Case Study

Aarogyam
Digital Health Mapping and Service Delivery

April 2012
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EXECUTIVE SUMMARY

The Infant Mortality Rate and Maternal Mortality rate in Uttar Pradesh (U.P) is amongst the highest in the country. The lack of access to adequate facilities combines with the unawareness of the rural population in the state to make the maternal and infant health situation abysmal.

Aarogyam, an ICT based health related service delivery provision system, seeks to correct this problem of high incidences of maternal and infant deaths in U.P by tracking women’s pregnancies and maintaining a record of child immunisation over time. It was initiated in Baghpat and J.P. Nagar districts of the state in 2008.

Under Aarogyam, a village wise database of all the beneficiaries (pregnant/lactating women, children up to 5 years) of an area is maintained, which gets continually updated. Based on this database, the Aarogyam software sends automated alerts in the form of vernacular voice calls/SMS to the beneficiaries informing and reminding them about their pending antenatal and postnatal care and immunisation appointments. These alerts are also sent to local level health officials informing them about due services in the area.

Aarogyam also has an in-dial facility where beneficiaries can call up to inquire about any maternal and infant related health issues and also file their grievances. These grievances are registered under the Management Information System (MIS) of Aarogyam that provides the basis for concerned health professionals to take related corrective measures.

In this manner, Aarogyam is ensuring that the government reaches out to people with proactive and responsive health care delivery. Aarogyam has today been expanded to about eight districts of the state, making health professionals accountable along with empowering the community with adequate reproductive and infant health related information. Given its remarkable performance, Aarogyam has received several awards and recognitions like the NASSCOM Social Innovation Honors 2010 and the M-Billionth Award 2010.

METHODOLOGY

The Governance Knowledge Centre (GKC) documents best practices in governance in India in support of further replication. For this purpose, select initiatives that are significantly

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contributing towards the betterment of public service delivery are identified by the GKC research team. The team conducted extensive secondary research using credible web sources to establish the suitability of Aarogyam - a pregnancy tracking and digital health mapping system in Uttar Pradesh - as a best practice. This research reflected the manner in which Aarogyam is successfully harnessing information and communication technology tools to create a pregnancy tracking database for facilitating the timely delivery of crucial maternal and infant related health services.

Having recognised Aarogyam as a best practice, the key stakeholders in the initiative were identified and interviewed to gain a deeper insight into the operation and impact of the initiative. This document has been created by compiling the information collected through secondary research as well as the insights gathered through an interview with the Managing Director of Kanpur State Electricity Company Limited (KESCO) who, along with the District Magistrate of Kanpur-Dehat, was responsible for initiating and implementing Aarogyam in Baghpat and J.P.Nagar.

Efforts have been made to provide objective information in the document. However, since only the implementers of the project were interviewed, there is a possibility of percolation of information bias.

BACKGROUND

Providing accessible and qualitative healthcare to an increasingly vast population remains a humongous task for service providers in India. Among the foremost healthcare challenges that the country faces is the high rate of maternal and infant mortality. As per the Sample Registration System (SRS)\(^2\), India’s Infant Mortality Rate (IMR)\(^3\) is 47 per 1000 live births (in 2010) while its Maternal Mortality Rate (MMR)\(^4\) is 212 per 100,000 live births (2007-2009).

As identified by the National Family Health Survey (NHFS)-2 of the year 1998-99, the main reasons behind such high incidences of infant and maternal deaths in India are the lack of awareness among women about the importance of antenatal care (ANC) and postnatal care (PNC), inadequate infrastructural as well as medical facilities and assistance during delivery, contributing towards the betterment of public service delivery are identified by the GKC research team. The team conducted extensive secondary research using credible web sources to establish the suitability of Aarogyam - a pregnancy tracking and digital health mapping system in Uttar Pradesh - as a best practice. This research reflected the manner in which Aarogyam is successfully harnessing information and communication technology tools to create a pregnancy tracking database for facilitating the timely delivery of crucial maternal and infant related health services.

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BACKGROUND

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incomplete immunisation and improper treatment of birth related problems among infants, and provision of service by under-capacitated health professionals. These factors further combine with under utilisation of technology and marginal involvement of communities and other stakeholders in the health system to result in a unidirectional, unresponsive supply based health service delivery approach.

Hoping to address these shortcomings, the Government of India (GOI) launched a Reproductive and Child Healthcare (RCH) Programme in 1997-98 with the goal of improving maternal and child health in the country. In April 2005, this RCH programme was integrated within the National Rural Health Mission (NRHM) to take forward the goals of safe motherhood and child survival. Under NRHM, the Janani Suraksha Yojana is a crucial scheme that seeks to address problems of maternal mortality and infant mortality by providing cash incentives to women who choose institutional delivery. With institutional delivery, it is hoped that both the mother and child are provided with adequate care (ANC and PNC) and medical facilities (medicines and immunisation) that they would otherwise be deprived of in case of home based deliveries with the assistance of a mid-wife.

However, in spite of such national level schemes, states all across India have failed to follow a streamlined approach to reach the targeted population. The absence of a proper tracking process results in many women and children being left out from the coverage of such health care schemes. In instances where the target population is being adequately reached out to, there is a lack of follow up mechanisms because of the failure to maintain an appropriate database. Recognising these shortcomings, most Indian states have been devising new processes and mechanisms to meet their commitments under the NRHM. An interesting development of late has been the use of information and communication technology (ICT) tools for improving the delivery of health related services.

One such initiative that is successfully leveraging the use of technology for efficient healthcare delivery in the country is Aarogyam in Uttar Pradesh (U.P). The IMR and MMR in U.P are amongst the highest in the country. The lack of adequate facilities combines with the unawareness of the rural population in the state to make the maternal and infant health situation abysmal. Developed in 2008, Aarogyam seeks to address this by effectively leveraging ICT for delivering timely health services.

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‘Aarogyam’ is a Sanskrit word that means ‘complete freedom from illness’. An ICT based responsive system, Aarogyam, ensures active participation of all key stakeholders viz. local administration, doctors, frontline health workers - ASHA (Accredited Social Health Activists), ANM (Auxiliary Nurse Midwife), and AWW (Anganwadi Workers) -village heads and beneficiaries, to ensure that a pregnant woman is provided with ANC, PNC and that children are given complete immunisation.

Aarogyam maintains a village wise database of all the beneficiaries (pregnant/lactating women, children up to 5 years) of an area, which gets continually updated. Based on this database, the Aarogyam software sends automated alerts in the form of vernacular voice calls/SMS to the beneficiaries informing them about their pending appointments. These alerts are also sent to local level health officials informing them about medical services due in the area. In this manner, Aarogyam ensures that the government reaches out to people with responsive health care delivery services. Initiated in two districts of U.P - Baghpat and J.P Nagar - Aarogyam has today been expanded to about eight districts of the state.

**OBJECTIVE**

Aarogyam is an ICT based health care delivery system for pregnancy tracking and digital health mapping. It has the following objectives:

- Tracking each pregnancy in the target areas with the help of a technology based monitoring system
- Ensuring complete ante and post natal care for pregnant women and promoting institutional deliveries
- Providing 100 percent immunisation for pregnant women and children in the age group 0-5 years
- Developing a two-way demand based interactive health care delivery eco-system
PROGRAMME DESIGN

KEY STAKEHOLDERS

- **Rural health workers like ASHA (Accredited Social Health Activists), ANM (Auxiliary Nurse Midwife), and AWW (Anganwadi Workers):** They play a crucial role in collection, aggregation and updation of data related to pregnant women and infants, and in ensuring that related health services are delivered in a timely manner.

- **Data operators at the Block and District level:** They ensure that the data collected by rural health workers is entered correctly in the Aarogyam software.

- **Complete Healthcare Centres (CHCs) and Primary Healthcare Centres (PHCs) at the Block Level:** Rural health workers associated with CHCs and PHCs leverage their facilities to deliver healthcare to mothers and infants. CHCs and PHCs also act as centres for data aggregation.

- **Village Pradhans:** Aarogyam keeps the Pradhans informed about the status of maternal and infant health related services, who then use the information to ensure timely delivery of services.

- **Beneficiaries:** These include pregnant and lactating women and children below five years of age.

- **Private software companies:** They have been responsible for development of the Aarogyam software.

- **National Informatics Centre (NIC):** It supervises the overall functioning of the software.

WORK FLOW

Aarogyam has two crucial components a) mother and child tracking facility b) provision of adequate healthcare facilities to mothers and children below five years of age.

MOTHER AND CHILD TRACKING FACILITY

The beginning point for health delivery services under Aarogyam was the collection of maternal and child health related information within the target area. For this purpose, a comprehensive baseline health survey of households in the targeted districts was conducted. Data was collected on the basis of gender, religion, caste and 13 health indicators that included aspects like immunisation details of infants and pregnancy related information with expected date of deliveries along with the services availed by a pregnant women till that time. At the time of the survey, each beneficiary was given an 8 digits unique ID that consists of block id (first two digits) + village id (second two digits) + beneficiary id (last four digits). This unique ID is used for tracking the health of a mother and her child in the system.
The ANMs were responsible for conducting the baseline health survey according to a prescribed format that helped in creating a village wise database of beneficiaries along with vital health indicators, pregnancy status and contact details. This database is housed at the office of the Chief Medical Officer (CMO) at the district level. At the village level, ANMs maintain the Aarogyam register, which contains village wise beneficiary details with the expected date of delivery and dates of actual and expected ANC/PNC visits and immunisation etc.

Once the process of creating this initial database was completed, a systematic data upgrading process was designed. Every month the data collection formats are filled by ANMs, unique IDs given to new beneficiaries and completed forms are submitted to the block PHC/CHC where the data entry operator consolidates village wise data in pre-formatted Microsoft Excel sheets. Once the Excel sheets are prepared, the data entry operator at the CMO office enters block-wise data into the Aarogyam software as per the excel sheets. This data is presented in the Management Information System (MIS), that is, the web-based monitoring portal designed for Aarogyam, and can be accessed by key health professionals.

**PROVISION OF ADEQUATE HEALTHCARE FACILITIES**

*Out-dialling facility*

Once the data of a family has been entered at the CMO database, every family’s reproductive and child health status is monitored regularly and alerts are sent through cell phone text messages and phone calls. Aarogyam uses an Interactive Voice Response System (IVRS), which automatically generates family specific reminder calls and SMSs in Hindi. It disseminates updates regarding immunisation for children from 0-5 years, the venue and date for vaccination delivery and also the ANC/PNC details of pregnant and lactating mothers based on the due dates for health service provision. Village Pradhans and the ANMs are also sent reminders about families currently not covered under maternal and child health service delivery facilities in order to ensure benefits of the system are equally distributed among families within the target areas.

*In-dialling facility*

Aarogyam also allows beneficiaries to interact with the system. By calling on a toll-free helpline number, beneficiaries can gather maternal and child health care information related to child vaccinations, antenatal care, postnatal care, institutional delivery and birth preparedness. This information has been pre-fed into the system and is provided to the beneficiary free of cost as per requirement.
Beneficiaries can also lodge specific health related complaints using the dial-in facility. These complaints are registered on the Aarogyam MIS and then attended to by in-charge health officials.

**CAPACITY BUILDING AND COMMUNITY AWARENESS GENERATION**

Standard operating procedures (SOP) were established and orientation of required officials at district and block level was done so as to streamline the data capturing, consolidation and reporting processes. Standardisation of required formats, periodicity of reporting, roles and responsibility of the field workers and accountability of health officials were also fixed.

The district administration held several rounds of training workshops for village pradhans, ASHA workers and ANMs for disseminating information regarding Aarogyam to target beneficiaries.

Community awareness was generated through films, songs, nukkad natak (street plays), distribution of pamphlets, display hoardings and such like to disseminate information about the project.

**MONITORING AND EVALUATION**

In order to monitor the proper functioning of Aarogyam system, regular monthly meetings are held with key stakeholders to assess the progress. Aarogyam also automatically generates pending lists with respect to unfulfilled targets for medical officers, ANMs, pradhans and beneficiaries. Based on this list, call alerts and SMSs are sent to all stakeholders every 10 days till the services are reported as delivered by the system.

The Aarogyam MIS reflects real time data on total number of grievances disposed, complaints pending in various offices, status of call alerts and SMSs sent on daily basis etc. This information is regularly accessed by key officials including the CMO and District Magistrate (DM) who then ensure that any visible gaps in health service delivery are attended to.

**Technology utilised**

The Aarogyam software has the following components:

- Management Information System (MIS) where health related data is uploaded and which facilitates web based monitoring.
- Interactive Voice Recording system (IVRS) and SMS service for sending automatic reminder alerts and responding to help line queries and grievances.

Aarogyam utilises the existing hardware at the PHC, CHC and CMO office. The computers at these offices are employed for use of the Aarogyam software.
**FUNDING**

The funds for Aarogyam have been secured under the Janani Suraksha Yojana scheme of the NRHM. Beneficiaries are not charged a user fee under the programme. The major costs incurred were in the process of developing the software which round out to an approximate amount of four lakh rupees. The running and maintenance costs of the programme are minimal as it utilizes existing human and infrastructural resources.

**IMPACT**

**IMPROVING ACCOUNTABILITY AND RESPONSIBILITY OF HEALTH SERVICE PROVIDERS**

Under Aarogyam, health related data of each individual in every household is captured and aggregated on a common web platform for monitoring by concerned officers. This monitoring provides a clear picture on status of health services, action taken by various departments involved and the rate of compliance by target population. Aarogyam has also streamlined processes for service providers by making available for them a comprehensive database that
helps them prioritise their work commitments as well as address gap areas. Instant messages and calls to service providers have resulted in more accountability and also ensured better and timely service delivery to the community.

The Aarogyam system has facilitated integration and effective participation of stakeholders at various levels such as ANMs, AWWs ASHAs, teachers and village pradhans in the delivery of health services and provides basis for rewards and incentives to well performing employees.

EMPOWERING THE COMMUNITY

Under Aarogyam, the economically and socially impoverished and illiterate families can avail information about medical services they are entitled to as per their health profile, demand services related to ANC, PNC and immunisations that was earlier denied to them and was the privilege of a select few. With Aarogyam, the beneficiaries have been able to understand the various types of health services available to them and are also able to report any non-compliance to the health and district administration. This sort of community feedback is providing valuable insight to the service providers regarding areas that need improvement.

BETTERING THE MATERNAL AND CHILD HEALTH SCENARIO IN U.P

With Aarogyam, there has been an improvement in the measurable health indicators in the state. Immunisation coverage particularly that of children has shown a significant positive trend over time. The coverage of Polio, BCG, Measles and Tetanus coverage has gone up from an average of 60 per cent in February 2008 to 91 per cent in February 2010. The number of institutional deliveries in the targeted districts has also risen.

The Aarogyam database has resulted in better planning of community level health programmes especially with regard to ANC, PNC checkups and immunisation drives. Health officials are now adequately informed about expected number of beneficiaries and can plan their activities and use of resources accordingly. This helps in avoiding wastage of medical and human resources. The model has also helped the Health Department to refocus its strategy on preventive healthcare whereby on the basis of the health indicators reported and demand...
generated, along with the complaints lodged in long term, precautionary measures can be timely planned and implemented.

Aarogyam has benefited more than 1.4 lakh families up to December 2010 in the three districts of operation in U.P., namely Baghpat, JP Nagar and GB Nagar. With its expansion to five other districts, it is expected to benefit about 2 lakh people more. As of July, 2011 more than 175,000 automated calls and SMSs have been sent by the system.

**PROVIDING A REPLICABLE MODEL FOR IMPROVING DELIVERY OF HEALTH SERVICES**

Since its development in 2008, Aarogyam has improved not just the RCH delivery processes in U.P but also impacted RCH processes across the country.

Given its remarkable performance, Aarogyam has received several awards and recognitions like the NASSCOM Social Innovation Honors 2010 and the M-Billionth Award 2010. It has also made it amongst the finalist in the run up for prestigious awards like the Stockholm Challenge and Manthan Award.

The Aarogyam model went on to become an inspiration behind the implementation of the Mother and Child Tracking Programme (MCTP) under the NRHM by providing a workable model to other Indian states for monitoring the delivery of maternal and child health services.

**CHALLENGES IN IMPLEMENTATION**

*Restricted administrative capacity*

The regular filing and submitting of data updates to the system at the block office is a time consuming mechanism and has added additional work load on the ANMs. This could be rectified by dividing the work responsibilities between ASHAs, AWWs and ANMs.

*Lack of a culture of transparency in government operations*

It was a very challenging task to motivate health professionals and village *pradhans* to support Aarogyam because it meant increased work load for them as well as tight monitoring of their functioning. However, with time the efficiency and usefulness of the system was successfully advocated to them and their cooperation secured.

*Low motivation among community members*

Getting the community on board was another significant challenge. Often the alerts sent out from Aarogyam were mistaken as promotional calls. Gradually, with time, the community has
been made aware about Aarogyam and the benefits it provides them with. As a result, the community has become more forthcoming.

**Technological challenges**

Aarogyam relies on telephonic communication to alert beneficiaries and government officials of health services due as well as to enable users to enquire about various diseases and medical services available. Therefore, in case of change in mobile numbers of stakeholders, the entire database needs updation in order to continue functioning effectively. In many instances, Aarogyam struggles to meet the desired output if the key stakeholders (officials and beneficiaries) change their mobile numbers unreported. Along with this, constant data upgrading remains a tedious task and for this purpose ANMs have to be given adequate incentives so that they perform this task with commitment.

**CONCLUSION**

While the Aarogyam team has already sent a proposal to the Government of Uttar Pradesh for replicating the programme in the entire state, teams from various state and central governments have met with them to learn from and adapt their model. The success of Aarogyam lies in its ability to develop a responsive healthcare model. Its sustainability now rests on the institutional will to leverage its potential in reforming rural healthcare scenario and utilising the data it provides for scanning other health indicators and promoting various health related campaigns. At the same time, it has to be ensured that Aarogyam continues to capture the health needs of beneficiaries over time adequately and is able to communicate this to service providers.

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**REFERENCES**


APPENDIX A – INTERVIEW QUESTIONNAIRE

BACKGROUND

1. Prior to the introduction of the ICT based initiative Aarogyam in 2008, what were the problems in delivering the required health care facilities (ANC, PNC and immunization) to pregnant women and new born children in Baghpat and J.P. Nagar districts? How were these problems being addressed?

2. Why was there a need to develop an ICT based maternal and child healthcare delivery system? How do you think is this ICT system going to be an improvement over existing mechanisms to provide and monitor health service delivery in the region?

3. Aarogyam seeks to address the problems of high Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR) in the target districts. Was it introduced to further the reproductive and child healthcare goals of NRHM? What are the specific maternal and child health issues that Aarogyam seeks to address and how does it plan to do so?

PROGRAM DESIGN

STAKEHOLDERS

4. The key stakeholders in the project are National Informatics Centre (NIC), District health Society-Baghpat and J.P. Nagar, PHCs, CHCs and rural health workers like ANMs and ASHAs. What are their roles and responsibilities?

5. Are there any other stakeholders? If yes, please explain their roles and responsibilities.

PROCESS FLOW

6. As per our research, Aarogyam began with surveys for collecting maternal and child related health information in the districts and mapping their current health status.
   a) Who was responsible for conducting these surveys? What was the unit of analysis for these surveys?
   b) Which health parameters do these surveys aim to measure?
   c) Who is responsible for aggregating the survey data? Where is it done?
   d) How often are the surveys conducted?

7. On the basis of the data collected, health alerts are sent to beneficiaries and health service providers about pending pregnancy and immunization issues through SMS and phone calls. Who is responsible for sending these alerts? What is the format of these alerts? Are they in the local language?

8. Beneficiaries can call a helpline for assistance with regard to their pregnancy and immunization needs and for grievance redressal.
a) How are these helplines managed? Were staff members specifically recruited for this purpose?
b) Who responds to the grievances? Is a record of the grievances maintained?
c) What are the charges that accrue to callers for this service?

**Awareness Generation and Capacity Building**

9. How was awareness generated among beneficiaries about Aarogyam and the purpose it serves? How did beneficiaries respond to this new ICT based system?
10. How was the support of service providers sought? Was there any resistance on their part? If yes, how was it overcome?
11. Were service providers given any training for using and maintaining Aarogyam? Is yes, please provide details of the training provided: resource persons, participants, exact content, methodology, duration, following up mechanisms.

**Technology**

12. Aarogyam has a web based monitoring portal for service providers that records all the maternal and child health related information about the area and an SMS and helpline facility to reach out to beneficiaries. What are technological specifications of both these components? Which software has been utilized? What is the hardware involved?

**Monitoring**

13. Who is responsible for monitoring the adequate usage of the software and to ensure that data is correctly updated and alerts are sent on time?

**Financial Costs**

14. What was the cost of development of the Aarogyam system? How were the funds procured? Please provide a breakdown of the major heads of expenditure.
15. What are the daily operational costs of the project? What are the current sources of funding?

**Impact and Potential**

**Achievements**

16. What have been the major achievements of Aarogyam?
17. How has Aarogyam impacted (a) health service providers, (b) target population, and (c) the overall maternal and child health scenario in the region?
CHALLENGES

18. What are the major challenges faced in the implementation of Aarogyam? How are they being overcome?

ENHANCEMENTS

19. What are the major enhancements planned for the future?
   a) How many more districts does Aarogyam plan to cover? Has there been any effort to advocate the up scaling of Aarogyam at the state level?
20. Have any other states shown interest in replicating Aarogyam? What do you think are the necessary preconditions for the success of such an initiative?
21. Please provide the following data:
   - Number of districts that Aarogyam covers
   - Data to show reduction in IMR and MMR as a result of Aarogyam
   - Pictures