AAROGYAM: An ICT-based community-centric approach for improving Reproductive and Child Health

Manju Khurana, OneWorld Foundation India
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About the Initiative

This publication is a part of the Capacity Building initiative under the National e-Governance Plan (NeGP) by NeGD with an aim to draw out learnings from various projects implemented in various States/UTs and sharing this knowledge, in the form of case studies, with the decision makers and implementers to benefit them, by way of knowledge creation and skill building, from these experiences during planning and implementation of various projects under NeGP.

Conceptualised and overseen by the National e-Governance Division (NeGD) of Media lab Asia/DeitY these case studies are submitted by e-Governance Practitioners from Government and Industry/Research Institutions. The cases submitted by the authors are vetted by experts from outside and within the Government for learning and reference value, relevance to future project implementers, planners and to those involved in e-governance capacity Building programs before they are recommended for publication. National Institute for Smart Government (NISG), working on behalf of this NeGD provided program management support and interacted with the authors and subject matter experts in bringing out these published case studies. It is hoped that these case studies drawn from successful and failed e-Governance projects would help practitioners to understand the real-time issues involved, typical dilemmas faced by e-Governance project implementers, and possible solutions to resolve them.

Acknowledgment

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Abstract

Aarogyam, an ICT based community driven approach, is an innovative initiative launched in Uttar Pradesh in 2008 with an aim to provide health care services to citizens at their door steps for ensuring safe motherhood and child survival components of Reproductive and Child Health (RCH). It prepares a complete health data base with respect to target group, that is, pregnant/lactating mothers and children in immunization age group. Once the data uploaded into Aarogyam software, automated calls are periodically generated to provide information on child immunization, ANC/PNC, safe delivery and pulse polio campaign through use of Integrated Voice Recording System (IVRS) and telecommunication technology. Aarogyam not only empowers the community with access to health related information and health care facilities but also provides an interactive platform to enquire about various health issues as well as file complaints on a prescribed helpline number. Currently, the project is functional in Bagpat, Amroha (earlier called J. P. Nagar) districts, Moradabad and Meerut mandals of the state.

Aarogyam has enhanced the government’s outreach to people for providing responsive health care delivery. It has contributed significantly to improvement in maternal and child health status in the target areas. Further, it has been able to empower the community by encouraging their active involvement in public health care system. The Mother and Child Health Tracking feature (MCTS) of Aarogyam has been upscaled to the national level and adopted for replication across the country under the National Rural Health Mission, Ministry of Health and Family Welfare, Government of India.

Key words: Infant mortality rate, maternal mortality ratio, reproductive and child health, antenatal care, prenatal care, immunization, Integrated Voice Response System, web portal, mother and child health tracking, Uttar Pradesh

Note to Practitioners

The case illustrates the successful use of IT in bringing about behavioral change in a measureable manner. It also illustrates the difficulties faced by a decentralised (at the district level) initiative in sustaining and replicating itself across the state. However, despite the lack of a top-down approach, Aarogyam’s success has resulted in its being incorporated into the National Rural Health Mission (NRHM) as the Mother and Child Tracking System (MCTS).

Note for Practitioners

- Aarogyam during its implementation was rolled out only in select districts of Uttar Pradesh. In order to give the initiative a pan-state presence, the support of the highest political and bureaucratic authorities such as Chief Minister of the state and the Chief Secretary should be leveraged to the extent possible in order to facilitate
the project’s take off in the entire state. Furthermore, this support will be crucial to the sustainability of the initiative as difficulties in securing funds will be greatly eased.

- Aarogyam’s mother and child tracking system is based upon a comprehensive baseline household health survey undertaken in the target districts. The data may also be sourced from other centralized data bases such as the District Level Household Survey (DLHS). The measure will make it easier to expand the initiative in the entire state during replication.

- Since the initiative is directly linked with enhancing Reproductive and Child Health, it is imperative to have direct communication with women themselves, the beneficiary of the programme. In rural settings women do not always own phones and their access to their husband’s phones can be limited. The scheme must take this into account when devising an Information Education and Communication (IEC) strategy that uses IVRS, SMS or other mediums. Thus women’s access to mobile is another important aspect which needs to be studied under the project.

- There are multiple procedures through which data is entered onto the MIS. This results in redundant human labour, manual data entry at some stages and has in-built danger of data inconsistency. Practitioners can devise ways of re-engineering the data entry process so that it involves minimal steps and no manual entry. One possible solution to this is providing field workers with tablet PCs on which data entry can be directly done. This approach is currently in use by the Government of Bihar in its monitoring of educational infrastructure and also in monitoring the Mid Day Meal scheme. The main component of the programme, the MCTS, is premised upon the existence of a sound telecommunication network so that the calls/SMSes reach the beneficiaries. For best results efforts should be taken by implementing agencies to ensure that all households have mobile phones and network coverage is reasonable in the area.

**Notes for instructors**

The case study shows how IT can be used to supplement human efforts to bring about behavioral change. The success of this approach can be seen firstly through the continuous improvement in health indicators in the regions where it was implemented and secondly in the adoption of the application by the Government of India at the central level.

There are a variety of academic perspectives outlined in the case which can be used by instructors. Apart from behavioral change using IT, it can be used in programmes of public health management as Aarogyam has other components as well. It can also be used in public administration courses to study how to build the capacities of existing personnel to take on new responsibilities. As the sustainability of the project was one of its weaker
points, it can also be studied in public finance courses to devise strategies of ensuring its sustainability. Lastly, as the programme has brought in transparency in operations, strengthened monitoring and evaluation and improved the planning capacities of implementing agencies in general, it can be taught as part of e-Governance courses. Aarogyam has been able to bring a remarkable change in IMR and MMR in the target districts. In this context how do you evaluate the success of initiative? Does it make it a replicable example? What are the key factors for its success?

- If the project is taken up in the entire district, how would you plan and implement the initiative?
- Would you suggest a PPP model for its successful implementation? How would you share the responsibilities between the partners?
- What strategies would you adopt for community awareness generation? Are the current awareness generation programmes adopted by Aarogyam sufficient enough?
- What would you suggest to have an efficient data base management system i.e. the basic pre-requisite for carrying out the project activities?
- The existing system requires the ANMs to maintain beneficiaries’ register at block level. Having similar data increased data redundancy and results in increased workload on ANMs. What measures would you suggest to decrease ANMs workload so as to facilitate optimum utilization of the skills they are trained for i.e. providing health care services?
- What measures would you suggest to increase the motivation levels of the health workers?

The initiative can be taken as an example while teaching courses on Hospital Management, Public Health Programmes, ANMs/ASHA Training Programmes Nursing, Change Management, Behavioral Psychology, e-Governance. It may also be incorporated as a case study section for MBBS curriculum.
1 Project Context

Infant Mortality Rate (IMR)\(^1\) and Maternal Mortality Ratio (MMR)\(^2\) are critical indicators of human development as referred to in Millennium Development Goals (MDGs)\(^3\). MDG 4 targets to reduce infant mortality by two-thirds between 1990 and 2015 and MDG 5 specifically focuses on improving maternal health by 2015 through universal access to reproductive health. In this context, India has reported an IMR of 47 per 1000 live births against MDG 4 target of 28 per 1000 live births (SRS 2010)\(^4\). Similarly, India’s current MMR is 212 per 100,000 live births (SRS 2007-09)\(^5\) against the MDG 5 target of 109 per one lakh live births by 2015.

Maternal and child health care has been a priority policy area for the Government of India, which has enunciated a range of initiatives to reduce the IMR and MMR in the country. The Reproductive and Child Health (RCH) Programme\(^6\) was introduced by the government in 1997 and subsequently integrated with National Rural Health Mission (NRHM) in 2005. Janani Suraksha Yojana\(^7\) is a significant component of the NRHM to address issues of maternal and infant mortality by providing cash incentives to women who choose institutional delivery. Despite these efforts, statistics indicate that much remains to be done in this field of health care in the country.

State level analysis by NRHM (2012)\(^8\) indicates Uttar Pradesh as the worst performing state, reporting highest IMR (61 per 1000 live birth)\(^9\), highest MMR (359 per 100,000 live births)\(^10\), lowest contraceptive prevalence rate (31.2 percent)\(^11\) and highest percentage of

\(^{1}\) IMR measures number of infant( < 1 year) deaths per 1000 live births

\(^{2}\) MMR measures number of women aged 15-49 years dying due to maternal causes per 1,00,000 live births

\(^{3}\) MDGs set of numerical & time-bound targets to measure achievements in human and social development laid down by the UN


\(^{6}\) RCH Phase I was launched with an objective to reduce total fertility rate, infant mortality rate and maternal mortality rate to realize the outcomes envisaged in Millennium Development Goals in 1997 followed by Phase II in 2005 (http://www.mohfw.nic.in/NRHM/RCH/Background_new.htm)

\(^{7}\) JSS was introduced as an intervention strategy for safe motherhood under NRHM on 12 April 2005. It is a 100 percent centrally sponsored scheme integrated with cash assistance for delivery and post-delivery care. (http://jknrhm.com/PDF/JSR.pdf)


unmet need for family planning (21.2 percent)\textsuperscript{12}. It may be attributed to lack of awareness among women about importance of prenatal care (PNC) and antenatal care (ANC), inadequate infrastructure as well as medical facilities and assistance during delivery, incomplete immunization and improper treatment for birth related problems. Particularly in the rural areas of the state, insufficient and poorly trained human resources pose a major challenge to health care delivery system. There is a severe shortage of nurses and specialists, thereby increasing the workload on a single Auxiliary Nurse Midwife (ANM).\textsuperscript{13} Financial monitoring report (2008-09) of RCH of UP reflects institutional strengthening as key area of concern with expenditure of less than 50 percent of the approved Priority Infrastructure Plan (PIP).

Thus, with a specific focus on maternal and child health in the rural areas of Uttar Pradesh, Aarogyam was introduced by the District Health Society, Government of Uttar Pradesh in 2008 as an ICT based health mapping and pregnancy tracking programme. The concept and idea behind this innovative initiative was provided by Ms. Ritu Maheshwari, Ex-District Magistrate, J. P. Nagar and Mr. Mayur Maheshwari, Ex-District Magistrate, Bagpat. It is based upon active participation of all concerned key stakeholders, namely local administration, doctors, front line health workers - ASHA (Accredited Social Health Activists), ANM, AWW (Angan Wadi Workers), village heads and beneficiaries. It aims to ensure ANC, PNC and 100 percent immunization of children for a safe motherhood and child survival.

Initiated in Bagpat and Amroha (earlier called J. P. Nagar) districts of Uttar Pradesh, Aarogyam was expanded to another eight districts of Moradabad and Meerut mandals of the state in 2010.

2  Project Overview

2.1  Project Objective

With the problems identified in public health care system in ensuring safe motherhood and child survival, Aarogyam project was envisaged as an ICT based health delivery system with following objectives:

- Tracking each pregnancy in the target area with the help of a technology based monitoring system
- Ensuring complete ante and post natal care for pregnant and lactating mothers through ANC visits, institutional delivery and promotion of Janani Suraksha Yojana (JSY)
- Providing 100 per cent immunization to pregnant women and children in the age group of 0-5 years

Salient features of Aarogyam:

- Prepares a complete health data base of pregnant/lactating mothers and children in immunization age group
- Disseminates information on basic mother and child health care through combination of telecommunication and IVRS technology
- Facilitates involvement of rural health workers and village pradhans for community mobilization
- Covers Bagpat and Amroha districts, Moradabad and Meerut mandals of Uttar Pradesh
- Has benefited more than 2 lakh families so far
- Mother and Child Tracking System of Aarogyam replicated at national level under the NRHM
### 2.2 Key Stakeholders

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>District Health Society Government of UP and Ministry of Health and Family Welfare, Government of India</td>
<td>Implementing agencies of Aarogyam</td>
</tr>
<tr>
<td>Rural health workers (ANM/ASHA/AWW)</td>
<td>Collection, aggregation and updation of data related to pregnant women and infants</td>
</tr>
<tr>
<td>School teachers and Shiksha Mitra (contractual teachers at village level)</td>
<td>Generate awareness on Aarogyam through school health programmes</td>
</tr>
<tr>
<td>Community leaders like village pradhan</td>
<td>Points-of-contact for basic information on maternal and child health care</td>
</tr>
<tr>
<td></td>
<td>Generating awareness about health care at the village level</td>
</tr>
<tr>
<td>Data operators at block and district level</td>
<td>Responsible for data uploading and ensuring its consistency in Aarogyam system</td>
</tr>
<tr>
<td>National Informatics Centre and Techtronic</td>
<td>Techtronic, a Delhi based software company, developed Aarogyam software</td>
</tr>
<tr>
<td></td>
<td>Currently, NIC is responsible for its overall supervision</td>
</tr>
<tr>
<td>Pregnant/lactating mothers and children aged 0-5 years</td>
<td>Key beneficiaries of the programme</td>
</tr>
</tbody>
</table>

**Figure 1: Key Stakeholders in Aarogyam**

**Source:** OneWorld Foundation India, 2013
## 2.3 Implementation Strategy

Aarogyam is based on a four-pronged approach - *proactive, interactive, reactive and educative* – to enable beneficiaries to have access to basic maternal and child health care facilities at their door step with a higher degree of transparency and accountability in service delivery. Figure 2 provides details of the implementation strategy adopted for Aarogyam.

<table>
<thead>
<tr>
<th>Proactive approach</th>
<th>Interactive approach</th>
<th>Reactive approach</th>
<th>Educative approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Disseminate information through out dial system</em></td>
<td><em>Based on a dial in option</em></td>
<td><em>Adopt auto dial/SMS system</em></td>
<td><em>Disseminate information on health related campaigns</em></td>
</tr>
<tr>
<td>• Immunization details of child from 0-2 years and place of immunization</td>
<td>• Beneficiaries can avail basic maternal and child health information and lodge their complaints for grievance redressal on Aarogyam helpline</td>
<td>• Provisions to monitor and track pregnancies</td>
<td>• Pulse Polio Campaign</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reminder calls to ANMs/Village Pradhans to expand the coverage of services in their respective areas</td>
<td>• Anti-Epidemic Campaign</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Effective and quick redressal of grievances</td>
<td>• Benefits of Janani Suraksha Yojana</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Gender equality</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Pre Natal Diagnostic Test (PNDT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Directly Observed Treatment Short Course of Tuberculosis (DOTS)</td>
</tr>
</tbody>
</table>

*Figure 2: Four pronged approach adopted by Aarogyam for provision of health care services*

*Source: OneWorld Foundation India, 2013*
2.4 Programme Components

![Diagram of Aarogyam components]

**Mother and Child Tracking System**
- Baseline health survey
- Allotment of unique IDs to beneficiaries
- Data uploading and dynamic data updation

**Interactive Voice Response System**
- Out-dial facility: Call alerts and SMSes sent to beneficiaries for health-related information, to ANMs and village pradhan about ensuring full coverage of community under the project
- In-dial facility: Provides health-related information and grievance redressal to beneficiaries through a toll-free helpline

**Web Portal**
- Using MIS, data collected during baseline survey is made available on portal
- Can be accessed by key healthcare professionals
- Makes real time reports available to review by relevant stakeholders
- Provision for registering complaints and complaint status tracking by the public

**Monitoring and Evaluation**
- District level review committee
- Standard Operating Procedures adopted
- Monitoring through Aarogyam web portal; includes automatic generation of pending lists in terms of unfulfilled targets; call alerts sent to relevant stakeholders

**Training and Awareness Generation**
- Capacity building of frontline healthcare workers at the grassroots
- *Nukkad natak*, documentary screenings, *gram sabha* meetings, pamphlets, hoardings etc. utilized for awareness generation among community members

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**Figure 3: Primary Components of Aarogyam; Source: OneWorld Foundation India, 2013**

**2.4.1 Mother and Child Tracking System**

This feature comprises of three components -

i. Baseline health survey

ii. Allotment of identification number to beneficiaries
iii. Data uploading and dynamic data updation

**Baseline health survey**

Aarogyam’s mother and child tracking system is based upon a comprehensive base line household health survey undertaken in the target districts. The survey is conducted in coordination with Department of Medical Health and Family Welfare and Department of Integrated Child Development Scheme, Government of Uttar Pradesh. Data is collected in a standardized format on 13 predefined health indicators that include immunization details of infants and pregnancy related information with expected dates of delivery along with health care services availed by women till that time. The ANMs and ASHA workers associated with Community Health Centre (CHC)/Primary Health Centre (PHC) are the main functionaries in this process.

**Allotment of identification number to each beneficiary**

Base line health survey is followed by assignment of an 8 digit unique ID to each household. The beneficiary ID constitutes of block code (first two digits), village code (second two digits) and a beneficiary code (last four digits). This unique ID number enables to track the health of mother and her child in the system. In this manner, every beneficiary of the programme has a designated space in the health care system and can use the identification number to access health related information or lodge a complaint through in-dial system. Every month household health survey is undertaken by ANMs with unique IDs assigned to new beneficiaries.

**Data uploading and dynamic data updation**

Data collected manually in a standard format during the base line survey is uploaded in preformatted excel sheets by data entry operators at the block level. The data is further collated into Aarogyam software at the office of Chief Medical Officer (CMO) at district level. Using the Management Information System (MIS), information is made available on a web based monitoring portal. The Aarogyam portal and can be accessed by key health professionals. The MIS makes real time reports on project available for review by relevant stakeholders.

2.4.2 **Interactive Voice Response System (IVRS)**

With the aim of bridging the gap between target and delivery of health care services, Aarogyam uses on IVRS to disseminate information to beneficiaries on basic maternal and child health care. This is followed by provision of health care facilities through PHCs or CHCs. It also enables them to seek immediate redressal of their grievances or information on any health related issues. IVRS is utilized for providing (i) out-dialing and (ii) in-dialing facilities under Aarogyam.

**Out-Dial Facility**
Once the health statistics of a household have been collated in Aarogyam data base, the household’s reproductive and child health is monitored regularly and alerts are sent through text messages/phone calls. Household health information is fed into the system on the basis of the family ID and is linked with IVRS system. The technique employed uses analog/digital cards to read the data and disseminate it to beneficiaries through free auto dialer and SMS in Hindi. Alert calls and SMSs are sent simultaneously to the beneficiaries; this ensures that even if a person is unable to receive a phone call at a particular time, the information is delivered to him/her and can be read later. However, owing to numerous instances of information being sent to households without a literate member, the Aarogyam system has adopted measures to follow up on missed phone calls by calling again. Since there are 6 vaccinations under child immunization programme, a minimum of 6 calls are made to each family along with ANC/PNC call alerts.

The out-dial facility extends to ANMs and village pradhans being sent reminders about families not covered under maternal and child health facilities to expand the coverage of services and facilitate community participation in public health delivery.

**In-Dial Facility**

Aarogyam has evolved an interactive module enabling the beneficiaries to have access to information on any health related issue and to seek redressal of their grievances through its in-dial facility. The Aarogyam Helpline operates in every district where the programme is implemented. The helpline can be accessed through a toll free number, which differs for every district. For instance, the Bagpat IVR No. is 0121-2222509 while that for J.P. Nagar is 05922-252038/252026. The helpline can be used for two purposes – (i) to seek maternal and child health care information, and (ii) grievance redressal. All phone calls are recorded for monitoring and evaluation purposed. The system is manned by date entry operators to provide information, pre-fed in the system, to beneficiaries free of cost as per their requirement. Once the complaints are registered on the MIS by the operator, they are forwarded to concerned medical officials for further action. The complaints are usually responded to within two days and the solution/action to be taken is relayed to the complainant through the out-dial facility of Aarogyam. In case the complaint requires field level action and redressal over the phone is not viable, village level health workers reach out to the complainants.

Currently, there are two lines for in dial facility; thus, a maximum of two calls can be handled at a time. In order to have access to any health related information or to lodge a complaint, the complainant must have the beneficiary ID number as provided by the ANM.

Figure 4 provides a detailed process flow of the functioning of the in-dial facility of Aarogyam.
Figure 4: Process flow of in-dial facility under Aarogyam,
Source: OneWorld Foundation India, 2013
2.4.3 Aarogyam Web Portal

![Aarogyam Web Portal Screenshot]

**Figure 5: Screenshot of Aarogyam web portal home page**

*Source: Aarogyam, 2013*

The web portal ([http://aarogyam.co.in/index.html](http://aarogyam.co.in/index.html)) provides an overview of Aarogyam. In particular, it consists of the following information:

- Genesis of Aarogyam and details of its functioning
- List of project districts along with the web links to district administration websites
- Recommended immunization schedule followed in India
- ‘Register Complaints’ section that provides an online form for filing complaints
- Provision for tracking the status of the complaint
- Media coverage of the initiative
- Links to contact the implementing agents

2.4.4 Training and Capacity Building

Initially, various training sessions were organized to build the capacity of ANMs, data entry operators, and other health staff at district and block level to orient them with the functioning of the programme, the objectives of the initiative, and its intended impact. In order to ensure efficient delivery of health services, regular meetings are held with key stakeholders to assess the need for any further training, thereby making capacity building a continuous exercise to ensure all stakeholders work in tandem with one another so that gaps in service delivery and monitoring are duly addressed.
2.4.5 Community Awareness Generation

Since Aarogyam adopts community participation as a key component of its implementation strategy, community awareness is a basic prerequisite for making this initiative a success. Number of awareness generation programmes has been designed to facilitate participation of community members, particularly women. This is done through screening of documentaries, songs, nukaad natak (street plays), distribution of pamphlets, display of critical information on roadside hoarding and such like. Regular gram sabha meetings are held in the villages and information on significance of maternal and child health care is disseminated. ANMs, AWWs and village pradhans are critical agents in promotion of primary health care.

2.4.6 Monitoring and Evaluation

One of the key factors for the success and sustainability of an initiative is adoption of a robust mechanism for regularly monitoring its progress and evaluating the impact against set standards. Under Aarogyam, various measures have been adopted to this effect:

- A district level review committee headed by the District Magistrate is entrusted with the responsibility of monitoring the project, with support from supervisors at the village and block levels.

- Standard operating procedures were adopted at the time of programme initiation. This was followed by orientation sessions for human resource to acquaint personnel with the with initiative procedures involved and mechanisms at village, block and district levels so as to streamline the data capturing, consolidation and reporting processes. Standardized formats are adopted for a uniform pattern of monitoring and evaluation, with a fixed periodicity of reporting and pre-defined roles for all the concerned stakeholders. Aarogyam web portal permits key stakeholders such as Chief Medical Officer and District Magistrate (DM) to monitor the status of health care service delivery with specific focus on disposal of grievances, pending complaints, call alerts, and SMS sent on dial basis.

- The system also includes a mechanism for automatic generation of pending lists with respect to unfulfilled targets for medical officers, ANMs, pradhans and beneficiaries through MIS report. These include reports on vaccinations for mothers, pending child immunization, SMS report, ANM/pradhan call report, polio report, complaint reports and such like. All these reports are uploaded for effective monitoring by district level officers right from District Magistrate to Chief Medical Officer. Based on this, call alerts are sent to all stakeholders within 10 days till services are reported as delivered by the system.
2.5 Technology Adopted

Aarogyam health care system is based on innovative use of IVRS and telecommunication technology to expand health care service in rural areas of Uttar Pradesh. It constitutes a central server with two client server that is connected to IVRS system operating on multiple phone lines at district level. Another system at block level CHC/PHC ensures maintenance of client details and regular updation. There is a provision for regular maintenance of Aarogyam software and hardware system at the district and block levels, adopted at the time of inception and funds are released accordingly.

2.6 Financial Costs

Funds for Aarogyam are secured under the Janani Suraksha Yojana of NRHM, Government of India. The expenditure incurred on Aarogyam can be classified under two heads – (i) set-up costs, and (ii) recurring costs. Figure 6 provides a detailed break-up of the financial costs involved.

<table>
<thead>
<tr>
<th>Heads of expenditure</th>
<th>Amount (in INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Set up cost</strong></td>
<td></td>
</tr>
<tr>
<td>Base line survey</td>
<td>1,70,000</td>
</tr>
<tr>
<td>Awareness generation</td>
<td>3,60,000</td>
</tr>
<tr>
<td>Training and capacity building</td>
<td>80,000</td>
</tr>
<tr>
<td>Technology set up at district and block level</td>
<td>10,00,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16,10,000</strong></td>
</tr>
<tr>
<td><strong>Recurring cost</strong></td>
<td></td>
</tr>
<tr>
<td>Monitoring and documentation</td>
<td>30,000</td>
</tr>
<tr>
<td>Stationary and miscellaneous cost</td>
<td>1,00,000</td>
</tr>
<tr>
<td>Human resources</td>
<td>4,80,000</td>
</tr>
<tr>
<td><strong>Total recurring cost</strong></td>
<td><strong>6,10,000</strong></td>
</tr>
<tr>
<td><strong>Total cost per year per district</strong></td>
<td><strong>22,20,000</strong></td>
</tr>
</tbody>
</table>

*Figure 6: Financial Implications of Aarogyam*

*Source: Aarogyam, 2012 and OneWorld Foundation India, 2013*
3 Project Outcomes

3.1 Improvement in maternal and child health in target areas

With the launch of Aarogyam project in 2008, there has been a remarkable improvement with respect to various indicators of maternal and child health. Immunization of children has shown a positive trend in the project areas. Similarly, the number of institutional deliveries has increased in the targeted districts i.e. from 4,333 in 2008 to 12,774 in 2010\textsuperscript{14}. The statistics (Figures 7 and 8) for district Bagpat reflect a marked improvement in maternal and child health status since the implementation of Aarogyam.\textsuperscript{15}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure7}
\caption{Impact of Aarogyam on child immunization in district Bagpat}
\label{fig:7}
\end{figure}

\textbf{Figure 7: Impact of Aarogyam on child immunization in district Bagpat}
\textit{Source: Computer Society of India, 2011}

\textsuperscript{14} Stockholm Challenge Web: 14 February 2013 < http://www.stockholmchallenge.org/project/2010/aarogyam>

3.2 **Enhanced transparency and accountability in health care delivery system**

Aarogyam software allows preparation of health related data base of beneficiaries on common platform enabling the concerned officials to review the gaps between target and delivery. It enables them to mobilize health care staff at field level in order to ensure efficient service delivery. Besides generating awareness among beneficiary households, instant messages and reminder calls are also sent to health service providers (like ANMs, MOs) to prevent pendency of cases as well as involve community members in the process of health care provision. The responsiveness and accountability of government health care service providers has increased significantly as is evident from a positive trend in indicators like TT Mother, BCG, DPT, DPT Booster, and Measles.

3.3 **Improvement in community health behavior through knowledge empowerment and participation**

Aarogyam is based upon behaviour change strategies to improve the reproductive and child health through disseminating information specific to beneficiaries and organizing mass general awareness programmes. It also enables them to air their grievances and doubts and seek redressal and clarification by calling Aarogyam’s helpline number or by registering complaints on web portal in case of any non-compliance in health service delivery. This implies that the community has been empowered to seek information rather than merely be silent receivers of knowledge.
Participation of the community has been made possible due to the user friendly approach adopted by Aarogyam in deploying technology to enable the community. Information is available in vernacular languages as well, hence user engagement is ensured and does not require a particular level of literacy. Further, information delivery and grievance redressal is available through toll free helpline, negating the cost accruing to the users for engaging with the system proactively.

3.4 Effective planning and monitoring

Aarogyam relies heavily on the use of ICT to provide a reliable system for better planning of community level health care activities like ANC/PNC and immunization. It provides a complete data base of all beneficiaries in the target areas. Since the frontline, community level health care providers are involved in the programme, the data gathered is authentic and regularly updated. One of the critical hurdles to effective planning of government schemes and programmes is the unavailability of updated data on the beneficiaries; Aarogyam deals specifically with this challenge and has provided a well-functioning solution to it.

In a related manner, the Aarogyam software has information on performance of the programme along predefined health parameters. This has facilitated micro-level monitoring and evaluation of programme performance and its impact. It enables periodic and easy identification of areas and communities where the programme has not performed as per expectations, thereby making it possible to take corrective measures at a short notice without wasting further resources. Since the data gathered is uploaded in real time and is available to the public through reports, Aarogyam has brought about transparency and accountability in health care service provision.

3.5 Provision of a replicable model for improving delivery of health services

Since its inception, Aarogyam has been able to bring in remarkable change in RCH status of project districts and its mother and child tracking system has been replicated at national level as an integral component of NRHM. An evaluation conducted by a team from the National Institute of Health and Family Welfare in 2009 reflected satisfaction with the way the project was conceived and launched in Uttar Pradesh. Health departments of Punjab, Rajasthan and Bihar have shown keen interest in replication of Aarogyam in their states. Various NGOs like the Rotary Club Foundation, Public Health Foundation of India are also willing to replicate key approaches and relevant practices from the project in their own fields. According to the government officials involved in initiation of the project, Aarogyam

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may also be replicated to bring about transparency in different schemes implemented by various government bodies with a constant review of the gap between target and service delivery.

3.6 Awards and Recognitions

Realizing its potential in improving basic health care services at the community level, Aarogyam has been recognized at national and international level through awards like the National e-Governance Award 2011, U.P. State Government e-Governance Award 2009-10, NASSCOM Social Innovation Award 2010, M-Billionth Award 2010, Federation of Indian Export Organizations (FIEO) Telecom Technology Award 2011, Finalist - Stockholm Challenge 2012, and the CSI Nihilent Award 2011 (District category). It had also been recommended for the UN Public Service Award by the Government of Uttar Pradesh in 2012.

4 Challenges in Implementation

4.1 Lack of motivation among ground level workers

One of the major challenges in project implementation was lack of motivation and resistance on part of ground level workers like ANMs/ASHAs and AWWs. Apart from regular baseline survey, the ANM, ASHA and AWW are also entrusted with the responsibility of maintaining village level register and providing health care services, which led to an increase in their workload without concomitant increase in human resources. This led to widespread resistance on their part to to collect data or fill data information sheets for households on basic mother and child health care and largely cooperate under the Aarogyam model. In the absence of a job card being generated by the MIS, they unable to plan their work schedule, thereby reducing ease of work. Gradually, the implementing agency was able to overcome these challenges with regular training programmes and overall capacity building of the frontline health workers at the grassroots.

4.2 Inconsistencies and delay in data entry

Every month, a household health survey is undertaken by ANMs, which is followed by data uploading by data entry operators in preformatted excel sheets at the block level. Later on the data is entered into Aarogyam software at the office of Chief Medical Officer (CMO) at the district level. Since there is manual data entry involved at multiple levels, the process is cumbersome and has the potential to result in data inconsistency as well as delays in data entry. The entire planning and monitoring of health care service delivery under Aarogyam depends on updated and reliable data. Therefore, this is a loophole that needs to be addressed at the earliest.
4.3 Technical challenges

An efficient telecommunication system is one of the most basic pre requisites for successful implementation of Aarogyam. Alerts can be sent to beneficiaries and concerned government officials and other stakeholders only through telephonic communication. In case of change of numbers, the whole data base needs updation. Any system based on telecommunication connectivity faces the challenge of poor network in remote areas. This undercuts the success of the project. In order to resolve this, it would be helpful to devise alternate mediums as well to reach out to beneficiaries as well as enable them to contact Aarogyam for grievance redressal or resolution of queries.

5 Key lessons

Aarogyam was initiated as an innovative model of health care delivery under the guidance and motivation of the Government of India and the Government of Uttar Pradesh. Owing to the widespread poverty in rural UP, the role of the private sector in delivering healthcare had limitations. The ‘latent demand’ for healthcare was thus met keeping the social context in mind and the government took the role of prime mover. It is noteworthy to mention here the proactive role of young bureaucrats in taking the initiative ahead. Thus, any innovation in public service delivery is successful and sustainable only if it enjoys government support as well as fulfills grassroots need.

It also provides community members a stake in the management of the system, ensuring a degree of responsiveness to the community and removing the passivity that accompanies centralized ‘command-and-control’ initiatives. It weaves in all the concerned health officials at the district, block and village level, technical personnel as well as community leaders. Key roles such as identification of beneficiaries and monitoring and evaluation are carried out by functionaries who are from the community such as ASHAs and AWWs, thus ensuring sensitivity to the context. Beneficiaries can also avail of the grievance redressal system, enabling implementing agencies to obtain feedback and carry out course-correction. Thus, a pro-active collaboration of all the key stakeholders with an efficient delegation of powers makes such initiatives successful.

Lack of awareness is an important factor that limits the access of beneficiaries to public services. Aarogyam covers a long period of time, beginning from pre-natal care to post-delivery immunisation of children. Not only does it cover the entire procedure right from awareness generation to monitoring and evaluation, it puts in place a formal mechanism for behavioral change. Behavioral change is a long—term process and a key principle of behavioral psychology is ‘conditioning’ or the periodic repetition of a message. Aarogyam thus ensures systematic and periodic outreach to beneficiaries, enhanced by the use of vernacular languages that makes it easily accessible to illiterate citizens as well. It therefore stands as a demonstration of how behavioral change can be carried out using technology.
In UP in particular and in many other parts of India, especially rural India, patriarchy, caste and religion are strongly entrenched social institutions, limiting the flow of information on a sensitive topic such as reproductive health. Given such a context, the technique of dissemination of information through IVRS calls or SMS is a personalized method that bypasses the difficulties modes of communication that involve human interaction might face or have faced. However the system does use more public modes of dissemination as well such as community awareness sessions and street plays, and here it has the advantage of transforming reproductive and child health into a public issue that men too should be aware of instead of it being seen as an exclusively women and child issue.

Aarogyam with its user friendly technology and systems approach has been able to expand the reach of health care services at grassroots level utilizing the existing staff at block and village level specifically ANMs/AWWs with relevant skill training. However it increased their workload, de-motivating the human resources involved. The existing system needs modification in terms of making it friendly for service providers. Aarogyam generates MIS reports on various aspects of mother and child health care, but there is no provision for automated job cards or work schedules for ANMs, ASHAs or AWWs, based upon the data collated. If the technology adopted may generate such reports, it would enable the ANMs/ASHAs and AWWs to plan their work schedule and would automatically ease of work would follow.

Consistency and efficiency in data management and data updation are some key parameters for successful implementation of ICT based initiatives specifically in the domain of public service delivery. Data entry into Aarogyam software is done at district level after which it is uploaded in preformatted MS Excel sheets by data entry operators at the block level. Separate registers are also maintained by ANMs at the village level. Thus with multiple level data handling there is likelihood of higher level of inconsistencies and delay in data uploading. Thus the existing system requires a systematic approach to streamline data updation and data management with consistency and efficiency. Unavailable or inaccurate statistics pose a challenge to policy makers for effective policy formulation and limit the efficacy of programme implementation and monitoring and evaluation.

Aarogyam has an interactive web portal which enables the beneficiaries to address their grievances online but it does not permit them to view the reports on mother and child health status as generated by the MIS. These are only accessible to the concerned stakeholders. If the relevant statistics on RCH status are available in the public domain, it would enhance the transparency of the approach and increase people’s faith in the system.
6 Research Methodology

Aarogyam is an ICT based community driven approach to reach out to socially and economically marginalized section of the society, with special focus on maternal and child health. It uses modern ICT techniques for digital health mapping and pregnancy tracking. It therefore prepares a complete data base of the beneficiaries’ families’ so as to bridge the gap between targets and service delivery. In order to understand the process involved and its implementation strategy, the OneWorld Foundation India research team conducted a thorough secondary literature review to understand the basic working design and benefits of the initiative. Main sources of reference included the Ministry of Health and Family Welfare website, Aarogyam web portal, SRS reports, NFHS Surveys, DLHS Surveys, MDG Reports, and Planning Commission Documents.

After identifying a set of unique features and benefits of the practice, the same were confirmed through a telephonic interview with Special Secretary, Department of Irrigation, Government of Uttar Pradesh, who was the IAS officer responsible for the conceptualization of the project.

7 References

- Aarogyam website. Web: 7 February 2013 www.aarogyam.co.in


• Synchronized health service Web: 11 February 2013 <http://ehealth.eletsonline.com/2013/01/synchronised-health-service/>

8 Case Fact Sheet

I. Demographic information:

<table>
<thead>
<tr>
<th>Year</th>
<th>All India</th>
<th>Uttar Pradesh</th>
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<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Male</td>
</tr>
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<td>2001</td>
<td>66</td>
<td>64</td>
</tr>
<tr>
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<tr>
<td>2010</td>
<td>47</td>
<td>46</td>
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</table>

Source: Sample Registration System, Office of Registrar General of India, Government of India
Critical health indicators of maternal and child health in Aarogyam districts (2007-8)

<table>
<thead>
<tr>
<th>Maternal health</th>
<th>Bagpa</th>
<th>Amroha</th>
<th>Meeru</th>
<th>Moradabad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mothers registered in the first trimester of pregnancy</td>
<td>52.6</td>
<td>19.7</td>
<td>49.0</td>
<td>23.5</td>
</tr>
<tr>
<td>Pregnant mothers with at least 3 ANC visits</td>
<td>34.2</td>
<td>19.2</td>
<td>28.0</td>
<td>20.2</td>
</tr>
<tr>
<td>Pregnant mothers with at least one TT injection</td>
<td>78.3</td>
<td>58.2</td>
<td>73.0</td>
<td>56.9</td>
</tr>
<tr>
<td>Institutional birth</td>
<td>32.1</td>
<td>27.3</td>
<td>38.8</td>
<td>24.0</td>
</tr>
<tr>
<td>Mother who received PNC within 48 hours of delivery</td>
<td>86.3</td>
<td>25.1</td>
<td>59.8</td>
<td>38.3</td>
</tr>
<tr>
<td>Child immunization status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children (12-23 months) fully immunized (BCG, 3 doses each of DPT, and Polio and Measles)</td>
<td>26.3</td>
<td>29.7</td>
<td>34.8</td>
<td>22.0</td>
</tr>
</tbody>
</table>

Source: District Level Health Survey (DLHS-3), 2007-08, MoHFW, GoI

I. Sector to which the project belongs to: ICT and Reproductive and Child Health

II. Stakeholder and beneficiaries:

   i. Stakeholders-Rural health workers like ASHA, ANMs, AWWs; CHCs and PHCs; Village Pradhans; Data operators at block and district level; Department of Basic Education, NIC and other private software companies

   ii. Beneficiaries-Pregnant/lactating mothers and children below five years of age

III. Calendar of major events:

<table>
<thead>
<tr>
<th>Event</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lunch of Aarogyam in Bijnore and Amroha districts</td>
<td>2008</td>
</tr>
<tr>
<td>Launched in districts of Moradabad and Meerut Mandal</td>
<td>2010</td>
</tr>
<tr>
<td>Pregnancy tracking system taken over under MCTS of NRHM all over India</td>
<td>2011-12</td>
</tr>
</tbody>
</table>

IV. Funding sources: Secured under Janani Suraksha Scheme of NRHM, Ministry of Health and Family Welfare, GoI

V. Services offered:

   i. Tracking each pregnancy in target area with technology based monitoring system
ii. Complete ANC and PNC for pregnant/lactating mothers

iii. 100 per cent immunization for pregnant women and children in the age group 0-5 years

iv. Grievance redressal on health related issues through a dial in option on helpline number

v. Information dissemination on various health campaigns to promote maternal and child health

VI. Sources of data:

i. Governance Knowledge Centre, DAR&PG

ii. Sample Registration Survey

iii. National Family Health Survey

iv. District Level Health Survey

v. Planning Commission

vi. IIM Ahemdabad Journal on Information Technology in Developing Countries

vii. Media News on Aarogyam

viii. Aarogyam Home Page

VII. Owner of the project: District Health Society, Government of Uttar Pradesh
List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>ANC</td>
<td>Ante Natal Care</td>
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<tr>
<td>ANM</td>
<td>Auxiliary Nurse Midwife</td>
</tr>
<tr>
<td>ASHA</td>
<td>Accredited Social Health Activist</td>
</tr>
<tr>
<td>AWW</td>
<td>Angan Wadi Workers</td>
</tr>
<tr>
<td>CHC</td>
<td>Community Health Centre</td>
</tr>
<tr>
<td>CMO</td>
<td>Chief Medical Officer</td>
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<tr>
<td>DEO</td>
<td>Data Entry Operator</td>
</tr>
<tr>
<td>DLHS</td>
<td>District Level Health Survey</td>
</tr>
<tr>
<td>DM</td>
<td>District Magistrate</td>
</tr>
<tr>
<td>DOTS</td>
<td>Directly Observed Treatment, Short Course of Tuberculosis</td>
</tr>
<tr>
<td>EDD</td>
<td>Expected Date of Delivery</td>
</tr>
<tr>
<td>GoI</td>
<td>Government of India</td>
</tr>
<tr>
<td>ICDS</td>
<td>Integrated Child Development Scheme</td>
</tr>
<tr>
<td>IMR</td>
<td>Infant Mortality Rate</td>
</tr>
<tr>
<td>IVRS</td>
<td>Integrated Voice Response System</td>
</tr>
<tr>
<td>JSY</td>
<td>Janani Suraksha Yojana</td>
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<tr>
<td>MCTS</td>
<td>Mother and Child Tracking System</td>
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<tr>
<td>MDGs</td>
<td>Millennium Development Goals</td>
</tr>
<tr>
<td>MMR</td>
<td>Maternal Mortality Ratio</td>
</tr>
<tr>
<td>MO</td>
<td>Medical Officer</td>
</tr>
<tr>
<td>MoHFW</td>
<td>Ministry of Health and Family Welfare</td>
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<tr>
<td>NFHS</td>
<td>National Family Health Survey</td>
</tr>
<tr>
<td>NIC</td>
<td>National Informatics Centre</td>
</tr>
<tr>
<td>NIHFW</td>
<td>National Institute of Health and Family Welfare</td>
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<td>NRHM</td>
<td>National Rural Health Mission</td>
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<tr>
<td>PHC</td>
<td>Primary Health Centre</td>
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<tr>
<td>PIP</td>
<td>Priority Infrastructure Plans</td>
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<tr>
<td>PNC</td>
<td>Pre Natal Care</td>
</tr>
<tr>
<td>PNDT</td>
<td>Prenatal Diagnostic Test</td>
</tr>
<tr>
<td>RCH</td>
<td>Reproductive and Child Health</td>
</tr>
<tr>
<td>SMS</td>
<td>Short Messaging Service</td>
</tr>
<tr>
<td>SRS</td>
<td>Sample Registration System</td>
</tr>
<tr>
<td>TT</td>
<td>Tetanus Toxoid</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UP</td>
<td>Uttar Pradesh</td>
</tr>
</tbody>
</table>
Annexure I: Interview Questionnaire

Special Secretary, Department of Irrigation, Government of Uttar Pradesh

Background

1. Aarogyam system was launched in district Bijnor and JP Nagar of UP in 2008. When was it expanded to other districts of UP?

2. What is the estimated number of beneficiaries it caters to?

3. When was pregnancy tracking system introduced in all the 75 districts of Uttar Pradesh?

Programme Design

Key Stakeholders

4. Aarogyam software is supervised by NIC. Who are the other private software companies involved in the project?

5. Is there any provision for software and hardware maintenance under Aarogyam project? If yes, please provide details

Out Dial System

6. Aarogyam prepares a complete health data base of all the beneficiaries’ i.e. pregnant/lactating mothers and children in immunization age group, with regular updation. Based on this data base, Aarogyam software generates automatic calls on all aspects of child immunization, ANC, PNC, safe delivery, Polio-Pulse campaign etc. in the form of vernacular voice calls/SMS, thereby ensuring health care at the doors step.

I. What is the number of alert calls made for - ANC/PNC/immunization in day/per month

II. What is the number of SMS sent for - ANC/PNC/immunization in day/per month

In Dial Facility

7. Aarogyam provides an initial facility as an interactive platform to the beneficiaries to have access to health related information or lodge their grievances.

I. How many calls does it handle at one time?

II. What are the human resources involved?

III. How much time does it take to respond to the complaints lodged?
IV. What is the number of complaints lodged on an average in day/month/year

V. What is the number of grievances addressed on an average in day/month/year

Capacity Building

8. What are the capacity building exercises taken up with various stakeholders? Please provide details—Number, duration, content, resource persons, geographical location, funds involved etc.

I. ANMSs

II. AWWs

III. Other health staff

IV. Data entry operators at block and district level

Funding

9. What are the major sources of funding for Aarogyam?

10. What is the total expenditure incurred on its various components?

I. Base Line Survey at village level

II. Data uploading at block and district level

III. Training and capacity building

IV. Software/hardware maintenance

V. Others

Project outcomes

11. What has been the most significant achievement of the project?

12. What is the impact of Aarogyam on maternal and child health? Please provide statistics to reflect these changes since the time of inception.

Challenges

13. What have been major challenges prior to and after the implementation of the project in terms of (i) human resources, (ii) data uploading, (iii) technology, and (iv) community participation? How were these overcome?