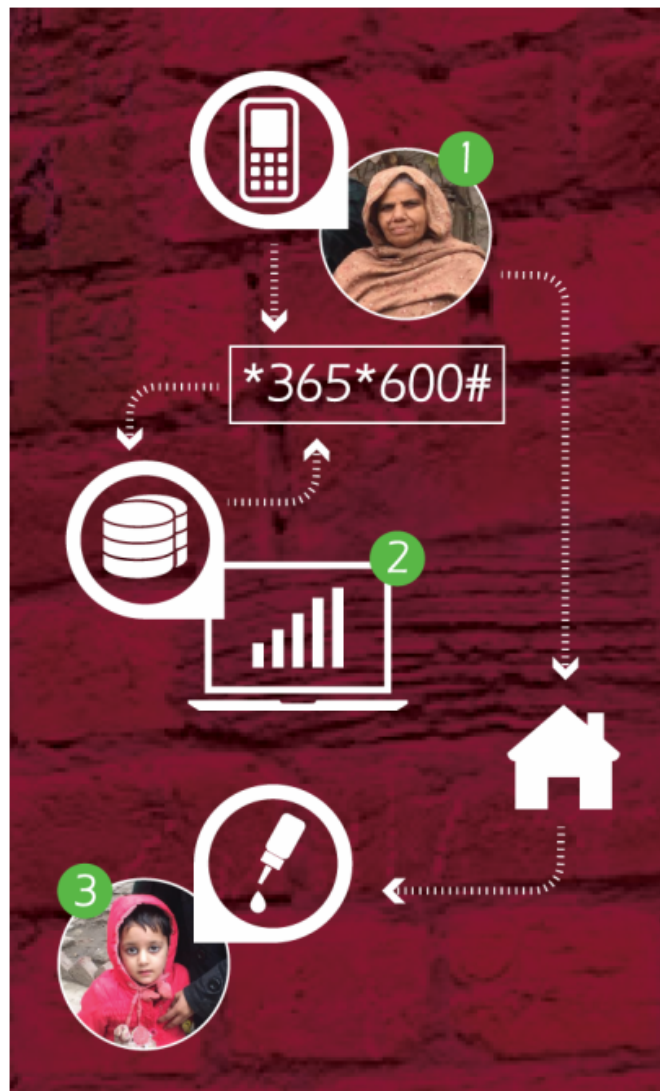
Implementation and Validation

Design Requirements

Description of USSD System

Lessons learned

Next Steps/Project Future



Background

Public healthcare in Pakistan, like in most countries, is not only cheaper in comparison to private healthcare, it also has greater geographical coverage. Thus, an overwhelming number of underserved people, belonging to both urban and rural, tend to visit public hospital. Public healthcare system in Pakistan comprises of three layers: primary care facilities, secondary care facilities, and tertiary care facilities. Primary healthcare comprises Basic Health Units (BHUs) and Rural Health Centers (RHCs). The Basic Health Unit (BHU) serves a population of 10,000 to 20,000 persons. Its staff includes one visiting doctor and three to five Lady Health Workers (LHWs) who are supervised by a Lady Health Supervisor (LHS). Along with BHUs, a Rural Health Centre (RHC) is a small peripheral hospital with a clinic comprising of small wards for some 20 patients, an operating room, and a delivery room. Apart from paramedical staff, the allocated staff consists of three medical officers (one female) and a dental surgeon. Nurse, midwives and Lady Health Visitors (LHVs) provide maternity care. Each RHC caters to a population of 100,000 to 150,000.

The secondary healthcare facilities including the first and second referral facilities provide acute, ambulatory and inpatient care through its District Headquarter Hospitals (DHQs) and Tehsil Headquarter Hospitals (THQs). Each administrative district has two or three general hospitals (for two and a half million people), to provide the required emergency cover. Tertiary healthcare includes all the major cities' public teaching hospitals providing a higher standard of tertiary care with better equipment in comparison to secondary and primary care facilities. A defining feature of the teaching facilities is the large number of medical students, comparatively more nursing and medical staff and a huge number of patients.

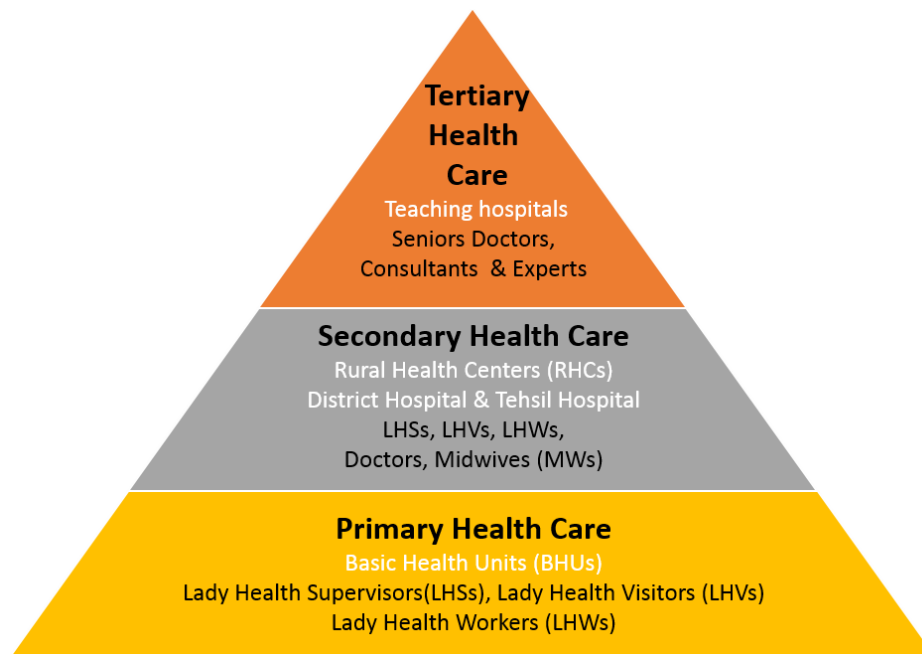


Figure 1: Health Care System in Pakistan

Our Problem Scope and Initial field Research

Primary health care facilities in Pakistan includes Basic Health Units (BHUs) operated by Lady Health Supervisors (LHS), Lady Health Visitors (LHVs) and Lady Health Workers (LHWs). LHWs are the backbone of the health care system for rural settings as they have direct access to the community. They were actually hired by the government to provide community counselling regarding family planning that were further extend first to maternal health and then to child health and health in general as well.

Hence LHWs have a huge workload as they have to:

- Counsel every expectant mother and child of all the households she is supposed to cover.
- Visit households to increase awareness on reproductive health and nutrition,
- Facilitate registration of births and deaths,
- Distribute medication for family planning
- Provide education on:
 - Reproductive health care
 - Promotion of healthy behaviors
 - Preventive care
 - Family planning,
 - HIV/AIDS care
 - Basic curative care
- Provide regular treatment for:
 - Diarrhea
 - Malaria
 - Acute respiratory
 - Infections
 - Intestinal worms
- Keep record of the health status of each household as well.
- Intimate patients (expecting mothers) about their visit to BHU.
- Do manual entries in a number of registers to maintain the data.
- Make lists of:
 - All expecting mothers who have their Expected Date of Delivery (EDD) in coming week,
 - All who will have normal deliveries,
 - Those who need to be referred to hospitals for C-section deliveries,
 - All items (and their quantity) required at BHU to do normal deliveries at BHU.

Hence a lot of paper and manual work is involved in this procedure. The reason they collect data is to send it to the upper level hierarchy in BHUs that includes management staff, medical

officers and lady health supervisors so they can make decisions on basis of this data and make arrangements in advance.

Due to heavy workload LHWs sometimes are unable to provide data on time that results in lagging behind making arrangements and manages stuff in advance. Talking in maternal health perspective, this mismanagement leads to the third delay of pregnancy i.e. delay in receiving adequate health care when patients reach at BHU due to:

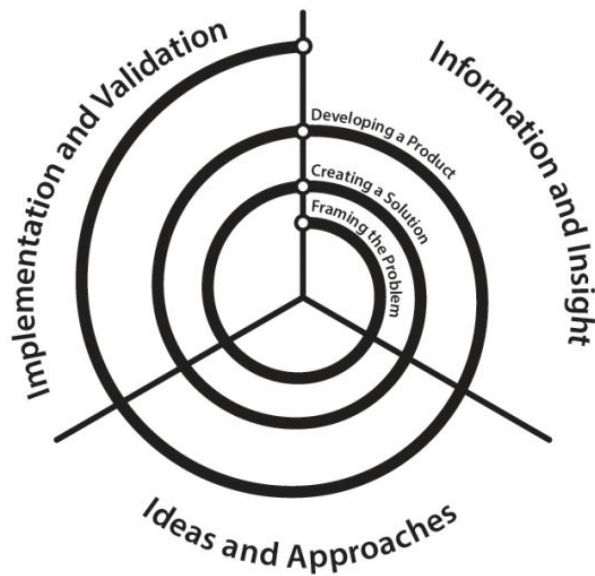
- Poor facilities and lack of medical supplies
- Inadequately trained and poorly motivated medical staff
- Inadequate referral systems

All above mentioned tasks are the routine work that LHWs need to perform on daily and monthly basis. Beside this, LHWs have to run polio campaigns every month. As Pakistan accounted for 86% of the global wild poliovirus (WPV) case count in 2014. Pakistan is the only country to have reported a dramatic increase in cases last year. In 2014, polio affected forty-four districts (23 in 2013) from three provinces/areas. Hence polio eradication continues to be a national emergency with the renewed commitment of the Government at all levels. The Polio Eradication Initiative (PEI) recognizes that quality and coverage of polio campaigns are too low, with significant pockets of continuously missed children. Hence, for government the goal remains to interrupt transmission of wild poliovirus in Pakistan.

To eradicate polio, government has started monthly polio campaigns. Hence it is the duty of every LHW and vaccinator to administered polio drops to each and every kid every month. A huge amount of money is being spent on these campaigns in order to get rid of polio campaigns. According to WHO, 4 doses of polio vaccines are required to kids from 0 to 5 years of age in order to prevent them from polio but in developing countries kids are getting polio every month till the age of 5 years.

This mismanagement causes huge wastage of money as well as resources. LHWs have to do extra work every month for one week for these polio campaigns, negatively impacting the time they spend on their routine work. LHWs need to record all child vaccination information from every house they covered and submit it to the supervisors. And because they don't have any central repository so LHW need to do it again and again every month that waste their time and resources as well.

Design Process



The Design Spiral: Ideas and Approaches, Implementation and Validation.

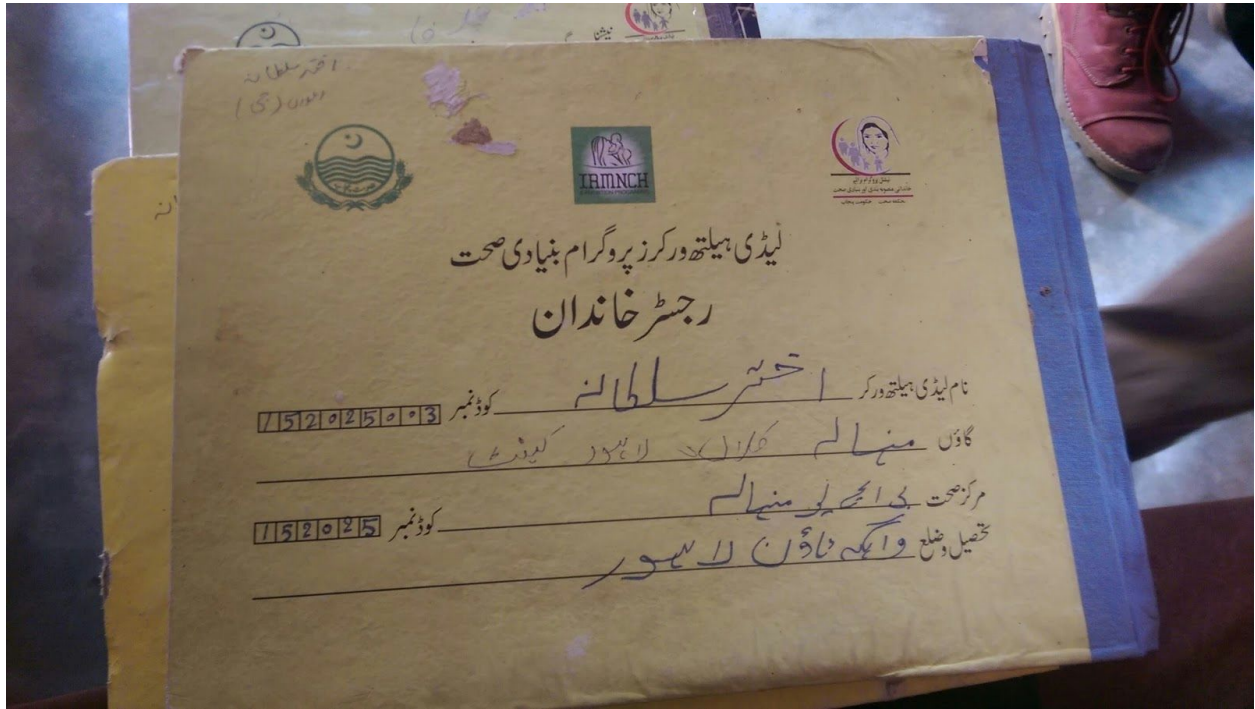
Once we had a basic introduction of our area of focus on addressing the needs of Lady Health Workers (LHWs), we began with the first steps of our own design spiral.

Information and Insight

1. *Creating and testing our hypothesis*

Knowing that we would be going out into the field to conduct information gathering with LHWs, we first needed to establish a hypothesis that we could test. This would help us determine whether our understanding of the problem to solve was correct, or whether we needed more information to reframe the challenge. Based on our provided background information on the data burden of LHWs and resource-heavy data reporting responsibilities, the hypothesis we created was “Manual data recording, aggregation, and reporting tasks take a significant portion of the LHWs time and effort resources, preventing LHWs from providing essential health services to the women and families they are intended to serve.” If our information gathering were to support our hypothesis, we would move forward with addressing the issue of the data burden on LHWs; if the information did not support the hypothesis, we would work with the LHWs to define the actual problem needing a solution.

Our first site visit took place the first Monday of the Summit—the fourth day of our work. Our team, accompanied by our design facilitator and another organizer, traveled to a more rural area of Lahore near the Wagah border. We visited three different basic health units and heard the basics of how the LHWs conduct their visits, both in normal days and during the polio campaign. We took some photographs of the LHW’s “diary” and the report they submit to the BHU.



The above picture shows the name, location and code number of the LHW, Akhtar Sultana.

گھرانے کا نام	تاریخ	گھرانے کا نام	تاریخ
گھرانہ 1	1-12-15	گھرانہ 2	2-12-15
گھرانہ 3	3-12-15	گھرانہ 4	4-12-15
گھرانہ 5	5-12-15	گھرانہ 6	6-12-15
گھرانہ 7	7-12-15	گھرانہ 8	8-12-15
گھرانہ 9	9-12-15	گھرانہ 10	10-12-15
گھرانہ 11	11-12-15	گھرانہ 12	12-12-15
گھرانہ 13	13-12-15	گھرانہ 14	14-12-15
گھرانہ 15	15-12-15	گھرانہ 16	16-12-15
گھرانہ 17	17-12-15	گھرانہ 18	18-12-15
گھرانہ 19	19-12-15	گھرانہ 20	20-12-15

This picture shows her monthly schedule of her visits of different households.

Pakistan is one of only two countries in the world where polio remains an active disease. As such, the government of Pakistan and international health organizations focus major time and money resources on eradication of this debilitating disease. In an effort to stymie the spread of this illness, Pakistan has implemented monthly anti-polio campaigns targeting each and every child under the age of five. However, these campaigns are tasked to the already-burdened Lady Health Workers, and the time they spend on inefficient campaign processes limits the services they can provide for families and mothers in need of essential primary care.

Asan Rasta is designed specifically to increase efficiencies of the polio campaign process. Not only does this allow LHW more time to provide the family services that are their main responsibility, it allows the government of Pakistan (and its global health partners) to focus anti-polio resources on areas that need it most. The money saved from redundant immunizations in areas that are already well-covered by routine vaccinations can be leveraged into more supplies, educational outreach, and manpower needed to finally eradicate polio in the challenging environments where it persists. And all of this is achieved by using data that is already available—Asan Rasta simply makes it accessible to the people that need it and paves the way for future reporting systems at the front line of care.

Learning the Design Process

As none of the Spicy Hath team members had taken part in a design process before, this aspect of our work was new to each of us and we were excited to take it on together. As we learned in the classroom session, the design spiral consists of three main stages: Information and Insight, chance to meet with one group of LHWs at their home site. We used out time with the LHWs to ask them about their typical work, how they spend their working hours, and the challenges they face. We also asked in-depth questions about the data they are required to collect, record, and aggregate for their monthly reports. Surprisingly, the LHWs did not identify data management and reporting as a major roadblock to their work. Instead, they spoke about a handful of other challenges that make their jobs difficult, calling out their anti-polio campaign tasks as particularly challenging. We finished our short time with the LHWs by taking photos of many of the registers and papers for reference later.

2. Creating our PATH Statement

Seeing that our hypothesis was not supported by the information gathered on this site visit, we reviewed the other information gathered and tried to identify a specific problem to address. While at first the polio campaign issue seemed out of reach, due to presumed disinterest by the government to alter any aspect of the polio eradication process, we realized that creating a solution to make the anti-polio campaigns more efficient would be of significant benefit to the LHWs and to the Pakistani health system at large, and that it was worth pursuing. As such, we chose as a group to create an ICT solution to make the polio campaign more efficient and increase the amount of time available to the LHW to serve their communities' primary health needs. The first version of our PATH statement was:

PATH Statement

Ideas and Approaches

In order to make the polio campaign process more efficient, we wanted to provide a system where LHWs could look up the status of each household before spending time going door to door in a neighborhood. Initially we were very excited about a mapping app where LHWs could use geolocation services on a smartphone to register locations of houses on a map and add child vaccination information to those instances. We understood that only a portion of LHWs had smart phones, but we also knew that the government was investing heavily in ICT solutions and providing tablets to every basic health unit. This made us believe that the government would also be interested in arming frontline care workers with smart tools. However, after more information gathering we discovered that sometimes the government takes up to three months to pay the LHWs, meaning that expecting them to provide LHWs with smartphones was unrealistic. This led us to the new requirement that the system we build must be usable on the feature phones already accessible to the LHW.

When it comes to feature phones, there are a limited number of ways to send and receive information. Based on the problem we were trying to address and the resources available, we opted to create a USSD system for data registration and retrieval. This would cost less than multiple SMS messages and is already a system that is familiar to anyone who has had to top up their mobile credit. Furthermore, it enables more flexibility in the type of data and queries that can be sent from the LHW device. Because it was not feasible to secure a Pakistani USSD shortcode for this prototype, we opted to design and test using a Kenyan SIM card and shortcode. This worked very well for our design process needs and even allowed us to build a working prototype by the end of the two week Summit.

Implementation and Validation

On our second visit to the field we were initially focused on getting LHW user feedback on the basic architecture and user experience of the system. In addition to getting initial feedback based on paper prototypes of the prompt screens, we also gathered more information that would be essential to our final solution design. This time in the field we actually went on a home visit with the LHWs and observe more about how the communities are set up and tracked. Because the LHWs already had a system in place for tracking unique households, we were able to leverage that system into our new USSD system and eliminate the need to print unique stickers/plaques for every household. During the course of the visit we were able to alter aspects of our paper prototype and get dynamic feedback from the LHW users. They gave us essential critiques and suggestions for improving the solution, and also specified exactly what information would be most useful to them from the system. This visit enabled us to validate the concept of this accessible, utile ICT solution and continue development and design with ideas borne of the co-creation process.

Design Requirements

Like our system design, our design requirements went through some evolution during our process. After a lot of discussion we decided to implement a USSD system for data reporting and querying. Some of our main requirements were:

- Must be usable on feature phones and smart phones
- Must work on LHWs existing devices
- Phone number can act as unique identifier for LHW
- Low system cost for retrieving/querying information
- Does not cost LHW money
- Can connect over 2G, 3G, or 4G network
- Fewer than 3 steps to retrieve information
- LHWs can report and look up household information
- Information arrives with accuracy and reasonable speed
- User training doable within 1 hour (not a high bar for entry)
- Messages are in local language
- Easy retrieval and viewing of data on dashboard end
- Household identifier code must be simple and easy to type

Description of USSD System

Have you ever typed a code starting with an asterisk (*), number set, and hash (#) on your mobile? If yes, then, knowingly or unknowingly, you have already been using USSD service. USSD is a communication protocol used to send text messages between a mobile phone and applications running on the network. It is a messaging service used in Global System for Mobile Communications (GSM) networks similar to SMS, where it sends data utilizing the signaling channel.

However, unlike SMS, which follows a store-and-forward oriented message transaction; USSD provides session-based connections. Because of its real-time and instant messaging service capability, USSD service is up to seven times faster and much cheaper than SMS for two way transactions. It is a technology unique to GSM networks and is the standard for transmitting information over GSM Signaling Channels.

The Asan Rasta USSD System operates in a similar manner specifically used by lady health workers to identify households in need of polio vaccinations, plan needed visits, and record streamlined immunization data. The functionalities of the system focus on the following areas of the system components;

If a new record is made or an older one is updated, the database is populated accordingly and the officials at different part of government can monitor the data, its trends and sensitive information like areas of high risk of infant mortality, or areas of high risk of viral diseases.

The basic flow of the system is:

During routine visit

1. LHW visits household
2. LHW registers household child vaccination information via USSD, linking info to unique household identifier

During polio campaign

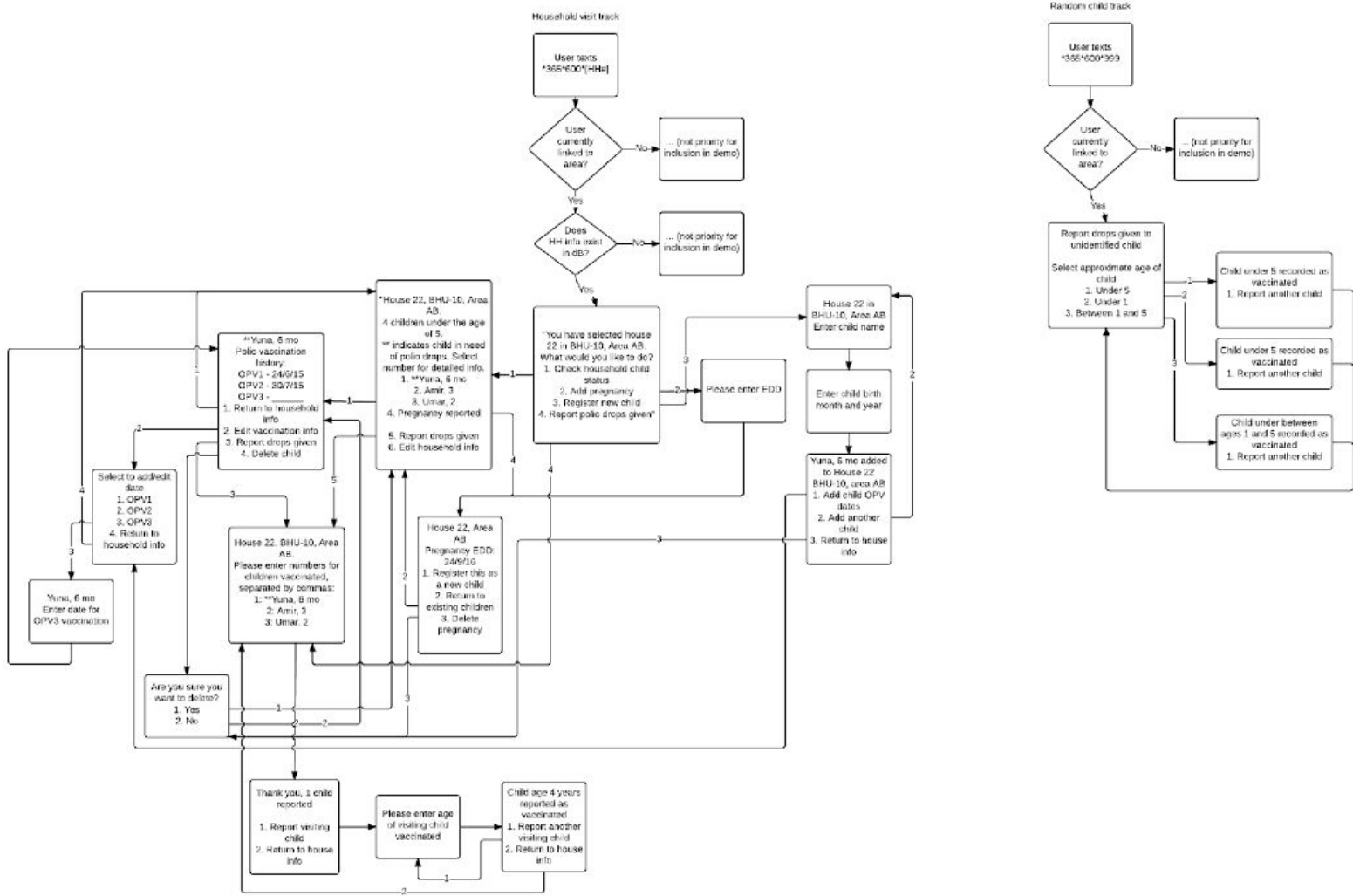
1. LHW visits household building
2. LHW reads existing household code painted on wall and enters it into the USSD system
3. Receives information on child vaccination status for that house
4. Distributes polio vaccine drops to children in need of vaccine
5. Reports vaccines given via USSD, linked to unique household identifier

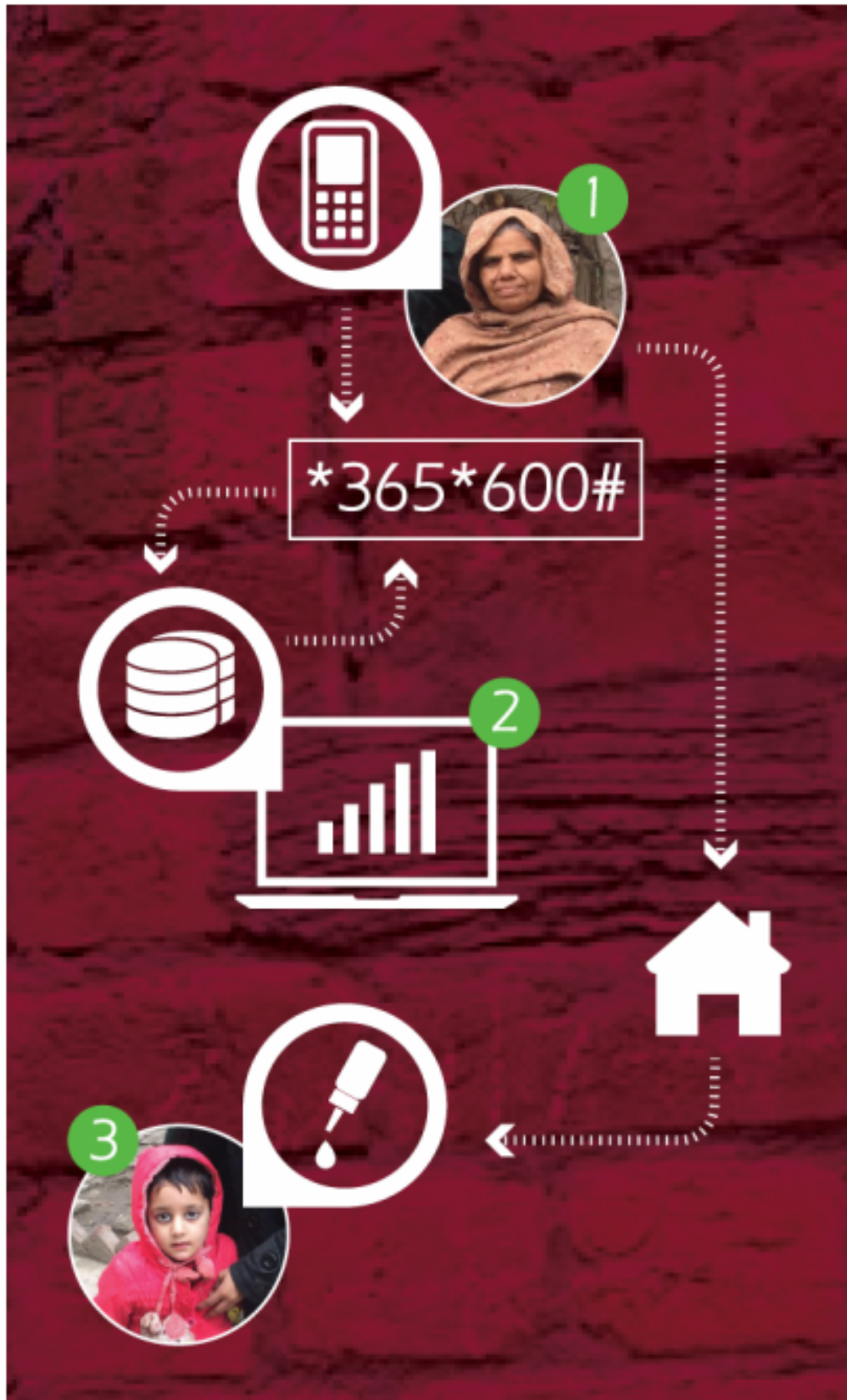
Dashboard view

1. Medical officer or data manager views statuses for all families in their area
2. Observes coverage rates and vaccinations given in real time

The complex screen flow for the USSD system is shown on the following page.

Screen Flow for USSD System (zoom in to view details)

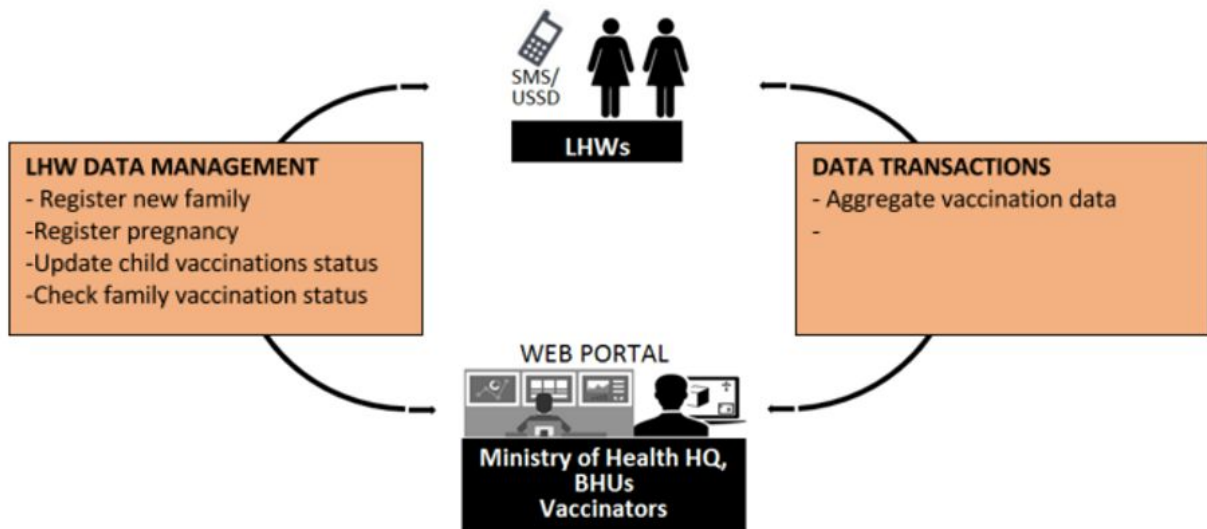




*Infographic on system flow, shows USSD shortcode of ***365*600#***

The functionalities of the system focus on the following areas of the system components;

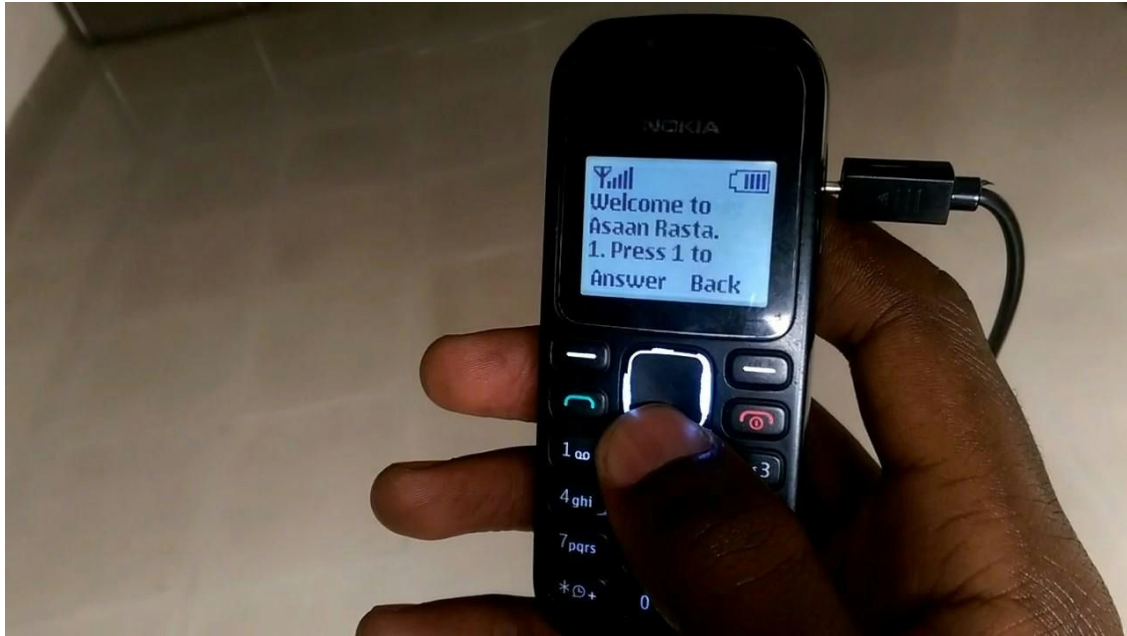
Tracking System: Key Functionalities



The following images walk through some of the main screens for Asan Rasta.

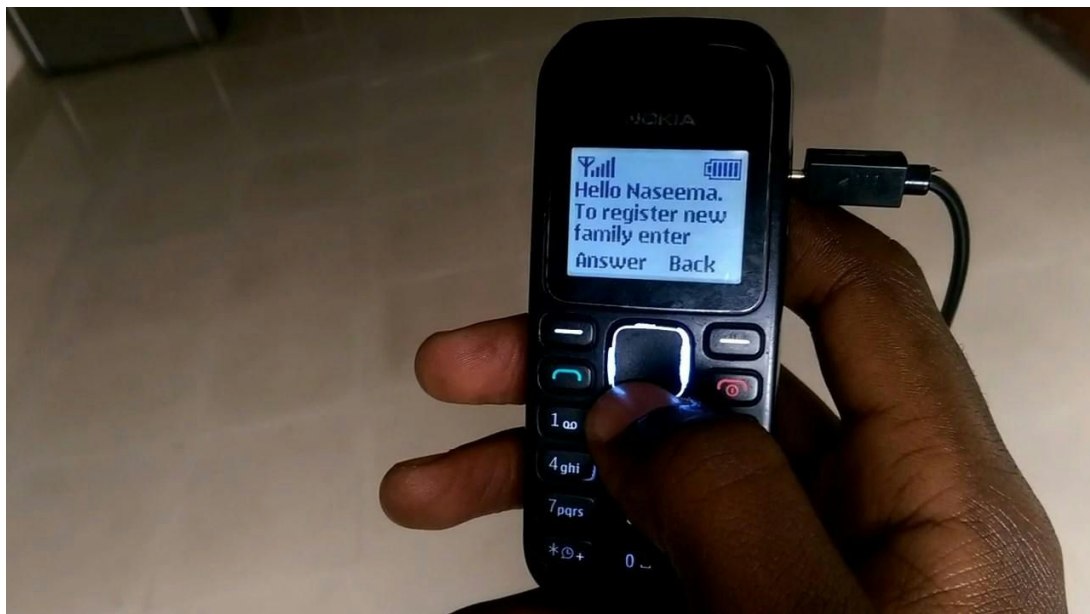
Main Menu

“Welcome to Asaan Rasta. Press to register family or Enter house number to check vaccination status”



Register Family

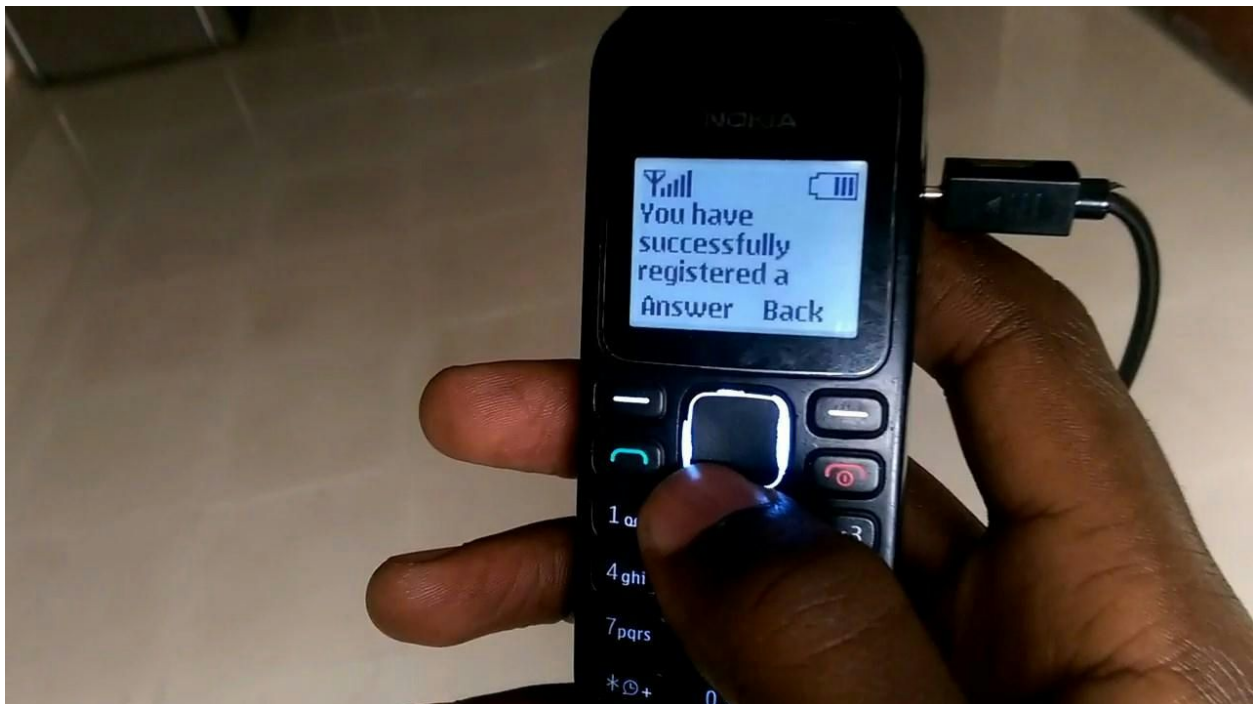
“To register new family enter house number, number of children under 5 years and number of vaccinated children separated by commas”



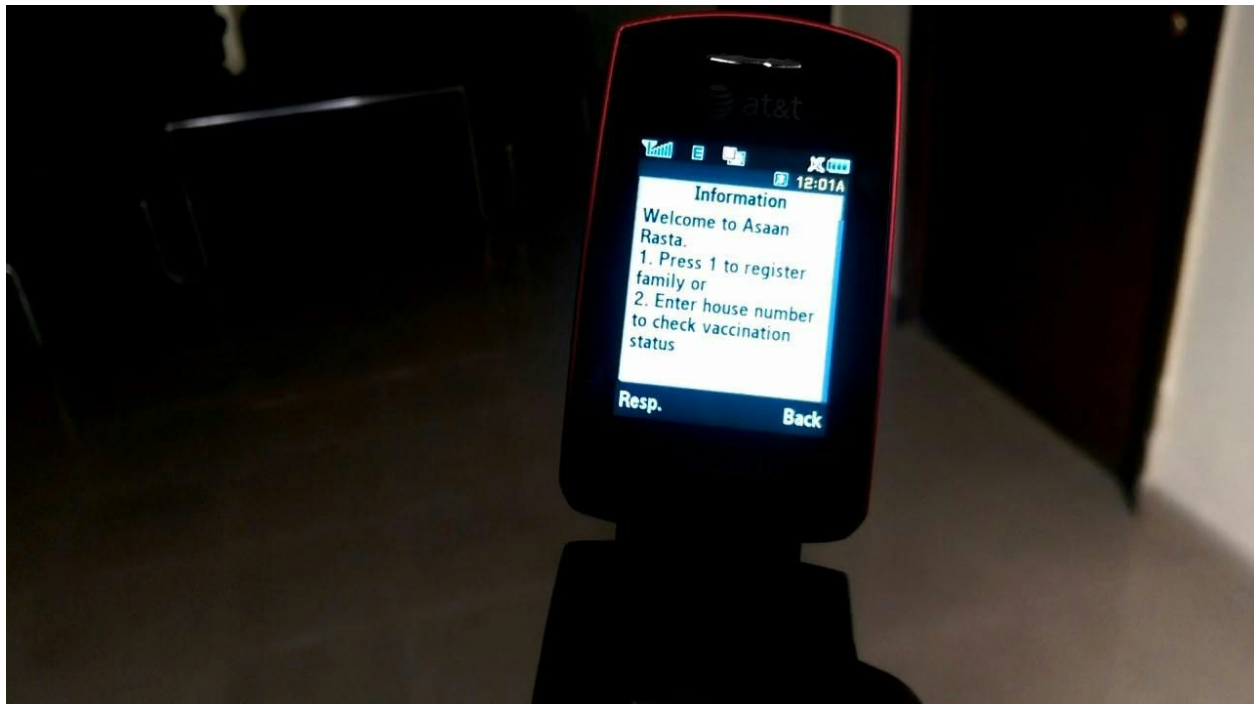
Entering the house number to register



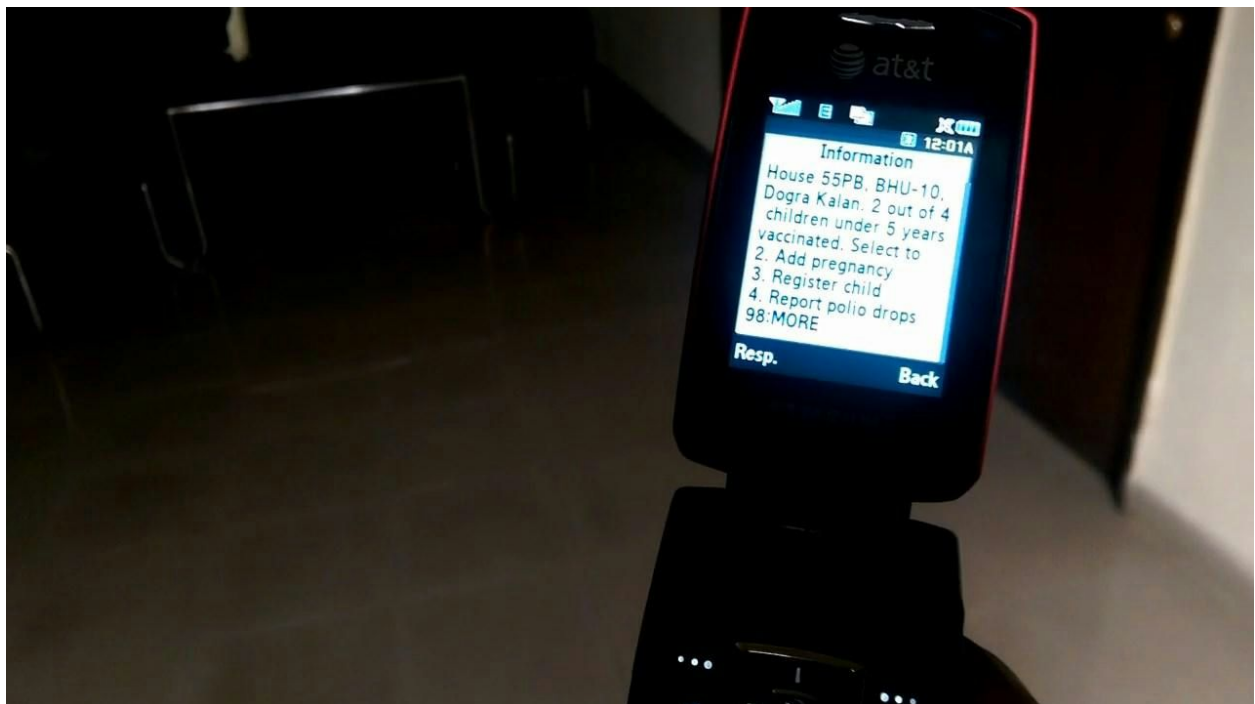
Registration successful.



Check Vaccination Status



Select 1 to add a new household, select 2 to query existing household number.



This picture shows the results for a particular a household and shows immunization record.

Performance

We were extremely pleased to have a working prototype by the end of the Summit. We did run into some challenges, however, mostly related to the complexities of telecommunications policy around USSD systems:

- We were using Kenyan SIM cards on Roaming
- Which had bad effect on speed
- We were not using a dedicated service for the database
- The Rest API that was used for the USSD had its own set of challenges
- The protocol was not designed to this much textual information
- But it was still working

Estimated implementation costs

- The cost of buying a USSD service, which varies from country to country
- The web hosting and USSD callback URL cost
- Developing the code cost

Lessons learned

Community engagement

We had multiple meetings with the LHWs, the medical offices and the government officials working in the health sector.

User feedback

We got the feedback from the medical officer for our dashboard. Their feedback was really essential to get and we made improvements to our dashboard accordingly.



Unfortunately we were not able to test the complete USSD system with the LHWs.

Troubleshooting

From the actual prototype, the USSD system used is not located in Pakistan but in Kenya. So, the the system is slow to send back information requested to the LHWs that are using features phones.

Next Steps/Project Future

6-month plan and team engagement (roles and responsibilities)

- Translation into Urdu for LHW (Nickson - extract from code; Amna and Umer - translation)
- Meeting with Soheil (Amna and Umer)
- Pursuing Kenyan SIM cards (Umer to talk with Mustafa)
- Prototype engagement with LHW - Umer and Amna

Anticipated risks and challenges

- (team) Geographic spread of team members
- Challenges of getting short code from Pakistan Telcos
- Limited opportunities to get feedback from LHW