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# System Design for Health Information Management in Rural India

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**To Mom, Dad and Grandma**

Thanks for being always their with me

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# Abstract

The problem of child mortality in India is one of the biggest that today's developing nation is dealing with. A complex matrix of different societal and behavioral forces is present at the root of this problem. Not only are absolute numbers of child deaths high in India, but the Child Mortality Rate (CMR) is also substantially higher among developing nations. Different sources of information at national as well as at state levels give feedback to the Indian Government on this nationwide issue. Looking closely at the west coast of India, the State of Maharashtra is having systematic problems in recording each child death. The way of operation of information sources and their accountability raises some serious issues about their efficiency, and the state governments are completely reliant on these sources to make decisions that save a child's life.

This thesis study works in the domain of the health management information system in the context of the rural region of the State of Maharashtra, India. This study documents practical experience gained in relation with user centered product design while working with Auxiliary Nurse Midwife (ANM) workers. Research was carried out to see different problems that health workers face during field work and their ways of operations to collect data on child and maternal health. Existing infrastructure for communication in the rural region of Maharashtra and the efficiency of health workers to adapt a new system are primary concerns about design decisions made in response to this issue. The intention behind this study is to create a strong network of health information and communication transfer among sufferers and helpers. A sound information system can create a foundation for correct decision making and formulation of public policies to save one complete life not lived.



## Author Keywords

Health Information System, Rural India, System Design, User Centered Product Design, Auxiliary Nurse Midwife (ANM), Child Mortality

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# Introduction

Each child death is one complete life not lived. It is a big humiliation of the very basic human right and wish to live. As children are helpless it becomes society's responsibility to save them. Not only are absolute numbers of child deaths high in India but the Child Mortality Rate (CMR) is also substantially higher amongst all other developing countries.

> *"In 1999, while the total under-five-years child deaths among less developed countries amount to about 10 million, India alone accounted for about one-fifth of the deaths (2.1 million), the highest number within a single country."* [1]
>
> Mariam Claeson, Eduard Bos, and Indra Pathmanathan
> *Reducing Child Mortality in India,* November 1999

The large body of imperial study often indicates that household income, female education, access to health services and immunization programs are important determinants of child mortality. This also indicates that policies which emphasize improving access to health services and, in particular, improving female literacy and socio-economic participation can play a vital role in reducing child mortality. India is one of the few countries in the world where women and men have nearly the same life expectancy at birth. The fact that the typical female advantage in life expectancy is not seen in India suggests there are systematic problems with women's health. Indian women have high mortality rates, particularly during childhood and their reproductive years. Research on a woman's status has found that the contributions Indian woman make to families are often overlooked, and instead they are viewed as economic burdens.[2]

Various cultures, religions, literacy levels, and development among India's 25 states and 7 union territories reflect different child mortality ratios. The Indian population increased in the late 1970s and India became the second most populated country in the world, at the same time problem of child mortality was cited from different government surveys. After 1975, the rate of child mortality decreased substantially until 1999 because of several efforts made by the Indian Government in terms of immunization

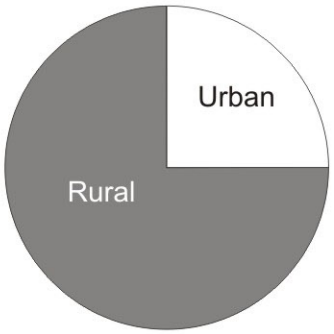
1 Mariam Claeson, Eduard Bos, and Indra Pathmanathan, *Reducing Child Mortality in India.* Nov, 1999
,
2 Victoria A. Velkoff and Arjun Adlakha, *Women of the world_ Women's Health in India.* Dec, 1998

camps, regular health checkups, and different interventions at an organizational level. After 1999, this rate stagnated particularly after several efforts by, the government and, most importantly the Child Mortality Rate is even higher in some states of India compared to national average.

## National Family Health Survey Data

The National Family Health Survey (NFHS)[3] is one of the comprehensive nationwide surveys conducted under the stewardship of the Ministry of Health and Family Welfare (MOHFW), Government of India. Since 1992-93, this survey is conducted after every five years. The MOHFW designated the International Institute of Population Sciences (IIPS) Mumbai, as the nodal agency for the surveys. A major part of the information presented here is cited from NFHS-3, which was conducted in 2005-06 and it interviewed 124,385 women age 15-49 and men age 15-54 to obtain information on population, health, and nutrition in India.

### Female Population Distribution




35% under age 15
5% age 65 and over

**Attitudes towards family life education in School**

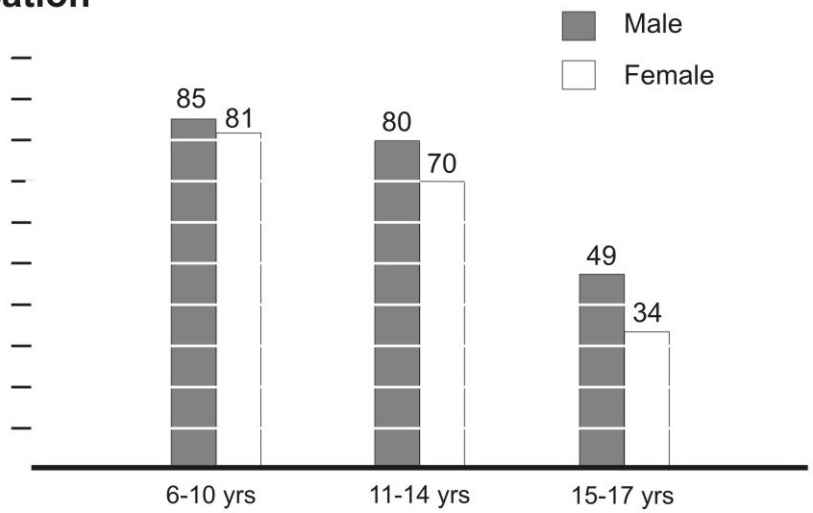
People who says YES

| | |
|---|---|
| Learning changes in own body during puberty | Most Adult |
| Learn about puberty related changes in opposite sex | Very few adults |
| Adult contraception | 49% W and 60% M |
| Sex Education | 49% W and 60% M |

**Women are more reluctant to discuss family life education at school**

3 The NFHS-3 fieldwork was conducted in two phases by 18 research organizations between Nov '05 and Aug '06

## Education

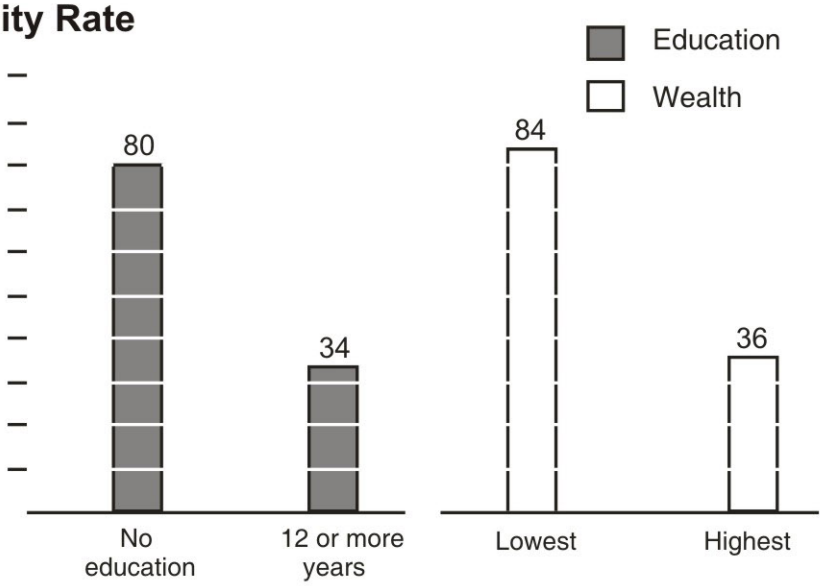



Only 83% population attend school till Primary-school age which is 6-10yrs
88% in Urban areas
81% in Rural areas

Age 15-49 never been to school
41% Women
18% Men

**Gender disparity in school attendance is in favor of boys**

## Fertility Rate




Waiting at least 3 years between children reduces the risk of infant mortality

Birth Rate
40% less than three years
60% within three years

**Unplanned pregnancies are relatively common**

## Fertility Levels

At current woman in India have
2.7 children in her lifetime

| Fertility | Rural | Urban |
|---|---|---|
| Children/Woman | 3.0 | 2.1 |

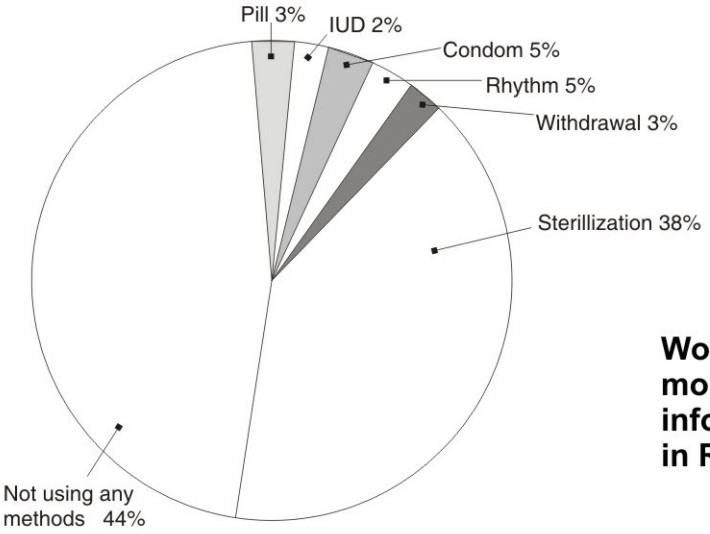
With desired number of wanted children fertility rate would be 1.9 instead of 2.7

Fertility rates are higher for women in disadvantaged groups

46% of women age 18-29 got married before legal age

**Greatest differentials in fertility are by wealth and education.**

## Contraceptive methods




**Woman in Urban areas are more likely to have information than Woman in Rural areas.**

## Social Empowerment

Married women who can make decisions on their health, purchase and relatives visits are only 37%

Women, who are allowed to travel outside village or community are only 38%

Wife beating

54% women agree

51% men agree

**Women in nuclear household and employed for cash can only participate in family decision making**

## Maternal Schooling

Relation between maternal schooling and factors known to reduce the risk of maternal and child mortality are following:

| Educated Mother | | Uneducated Mother |
|---|---|---|
| | Utilization of antenatal and delivery care services | |
| | Utilization of child immunization services | |
| | Treatment of childhood diseases | |

**Education considers knowledge about pregnancy, child birth, immunization and child diseases**

## Regional Segregation

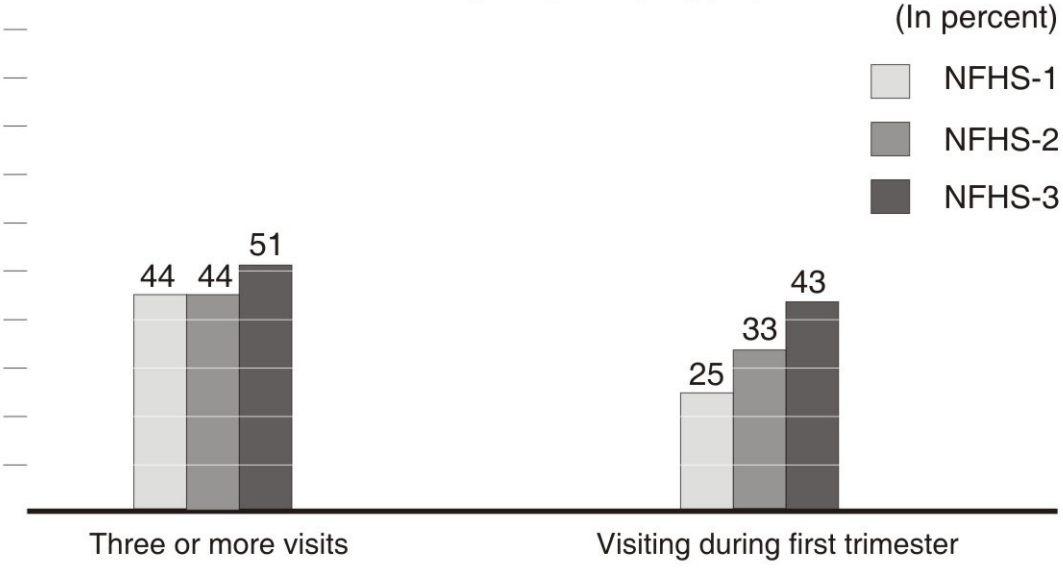
| Southern woman | Northen woman |
|---|---|
| • Higher level of literacy<br>• Education<br>• Employment | • Predominantly illiterate<br>• Less educated<br>• Less likely to work outside |
| 2.9 births or lower | 3.6 births or higher |

Perinatal mortality is 45% higher in rural areas than in urban areas

**Mortality is the outcome of combination of social, economic, biological and environmental factors;**

## Maternal Health

Are mothers getting timely, appropriate antenatal care?
(In percent)



More than one in five mothers received no antenatal care

Less than half of women received antenatal care during first trimester as is recommended

73% male does not know to handle complications of pregnancy

**Why women do not deliver baby in a health facility?**

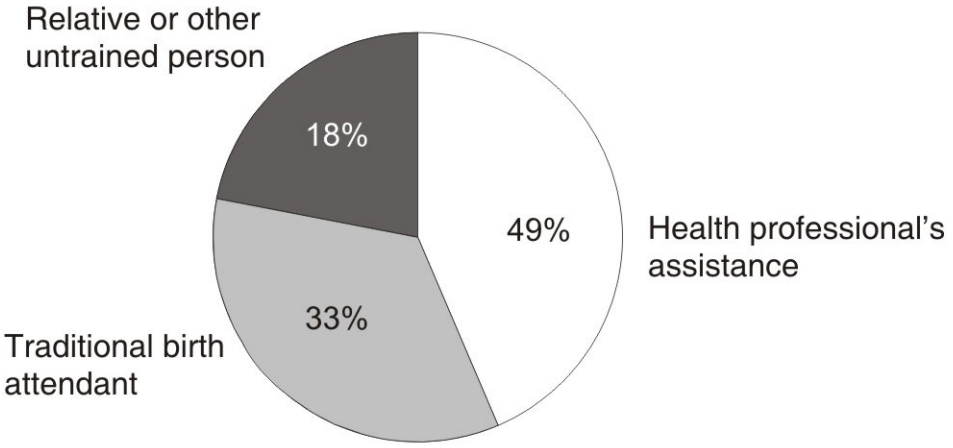
| | |
|---|---|
| Simply felt not necessary | 72% women |
| Health facility is too expensive | 25% women |

20% women do not receive postnatal in health facilities

Only 15% of home births receive postnatal care

**Early postnatal care for mother helps safeguard her health and can reduce maternal mortality**

## Birth Delivery Support




Three out of every five birth in India take place at home and only two in health facility

Only 37% had check up within 2 days

Most woman receive no postnatal care

Only 43% male know about importance to deliver baby in health care

These readings convey that how deeply problems of Indian woman are rooted in socio-economic and socio-cultural conditions of Indian society and human psyche.  Addressing any of these issues is like looking into complex set of matrix of the society having various cultures, languages, geographical conditions and behavioral patterns. The problem of child mortality is cumulative effect of woman's health, economic, educational and social status. Substantial impact in the life of new born will require high level of aspiration and change in societal outlook.

This thesis study is an attempt to bring forth most true and relevant picture of such deeply rooted problem in front of society and in process save a complete life not lived.

## | Age Distribution Diagram

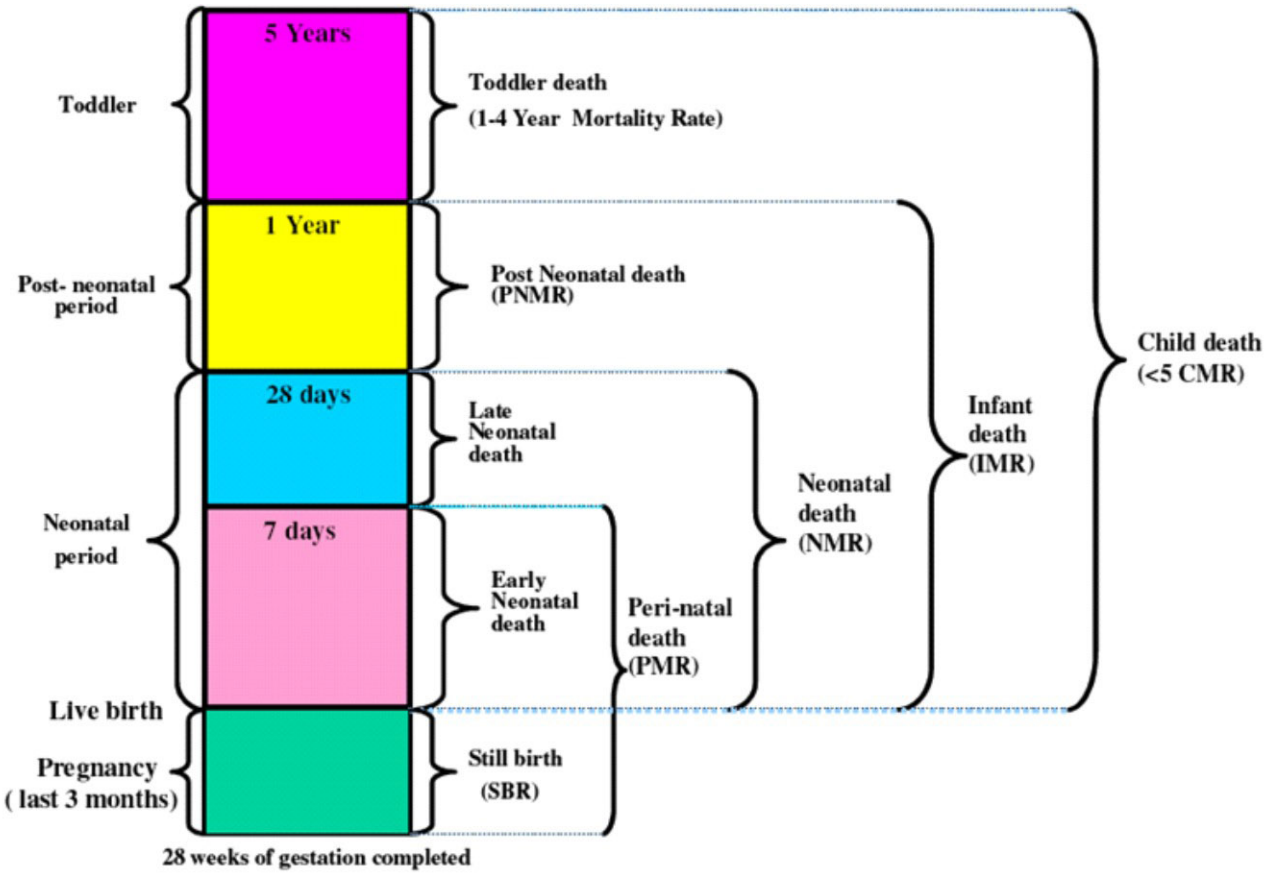


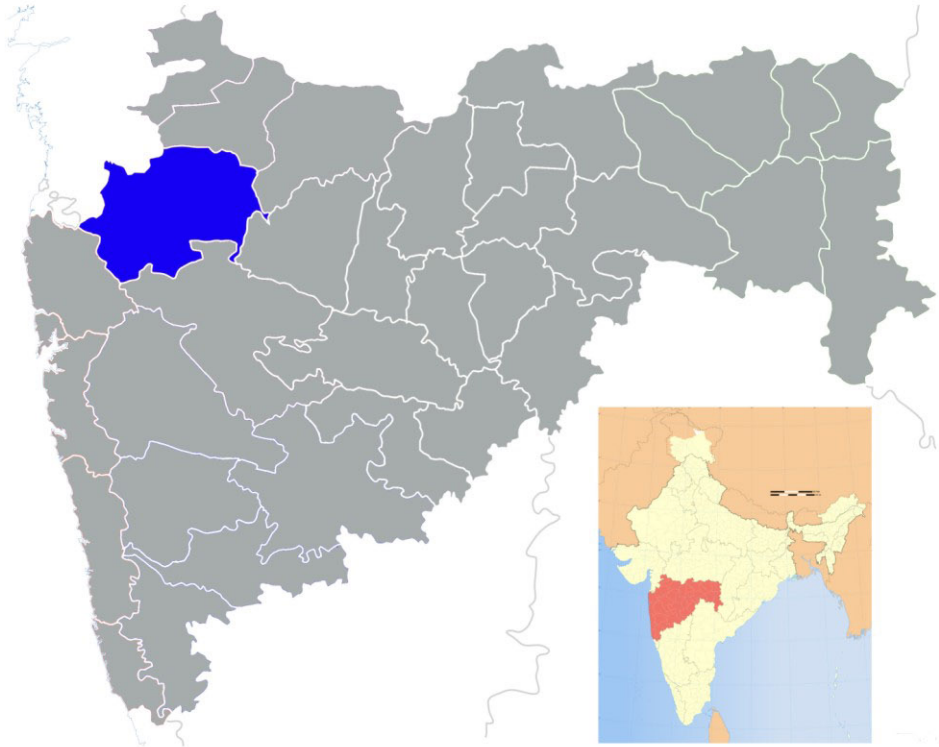

Image provided by Integrated Child Development Services (ICDS), India

3 The NFHS-3 fieldwork was conducted in two phases by 18 research organizations between Nov '05 and Aug '06

# Case of Maharashtra

To identify the scope of work, a certain area is selected for the study purpose; in this case it is Maharashtra state. This area is situated on the central west coast of India.  It is the third largest state by area and the second largest by population. The  2003 state report declared that, every year around 25,000 to 40,000 child deaths are cause by mortality in Maharashtra; whereas, according to the Sample Registration Survey (SRS) done by Central Government, on the contrary, reported this number to be around 120,000, and according to the different surveys conducted by various Non- Government organizations, this number is 175,000.
In addition, every year around 22,000 to 66,000 still births happen in Maharashtra (child death happens during pregnancy period and can be saved). In all, every year around 140,000 to 240,000 child deaths occuring Maharashtra state, which include both still births and child mortalities.

## Geographical area consideration



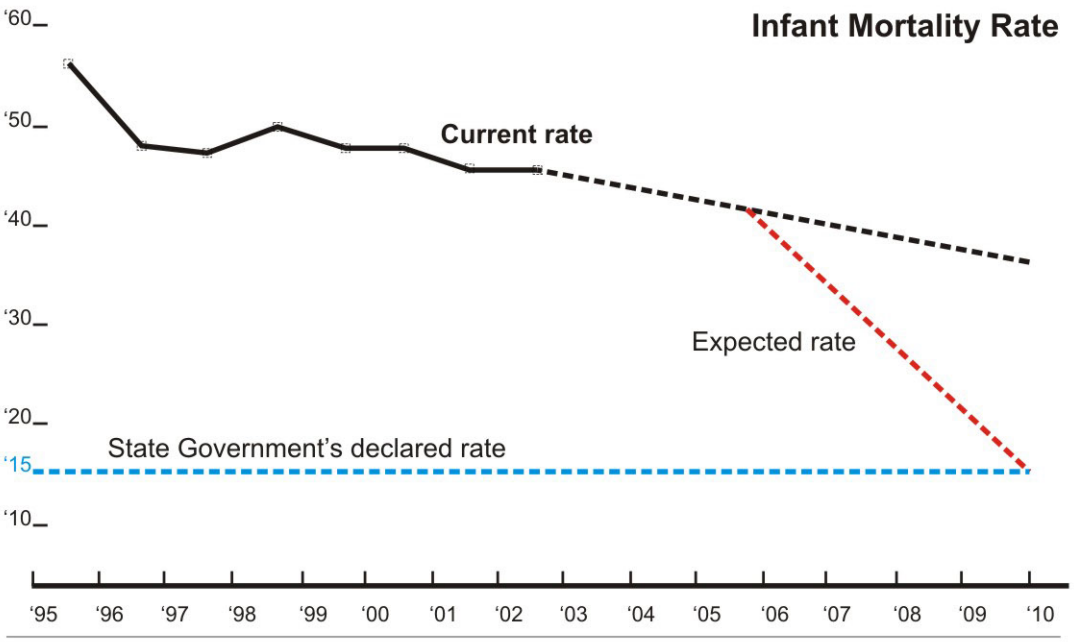
Source : http://www.ask.com/wiki/Nashik_District

Rural area around Nashik City_Maharashtra State_India

Child mortality is a state wide problem for Maharashtra. The estimated Infant Mortality Rate (IMR) and count of child deaths each year per broad category of regions is as follows:

| |
|---|
| Rural area IMR is 64 and total child deaths are 82,000 |
| Tribal areas IMR is 80 and total child deaths are 23,500 |
| Urban slums IMR is 68 and total child deaths are 56,000 |

Most of these child deaths happened because of malnutrition problem and bacterial infections. Infant mortality, pneumonia and diarrhea cause almost 80% of Maharashtra state's child deaths. These causes are very much curable by simple precautions and actions; hence, the problem of child mortality can be controlled in the state. From 1980 to 1996, the Child Mortality Rate (CMR) in Maharashtra decreased quite rapidly; after that, according to the SRS report, it stagnated, only decreasing from 48 to 45. Although during these seven years the National CMR decreased by thirteen, the average for the state of Maharashtra has only decreased by three. The Maharashtra State government aimed to reduce the CMR down to 25 by 2004 and down to 15 by the end of 2010. Referring to Child Death Evaluation Committee's report published in August 2004; the CMR was between 45 and 66 by 2004 instead of 25. After looking at the last ten years of the State's progress, to reduce this CMR down to 15 it will take until at least the year 2027, possibly taking up to 2042. [4]




4 Dr. Abhay Bang, Maharashtra State Government's *Child Death Evaluation Committee's first report.* August, 2004

## Stagnated Infant Mortality Rate in Maharashtra

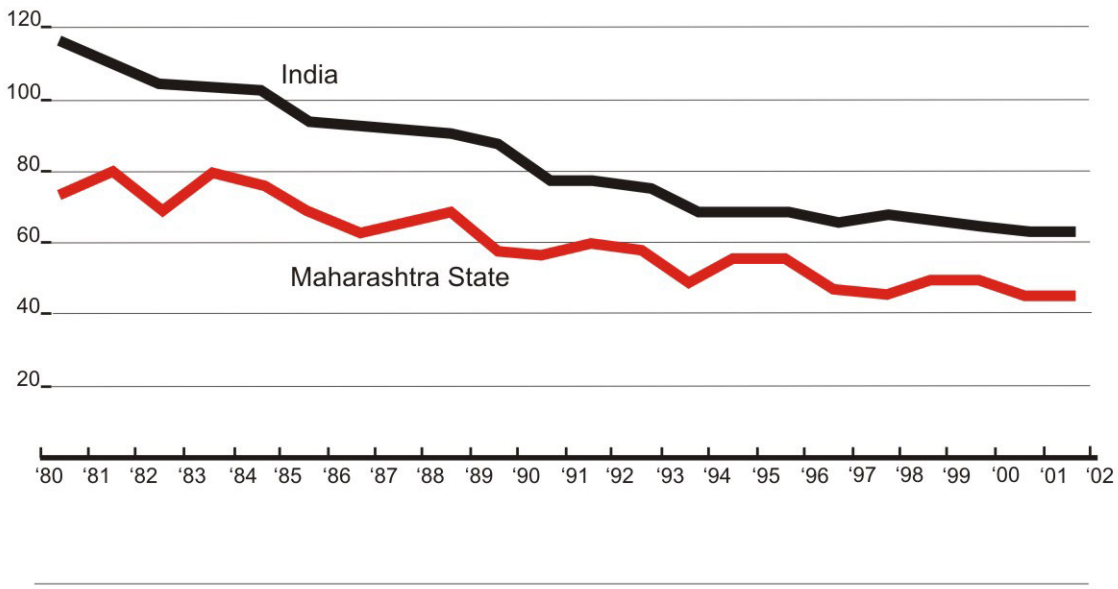
(Based on reports by Sample Registration Survey in 2002)

India's Infant Mortality Rate (IMR) by 1980 was 114, which dropped down to 65 by 2002. This means in 22 years it was reduced by 49 deaths per 1000 births. During the same time, IMR for Maharashtra state decreased from 75 to 45, which means it reduced by only 30 deaths compared to the National report.

There are two primary reasons for this remarkable slow down in IMR. First, it becomes very difficult to reduce the Child Mortality Rate in later stages. Second, now from remaining infant deaths 75% of them happen during the neonatal stage. There is no comprehensive policy to reduce neonatal deaths in Government Health programs. These programs mostly focus on earlier campaign of vaccination and nutrition food supply, which does not work effectively on remaining infant deaths.

**Infant Mortality Rate Progress Chart**

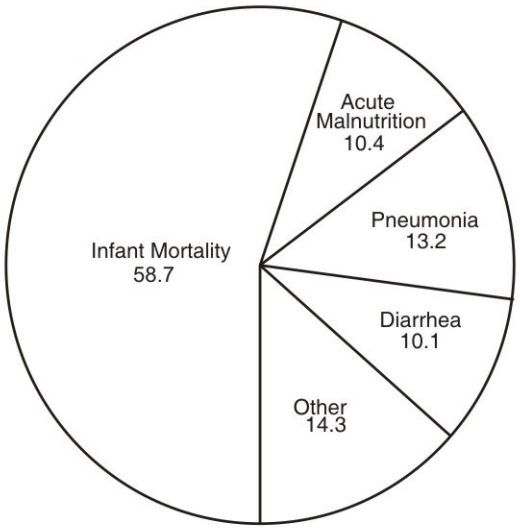
Source : Report of SRS, Registrar General of India,2002



## Problem of Malnutrition

According to the World Health Organization's (WHO) survey, 55% of child deaths through out the entire world happened because of malnutrition. Malnutrition causes a decrease in a child's immune system that provokes viral infections (pneumonia and diarrhea). On the other hand, viral infection decreases a child's food intake level and reduces his/her energy to fight back against bacteria that creates and boosts malnutrition. This causes the start of the vicious cycle of malnutrition and viral infections in a child's body.

In Maharashtra state, the percentage of malnutrition is about 7.2% that brings this state in the range of deprived regions. According to the definition by the Indian Academy of Pediatrics (IAP), in Maharashtra the percentage of acute malnutrition (Grade 3+4) is 5.4%, medium malnutrition (Grade 2) is 21.2% and severely acute (Grade 4) is 0.6%. That reflects almost 815,000 children are acutely malnutritioned, 3,200,000 children suffer from medium malnutrition and 100,000 suffer from severely acute (Grade 4) malnutrition. In tribal regions, problems of malnutrition are more serious, as 15% of tribal children suffer from an acute malnutrition problem.[5] That makes twice the number of children from rural areas. During this period of 1975 to 1988 the rate of malnutrition in National as well as State levels dropped considerably, but from 1988 to 2002 malnutrition only dropped from 7.8 to 7.2, which constitutes a very serious problem.




### Causes of Child Mortality

- Child's malnutrition
- Mother's diseases and malnutrition
- Lack of health related knowledge and behavior
- Lack of health and nutrition services
- Government's inaptness
- Social and economic reasons

5 Dr. Abhay Bang, Maharashtra State Government's *Child Death Evaluation Committee's first report.* August, 2004

Child mortality is a heart breaking problem for the state of Maharashtra. This problem has been identified several times by different social media, politicians, Non-Government Organizations, and alert officers. After rigorous discussions, government plans and financial support to solve this problem reflects that society in general is aware of the problem and political will is in favor of addressing these issues. On the map of the child mortality issue two distinct sets of dots are clearly visible; the sufferer and the helper. To make this vision more clear and address this problem more effectively one needs to connect the missing dots.  Going further to look closely into this problem we need to see the sources of information that give us the overall picture of the child mortality issue. The method of operation of these sources and their efficiency will put a clear light on some of the untouched issues and provide the foundation for further design framework.

# Information Management

***One accurate measurement is infinitely superior to a thousand intelligent opinions_*** Murphy's Law

Behind every child's death there is a complex matrix of reasons that can be identified right from social, economical, cultural, administrative and medicinal domains. Absence of the correct medical aid at the right time is also one of the reasons for child mortality. Socio-economic reasons cannot be overcome immediately; therefore, this study is more intended to work in the domain of health. The identified domain is one of the reasons to cause this problem and is most likely quantifiable. Information management is like the 'Nervous System' for proper control and management health systems that provide support throughout the state of Maharashtra. When the human body's nervous system collapses and is infected by disease like leprosy, slowly and steadily it starts losing control of the hands and legs, and ultimately the entire body becomes non- reactive.

Foundations for various efforts which are made to solve the problem of child mortality in India will be made with 100% accountability of child deaths. As succinctly summarized by C Rangarajan, Chairman of National Statistical commission,

> *" A good statistical system is a prerequisite for sound decision making and for the formulation and monitoring of public policies…What has brought about a decline in the quality and reliability of the inability of the present system or procedure of collecting data to meet the quality standards."* [6]
>
> C Rangarajan
> *National Statistical Commission.* Oct 2001

## | Health Information Systems

The following are different systems of information collection on child's health

**State level:**

1. Civil Registration System (CRS)
2. Management Information System (MIS)
3. Integrated Child Development Scheme (ICDS)

6 C Rangarajan, *National Statistical Commission: An overview of The Recommendations,* Oct 2001

**National level:**

1. Sample Registration System (SRS)
2. National Family Health Survey (NFHS)

## Information sources on births and child deaths[7]

1. **Sample Registration System (SRS):** Under the registrar general of India (ministry of home affairs), regularly measures the births and deaths in a national sample population of nearly six million.
2. **National Family Health Survey (NFHS):** Were conducted in 1992-93, 98-99 and 2003-04 in randomly selected national samples of people by the International Institute of Population Sciences, Mumbai.
3. **Civil Registration System (CRS):** Under civil registration of the birth and deaths Act of 1969, the local governance bodies (gram panchayat and municipality) record births and deaths in their area.
4. **Management Information System (MIS):** This system collect data under health and family welfare department of various state governments within India.

In addition to the above, the State Government's health department makes a **Survey of Cause of Death (SCD)** through certain villages. The purpose behind selection of regions and information quality and comprehensiveness is not up to expectations.[8]

None of the above surveys are comprehensive. Each one of them has some qualities and limitations. An inconsistent selection criteria and method of information gathering make it difficult for the state government to rely on these reports, and that is ultimately reflected in the governments help in the generation of new schemes and effective dispatch of resources. To solve any problem such as poverty, unemployment, AIDS etc. it is necessary to know the extent of the problem in every possible and correct manner. If it is not known, then the government decision makers can't understand the importance and, hence, can't evaluate the problem before solving it.

7 Dr. Abhay Bang, M H Reddy, M D Deshmukh. *Child Mortality in Maharashtra.* Economic and Political Weekly. Dec,2007

8 Dr. Abhay Bang, Maharashtra State Government's *Child Death Evaluation Committee's first report.* August, 2004

## Issues with various child health information systems

SRS and NFHS data provide more reliable information amongst the rest, as their target population is selected through a stratified cluster and random sampling. However, these data systems cover a very small portion of the population within a specific state. The region of operation for these systems is only up to the state level and is unable to provide information on districts or primary health centers, since these come under interior regions of the state. Moreover, because of the smaller sample size (for NFHS in 2002 it was 29,775), estimated rates have wide confidence intervals.[9] Second, these reports get published in very long time intervals; for SRS it is 3 to 4 years while for NFHS it is 7 years. That means information on these reports can be used for five-year planning but for performance monitoring on a yearly basis of various state's interior parts and primary health centers the state government has to rely on other information systems.

The CRS is one of the state's more important information systems; though it is extensive in terms of target population records, very incomplete information has been collected on births and deaths in most states and especially in rural areas. The health and family welfare department needs to record every pregnancy and every birth because these constitute their target populations for delivery of services, and every death because these constitute the events of the failure of services.[10] To monitor flow of performance on various levels overseen by other systems and for periodic inspection, different components and employees of the state government submit their report after every month through the state government's MIS.

**Flow of information in MIS on monthly basis:**

Multipurpose worker (auxiliary nurse midwife) at sub-centre

↓

Medical officer of primary health centre

↓

District health officer

↓

Directorate of health services, state

9,10 Dr. Abhay Bang, M H Reddy, M D Deshmukh. *Child Mortality in Maharashtra*. Economic and Political Weekly. Dec,2007

## Inconsistencies in data recording:

The Management Information System (MIS) plays a crucial role in proper functioning and monitoring of the health and family welfare department of the state. The outcome of this system literally affects the life and death of children and here, in specific, we are considering the entire population of the state. Thus, what seems merely technical information for the internal consumption of the department, becomes the critical data on which the Actualization of the 'right to survive' of defenseless infants is decided.[11]

| Type of Information | Health Dept. MIS | ICDS | CRS |
|---|---|---|---|
| Infant Deaths | 25,646 | 20,673 | 27,322 |
| 1-5 Year Deaths | — | 10,318 | 7,121 |
| Total Child Deaths | 25,646 (?) | 30,991 | 34,443 |

*From: Year 1999-2000 Child deaths reported to Government of Maharashtra*

According to the information reflected in the table above, the Child Death Evaluation Committee is been told that the MIS collect information on infant deaths, but no information was collected by MIS about deaths of children between one to five years on a state level..

| Year | Infant Deaths | Against SRS Report (%) |
|---|---|---|
| 2000-2001 | 31,987 | 33.6 |
| 2001-2002 | 32,271 | 36.0 |
| 2002-2003 | 28,976 | 31.6 |
| 2003-2004 | 39,527 | 42.3 |

*Completion of MIS report against SRS report to record infant deaths*

The table above reflects that there has not been much change reporting infant deaths in the span of four years, from 1999 to 2000.

11 Dr. Abhay Bang, Maharashtra State Government's *Child Death Evaluation Committee's first report.* August, 2004

## Problem of under reporting with MIS

SRS and NFHS estimates, can be more useful for health policy and planning purposes since they are periodically recorded with very small target populations. The health and family welfare department needs to keep records for each pregnant woman, live birth, delivery, and sick child at risk of dying. To monitor the efficiency of different services provided in the region, this department also needs to record each still birth and each child death. Record of these events is kept in the Management Information System (MIS). As this data is conveniently cited by non-technical professional like bureaucrats, politicians and media personnel, it can cause enormous confusion in interpretation and reaction. Based on the various sources of reports published by SRS and MIS it has been concluded that only 30% of total child deaths have been recorded in the MIS.

Based on the report 'Child mortality in Maharashtra' published in Economic and Political Weekly in December, 2002, the author had discussions with the staff of health department in order to find the root cause of some of these problems and few of the following facts appeared:

1. Failure of the field worker to monthly cover the entire assigned region which contains approximately 5,000-8,000 population.
2. The Auxiliary Nurse Midwife (ANM), who is the starting point of data collection in the MIS doesn't conduct most of the deliveries, and hence does not come to know about births, still births and neonatal deaths.
3. Traditional dais (mid wives) who conduct the majority of pregnancies in the interior regions are not part of the MIS data collection network.
4. Some people in the health department believe that lower numbers are better and under report deaths.
5. Higher authorities respond in a strict manner against accurately numbered reports as they are likely to report in increase in the number of deaths than previous low numbered reports and, hence, updated reports get poor grades.
6. Low rates look good and benefit politician; hence, they are appreciated.

As family welfare and immunization programs have utmost priority in the Management Information System (MIS) and various other different levels of census, nobody gives the required attention in reporting child deaths. Also, most of the cases that go to primary referral are not recorded at hospitals and, hence, they remain unaccounted. There are also two locations of pregnancy used for reporting purposes. The ‘de facto’ region refers to the base region from where the mother comes, and the ‘de jure’ region, where a mother may travel to during the pregnancy.  The regular practice within the three state health departments for reporting child deaths shows irregularity with reporting, as the CRS uses de facto where as the MIS and ICDS use de jure. This irregularity causes confusion amongst health workers and gives scope to eliminate the report of some some child deaths.

Child death information is the foundation to make decisions for helping the helpless to save his/her life. As the information system itself creates a false image, it is important to address this issue as a scope of this study and try to find a solution using the thought process and tools of design.

# Evaluation of HMIS

Health management requires the monitoring of the health status of the population, the provision of services as to coverage and utility, drugs stocks and consumption patterns, equipment status and availability. It is a process whereby health data (input) are recorded, stored, retrieved and processed for decision-making (output). This specific chapter criticizes the operation, compilation and transmission of child and maternal health related information collected in MIS.[12] Different departments of state government use their own data collection system without concern for others. Within these individual systems, again different tools are used at various levels. Effective coordination of health information is often lacking, which results in duplication and gaps in data collection, reporting, use and management (WHO report).

Based on the observations in the report entitled 'Evaluation of HMIS', Harvard School of Public Health by Ranganayakulu Bodavala, issues with the current information system can be broadly categorized into four major parts: structural, procedural, content related and technical.

## Structural Issues

1. Considering the importance of issue and scope of work, there are different departments of government that work independently at the state and national level. Depending on every department's target people group, their size, complexity and requirement, operations become too specific. This creates a problem in the integration and co-ordination of data collection.
2. Health departments have a tendency to create their own system for data collection without consulting any other data collection systems. Effective co-ordination of health information is always lacking, which results in duplication and gaps in data collection.
3. Within the system at different levels depending on the availability and routine practices, different tools are used (from manual to computerized) to collect and record data. This results in duplication of efforts and perpetuates dependence on the system of data collection and Maintenance.

12 Ranganayakulu Bodavala *Evaluation of HMIS in India_* Harvard school of public health 2005

## Procedural Issues

1. On a monthly basis information is collected from Primary Health Centers (PHC) and other hospitals. All possible information at different levels of depth is collected; which is exhaustive and ignores the simple rule that there should not be any information which is not going to be Used.
2. Excessive information cause unnecessary load on the system and at times generates carelessness among ANM workers who actually collect information on field. After bypassing basic intentions behind all the efforts, data collection remains the job of filling rows and columns of the data collection form.
3. Conventionally, registers are maintained to keep a record of collected data. Depending on the target population, collection process and inventory items, registers are maintained for each purpose. Hence the number of registers increases considerably in any health information System.
4. Average time spent on registers is about 2 hours per day. That means considering 6 hours of total daily work, 1/3$^{rd}$ of the time is spent unnecessarily on maintaining and filling the forms and registers. Data collection becomes such a preoccupation process that the primary health care implementation is ignored.
5. With each report, extra efforts and time needs to be invested to transfer data from manual into digital format.
6. Some type of information is collected like a fresh report every month, for example: location of PHC, hospital beds, number of villages, etc. Because this information is supplied every month it increases job noting efforts and also creates scope for error.
7. It is a vertical process of data collection, where every level collects some data and passes it on to the next level for processing. During this entire process, the one who is in direct contact with the target group and works on field never gets feedback from higher tiers on this chain. This genuinely affects the willingness of the PHC workers to Take any required actions.

## Content Related Issues

1. Collected data is processed in such a manner that only summaries reach the higher levels. The details are conveniently overseen by policy makers. For example, when the data is mentioned about an 80% nutrition rate actual consumption of nutritious food in some of the areas might be only 20-30%, or the rate of breast feeding is not as expected during specific age of child.
2. The current system generates data that gives a broad set of reasons for a child's death like diarrhea or malnutrition, but worthwhile information that causes the complex details behind these problems for the child and mother's life are absent.

## Technical Issues

1. Major parts of data collection are still in black and white format. These data bases required a common platform for real time update and feedback. Currently different types of hardware are available at the district level and there is good coverage of communication towers as well in some of the rural pockets where people have their own cell phone connections.  Irrespective of the current situation most of the system setup is quite conventional, which puts more emphasis on manual work that creates a space for unnecessary errors which can be avoided.
2. The absence of references can be seen in these data. For example, in case if certain data is collected from a hospital and if the name of that hospital is not mentioned, then the system produces only some aggregates at different levels. These aggregates on paper do not facilitate any query, sorting, relating etc. and the source of information is permanently lost.

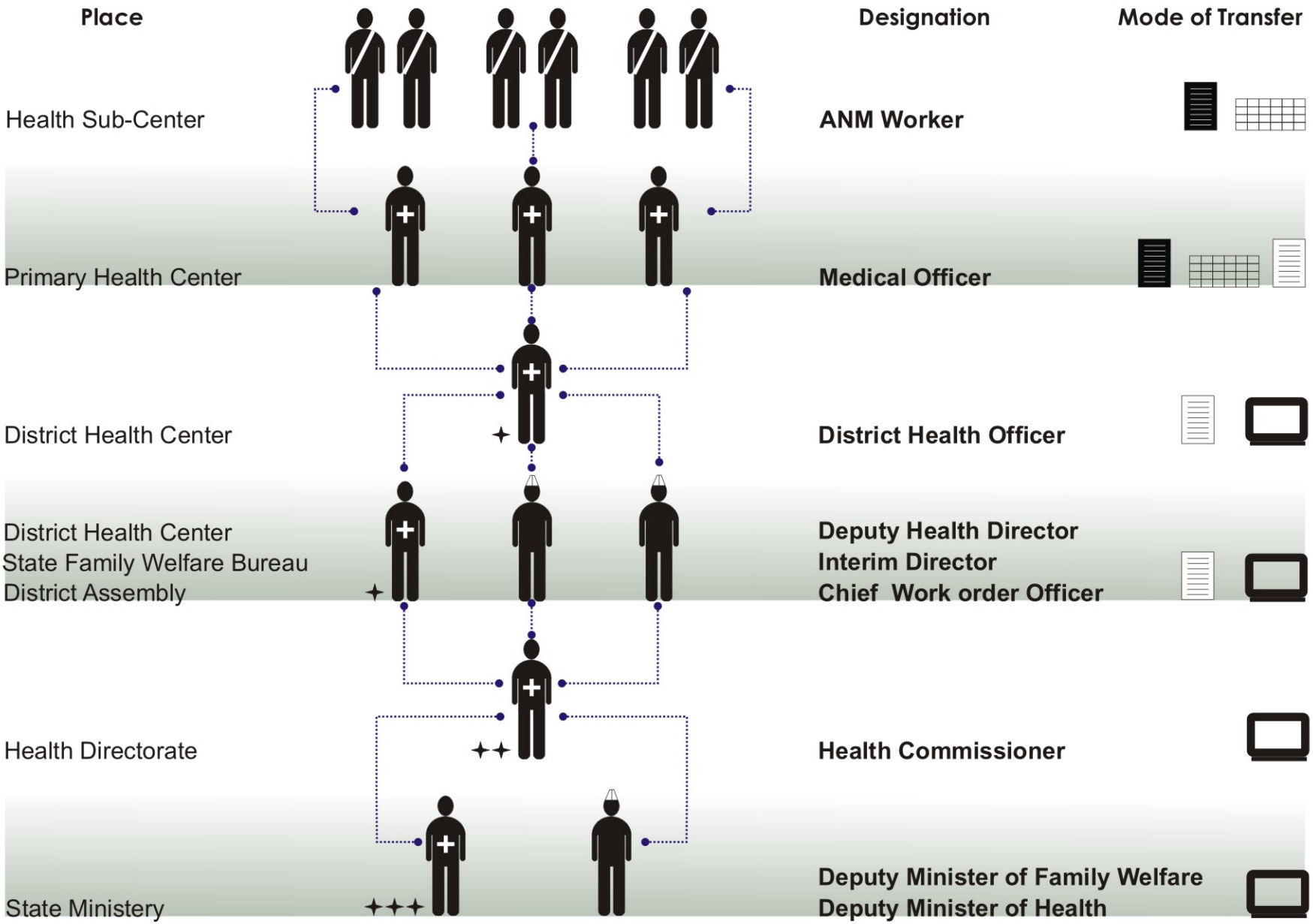
Existing loopholes in the current health management information system are major hindrances in effectual outcome and ultimately that affect decisions made about the health polity by the state government. Time and money spent behind generating and distributing resources to tackle the problem of 'child mortality' is not justified if results are not visible,

on the contrary child mortality ratio had stagnated since last few years. When the system of data collection has been revived right from the first input level and is brought on to common platform, where required data is most easily accessible and updated, it will create a value for decision makers who are majorly responsible for solving the problem of child mortality. When the representatives who directly or indirectly are part of MIS, see the visible incentive of their work and  long-term results for society benefit there will be some sort of sense of responsibility and belonging that will enrich the system efficiency altogether.

During this study efforts are made to look closely at some of the issues mentioned earlier and try to create a system where exchange of the information will not only be restricted to the effective data collection but also includes enriched communication between sufferers and decision makers.

## Infographic

different levels of health information data transfer



# About Communication

*" Communication goes far beyond providing people with information. It involves listening to people, sharing information in interesting and accessible ways, and helping them understand its relevance to their lives. Communicating Facts for Life calls for an interactive, two-way Process of sharing ideas, knowledge and opinions."* [13]

UNICEF, *Facts for Life.* 3rd Edition, 2002

Looking comprehensively at the problems of the Management Information System (MIS) another issue that contributes to the efficiency of MIS is the level of communication between Auxiliary Nurse Midwife (ANM) workers and the target population. Every society has its own ways and languages to convey messages effectively. The socio-cultural condition of the society and the level of literacy of people play an important role in deciding the way of communication. Precisely to deal with the problems of child mortality, the child's health, the mother's health and precaution during and after pregnancy, ANM workers and several other NGO's workers as well as barefoot activists are taking all sorts of initiatives to increase literacy in the sufferers from both rural and urban areas. Depending on their ability to understand and absorb the message that has been delivered, different mediums are used. One common tools that has been used for communication has visual based content, like a printed information booklet. This is found to be the most effective way to convey the message in a very clear and precise manner. Also, with this method, workers are able to take feedback from the receivers and, hence, the cycle of communication gets completed.

Most of the content that is been circulated is a standard set of information about the mother's and the child's health, created either by health agencies or the World Health Organization (WHO). These are printed pictures either black/white or color which are shown to a target population. Primarily, this communication take place in two sections; one, where the worker and woman are in one on one contact mostly at home and second, when the worker establishes contact with a group of woman either at street junctions,

13 UNICEF
*Facts for Life, Third Edition.*
2002

schools or other public places. Different mediums are used based on the information content and group size. When it is one on one or personal communication usually the content is more specific and the proximity to the medium during the process of learning is very close. On the contrary, when it is a group oriented activity the information is very general and usually is beneficial for every woman irrespective of her own situation. The communication happens from a distance, where the worker is referring to pictures or charts and women are looking at them collectively. In the previous two cases, chances for both ways of communication are very high, but the retainabilty of the information is very low. Because ANM workers are so preoccupied with their data compilation and form completion work, this kind of communication either takes longer time intervals or happens for very short periods of time. Again there are many chances for material to get faded or torn after several uses. ANM's who carry all the registers and forms to the field survey also carry material for communication with her and that increases the unnecessary load for filed visits. In addition to this situation, ANMs need to travel long distances by foot because of unsuitable road conditions for vehicles. There is quite a possibility, that these heavy loads cause workers to cover less area than what is required.

People's reactions to new information are influenced by how, where and from whom they receive it. These factors can mean the difference in whether or not people act on the information.

**People are more likely to trust information and act on it if:** [14]

*They hear it repeatedly from many different sources*
*The person delivering it is well known and trusted*
*They understand how it can help their families*
*It is communicated in familiar language*
*They are encouraged to discuss it and to ask questions to clarify their understanding of what needs to be done, when and why.*

UNICEF, *Facts for Life.* 3rd Edition, 2002

14 UNICEF
*Facts for Life, Third Edition.*
2002

Because of the format and content of information that is used to educate people about their health problems, it is found that the scope of interaction is very limited. With different geographical, cultural and social conditions this medium requires revisions after some time interval for a better impact, but, the printing format, cost of duplication and presence of an interpreter almost always keeps the content constant. There is a great need for data to be radically altered as per the demand as well as it should be revised after certain time interval to keep it fresh and more interesting for repeated viewers. As there is almost no content in the audio format with the current information package, the ANM worker always has to tell the viewer what message the picture has. This process took a great amount of effort and time to repeat the same message several times in a day, and there are chances that the entire information had not been transferred to the viewer Every time. During the process, important parts might get missed and that completely defies the purpose of this entire activity.

The overall quantum of the content is quite large; the ANM worker carries only part of the information with her when she usually goes into the field. When the ANM worker gets to see a mother having quite a large family, usually the information the ANM  has is only useful to establish dialogue with the mother and she loses the chance to show pictures and talk with teenagers or other members of that family. To give valuable information to those people the ANM worker has to come back once again to the same house and hence time and effort are lost.

The areas of communication and health education requires a lot of attention when we look at the problem of child mortality in India. Since, this area of implementation takes lots of effort and time from health workers who work in the field and are directly in contact with target groups; directly and indirectly, it makes a great difference on the efficiency of the health management information system.

UNICEF, *Facts for Life*. 3rd Edition, 2002

# Auxiliary Nurse Midwife

(ANM Worker)

The Auxiliary Nurse Midwife (ANM) worker for the community is like a what mother is to her child. To serve the community in a better way, it is important to go to people with a clear mind, listen to their questions, gain their trust and serve them effectively. This is what an ANM worker is trained for. As defined by the World Health Organization (WHO), "Auxiliary Nurse Midwife is a technical worker in a particular field with less than full qualifications", to be a nurse. According to training literature prescribed by the Ministry of Family and Health Welfare, India (MoFHW), an ANM must possess technical competence related to routine care provision including identification and immediate management of complications arising during pregnancy and child birth. The ANM attends 18 months of training after passing her 10th Standard (High School).There are around half a million Auxiliary Nurse Midwives registered with the State Nursing Council and Board of Examination, India (WHO 2007).[15] It is estimated that only about 40% of registered nurses are currently active in the country because of low recruitment, migration, attrition and drop-outs due to poor working conditions (GoI, NCMH, 2005).[16]

## Health Infrastructure in a Typical Indian District[17]

| Level of Health Care Institution | Population Norm | Human Resource Available |
|---|---|---|
| District Hospital | 2-3 million | Obstetrician, Anesthetist, |
| First Referral Unit (FRU) | 300,000- 500,000 | Obstetrician,General doctors, Nurses |
| Community Health Center (CHC) | 100,000- 300,000 | Any specialist, General doctors, Nurses |
| Primary Health Center (PHC) (Old or Block level) | 100,000 | General doctors (2), Nurses, LHVs, ANMs |
| PHC (New) | 30,000 | General doctor, Nurse, LHV ANM |
| Sub Center | 5,000 | ANM |

On every sub center one ANM worker is assigned with responsibility of village/hamlets covering 3,500 to 9,000 people. Typically any ANM worker covers around 9 to 12 families, or 40 to 50 people in her daily visits. Not all ANM workers share the same operational practices, but

15 World Health Organization Report, 2007

16 Government of India. *National Commission on Macroeconomics and Health* Sep 2005

17 Dileep Mavalankar, Kranti Vora *The Changing Role of Auxiliary Nurse Midwife (ANM) in India: Implication for Maternal and Child Health (MCH)* CMA, IIM Ahmedabad , India March 2010

their duties are basically the same. Her work includes treating minor injuries and ailments, refereeing people to the local hospital, providing ante and post natal care, vaccinating people, malaria testing and motivating villagers to use contraceptives. Conditions such as village power dynamics, where a traditional chief or 'headman' with unclear social accountability make major decisions, help of an ANM worker is not taken into consideration. Also, for the community or in households where people rely on having children they most likely prefer boys because of the source of income, an ANM's advice is not always welcome. The ANM role requires possessing good communication skills and insight to gain people's trust. This is not an easy task, especially when the people she deals with are different from the community or caste of her own.

The ANM's day usually begins with field work. Depending on vehicle Availability and geographical terrain she visits either by foot, bicycle or moped. In this specific study the ANM worker who I worked with uses city transport services that come to her designated area from her home, and then she walks to different households to cover her daily tasks.  These include conducting home visits to women who recently delivered babies or are currently pregnant, and providing sterilization operations.

It is very common to see men, women and children approaching her for medicine to heal their ailments, stomachaches and diarrhea. Typically an ANM carries with her a satchel that contains some medicines, delivery kits, a weighing scale, a blood sampling apparatus, a blood pressure machine and a link diary to take field records. The link diary is the most common and most important item that an ANM worker carries for data collection. After finishing her morning fieldwork, she goes back to her quarter to finish documentation of her daily work. It is a very time consuming and uninteresting job to duplicate records. At the end of every month she spends time filling in form # 7b prescribed by MoHFW. On a biweekly basis an ANM worker also needs to coordinate with a health worker (male) to gather information on tuberculosis, malaria and other communicable diseases. She also spends her time attending monthly meetings at the PHC or the district hospital.

# A Typical Day at Work for ANM Worker

Source:
Self_Field visit at Hiranegaon_District Nasik_India
Google Image

1

## mapping

Her day begins with mapping houses, those she will be attending on the day. This map is done by herself

2

## equipment

It is not required to carry all medicines for each visit. Depending on everyday's tasks equipment kit is altered.

3

## walking

Most of the time topography of the village requires ANM worker to walk longer distances to complete her tasks.

4

## noting

Taking notes about health of child and mother is an important routine activity. These sketchy field notes gets transferred into more organized data sheets.

## A Typical Day at Work for ANM Worker

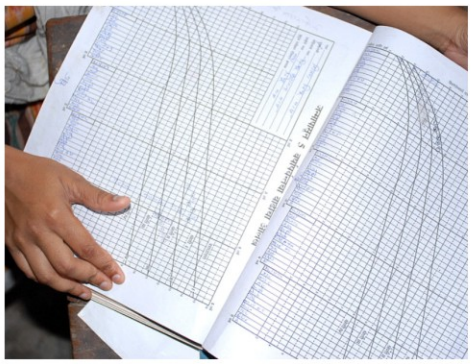
Source:
Self_Field visit at Hiranegaon_District Nasik_India
Google Image

5

### checking

Blood pressure, red cell count, body temperature and other health related things needs to be checked to get more information about mother's health

6



### documenting

All the readings collected in a day are documented in the lager book provided by the State government.

7

### reporting

ANM workers required to submit hand written report along with lager books. Most of the time this activity is done collectively by a few ANM workers.

8

### submitting

All the reports and lager books needs to be submitted to primary health center (PHC) to get inspected by doctor

Since 1952 the number of Primary Health Centers (PHC) throughout India has increased remarkably to serve the exponentially growing population, but the state government failed to match the number of ANM workers to serve these PHCs. It is very difficult to effectively gather maternal and child health data with the present scarcity of ANM workers. Also, available resources and current data collecting practices prescribed by MoFHW raise some serious concerns about the efficiency and authenticity of the data collected by an ANM worker. For effectively reinstating the midwifery role of ANM workers, government, NGOs and international agencies have to make combined systematic steps. Auxiliary Nurse Midwives are the basic source in gathering maternal health and child health information; she is an important figure, which can help in saving the life of a mother and a child.

During this research field visits were carried out with the help of Auxiliary Nurse Midwife, to understand what kind of problems she faces on daily basis. After interviewing ANM worker, task analysis board was prepared and product ideation started in response with current data collection system. This process is illustrated in following pages.

**Jyoti**
**Auxiliary Nurse Midwife (ANM worker)**

*I want to record work report in effective and time saving manner.*

# Task Analysis

daily tasks that ANM needs to perform on her filed visit to collect the data

| | step 1 | step 2 | step 3 | step 4 |
|---|---|---|---|---|
| **Task** | Needs to identify family locations to start field visits | Preparation of the kit to support her job purpose | Journey starts by walking to visit the families | Requires to pull out data history or start for new one after greeting mother |
| **Scenario** | Jyoti had prepared the map of her locality with the help of villagers. She always need it to locate houses that she requires to cover. | Jyoti needs only few items from medical kit she has been given by government and also stationary material she might require during her field visit. | Jyoti does not have any vehicle also geography of the locality requires her to walk distances to cover all the houses those she targeted for today. | After greeting the family she visited Jyoti needs to pull out the data of mother and/or child from her personal diary. If it is not present she prepare for the new. |
| **Considerations** | How can I keep map with me in handy manner? How can I check back houses I visited? How do I update my reference map periodically? | Can I prepare my daily kit quickly? How can I make sure I took all required items? | Can I reduced my walking efforts? How? Can I calculate the time I need to walk? How? | How can I quickly pull out the required case data? How can I maintain the data effectively? How can I reduce the dead load of carrying stationary? |
| **Pain-points** | Map I used is not handy. It gets faded and tear off after some time. It's hard to keep track on newly built houses. | Sometimes I forgot to take some items. At times kit becomes heavy and I make it into two. I need to report in timely manner to higher authority if I fall short of any item. | Walking takes lots of energy and time. At times I am unable to get shortest possible route. | Personal sketchy notes makes it difficult to find individual's data. It's very hard to preserve data for longer time. There is possibility of data loss at my end. |
| | **Advance Mapping** | **Planning Assistance** | **Travel Assistance** | **Data Organizer** |

**Jyoti**
**Auxiliary Nurse Midwife (ANM worker)**

*I want to record work report in effective and time saving manner.*

# Task Analysis

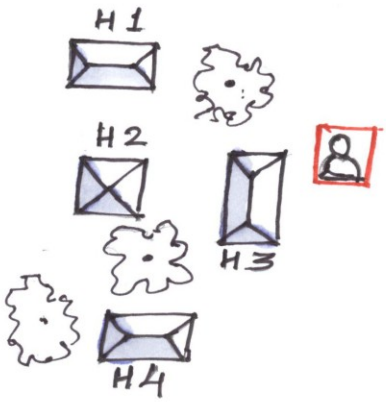
daily tasks that ANM needs to perform on her filed visit to collect the data

| | step 5 | step 6 | Step 7 | step 8 |
|---|---|---|---|---|
| **Task** | Counseling mother and rest of the family | Maintain personal notes during field visit | Filling lagers and making reports | Submitting data to primary health center |
| **Scenario** | After checkup Jyoti took some time to talk about mother's and child's health. Either show some charts or describe the situation that suggest betterment of both. | Jyoti requires to note all the reading she takes in addition she took notes during her talks with mother and rest of the family members. This is very important part of her work. | At the end of field visit Jyoti needs to transfer all her personal notes into government lager books and she needs to prepare a report to submit at PHC. | After completing all required documentation Jyoti needs to submits those to PHC. Also during her visit she gets new lagers and some medicines if she requires. |
| **Considerations** | How effectively can I convey my message? How can I avoid repetition of information? How can this session be more interactive? | How can I take my personal notes in most effective and organized manner? How can I reduce the dead load of stationary I carry to take these notes? | Can I avoid repetition in writing? How? How can I fill lagers in most effective way? How can I reduce the dead load of carrying lagers to PHC? | Can I get quick feedback on my reports? How can reports be used in most relevant manner? |
| **Pain-points** | I need to carry information brochures always with me. Sometime I need to narrate for long. I can not get feedback on the information I delivered. | It took large amount of efforts and time to take these notes. It becomes confusing with quantity. I need to rewrite those anyway to fill lagers. | I need to rewrite notes again. Numbers are too big to write. At times I fill lagers just for the sake of doing it. With every new scheme I need to carry new lagers. | I don't get feedback on my work. I can not evaluate my work. Data get processed postdated. It is very heavy to carry all lagers to PHC. |
| | **Information Support** | **Documentation Support** | **Data Up gradation** | **Work Feedback** |

## Product Offerings

product proposal ideation

**Advance Mapping**

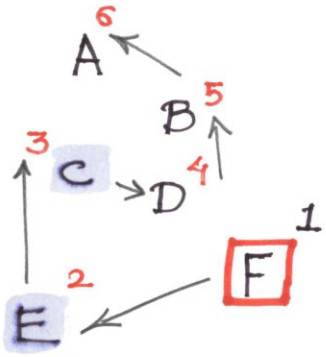



Satellite Mapping

**Planning Assistance**

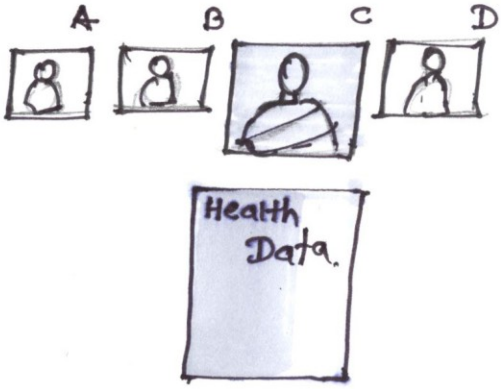

Kit planner

**Travel Assistance**




Travelling Heirachy

**Data Organizer**




Quick Reference

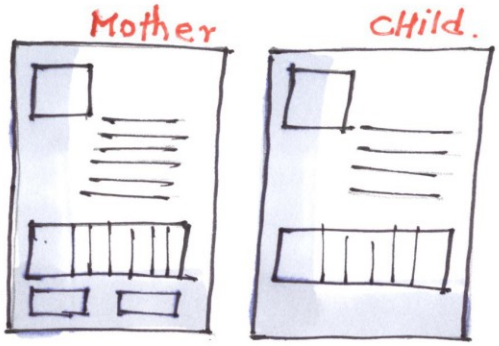
## Product Offerings

product proposal ideation

**Information Support**

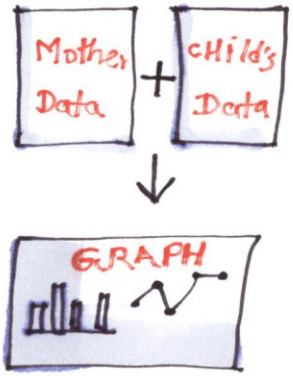

Portable Media

**Documentation Support**



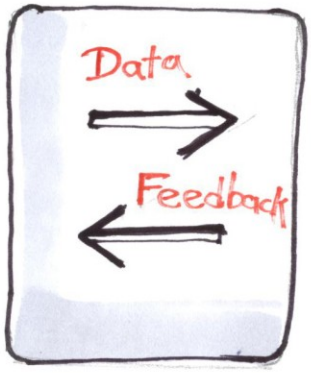

Standard Data template

**Data Up gradation**




Data processing and visualization

**Work Feedback**




Periodical Feedback

## Product Environment

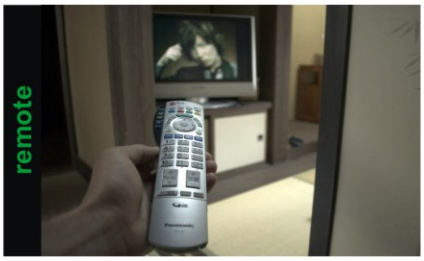
existing product interaction environment for ANM worker

complex

simple

regular

occasional











# Life in Rural India

After spending more than 20 years of my life in city called Nasik, I did had several chances to closely see and observe rural life around the city. In the course of this research I went back again to those rural areas with the intent of documentation. These visits had generated some interesting dialogs with people residing in rural areas about their life styles, their problems and living environment. The experience has set the context behind this research study and helped me in understanding the real needs of people that require immediate attention to solve their health problems.

Following pictures will show how some people and places are more important part of this research work as they inevitably contribute to daily life of a woman in rural India. With few exceptions in regional environment; broadly these visuals are most commonly seen across India.

Photo credit:

http://www.google.com/imghp
http://www.corbisimages.com

## People

Next pictures explain about individuals who take active part in rural social life. These individuals or groups are connected with people and work as catalyst to help/educate/preach them. This information is helpful to understand the social activists who are in immediate contact with our main user.

### School Teacher

Women have very limited access to schools; where they get education mainly from textbooks. This is an appropriate opportunity to educate women beyond textbooks and let them know about their health and body

### Health Personnel

Government appointed health personnel is always reliable but scares source for health related information. These medical experts were engage in taking care of patients at health center and find very little time to literate woman in their health issues.

### Barefoot Activist

These individuals are willing to help people from interior parts of India. Most of the time these activists have excellent knowledge about regional and cultural context in which they operate and hence maintain healthy relationship with other people.

### Mid Wife

Aya (Mid Wife) is very popular term in rural India. These are woman individuals who help other women during their pregnancy and maturity period. Aya handle childbirth in very traditional manner and have little knowledge about latest medicine.

## NGO Worker

There are some small and large nonprofit organizations that specifically work on issues of child mortality and woman's health. Often these groups have appropriate information about their target group but them lake in active government support.

## Village Authority

Every community or village has their local authority, which makes decisions about goodwill of people it represents. This authority has access to almost every formal and informal institutes that operate within the region and hence have maximum impact on community.

## Cultural Messenger

Traditionally some communities have their cultural messenger. This person has specific role to play in that community to earn his bread and butter. He travel door-to-door reciting chants and tell stories about god and devil. He is most popular between woman and children.

## Religious Leader

In general people in India have more faith in their religious leaders than political leaders. Their teaching decides general point of view of any community, which will be either conservative or liberal. Educated people also show faith in him.

# Life in Rural India

## Places

Next pictures put some light on built environment in rural India. These are the places where rural Indian woman spends most of her day time and found to be engaged either doing work or developing social contacts. This image board is particularly helpful to understand different areas where we can find good access to reach the sufferer.

### Home

A typical rural woman spends most of her daily time at home, taking care of her family. It is best possible place for individual's education.

### Front Yard

Front yard of home is favorite place for rural woman to spend her afternoon time. At this place woman does some of her daily activities so as chitchat with her neighbors. Frequent dialogue transfer happens at intimate level.

### Kitchen

While cooking, woman is very focused and at times stressed also cause of excessive carbon burning from the fuel that usually used for cooking in rural India. Kitchen is most frequent place for entire family to gather during dinners.

### Water Front

Very specific time during morning and evening woman spends at waterfront. Most of the time it's group activity where bunch of women go collectively to fetch water or clean clothes. Woman performs very actively during this time.

### Farm

Depending on various social and economical circumstances even woman has to work at farm either on contract basis or her family's owned land. It is ideal place to educate woman as well as man together in informal setup.

### Bazaar

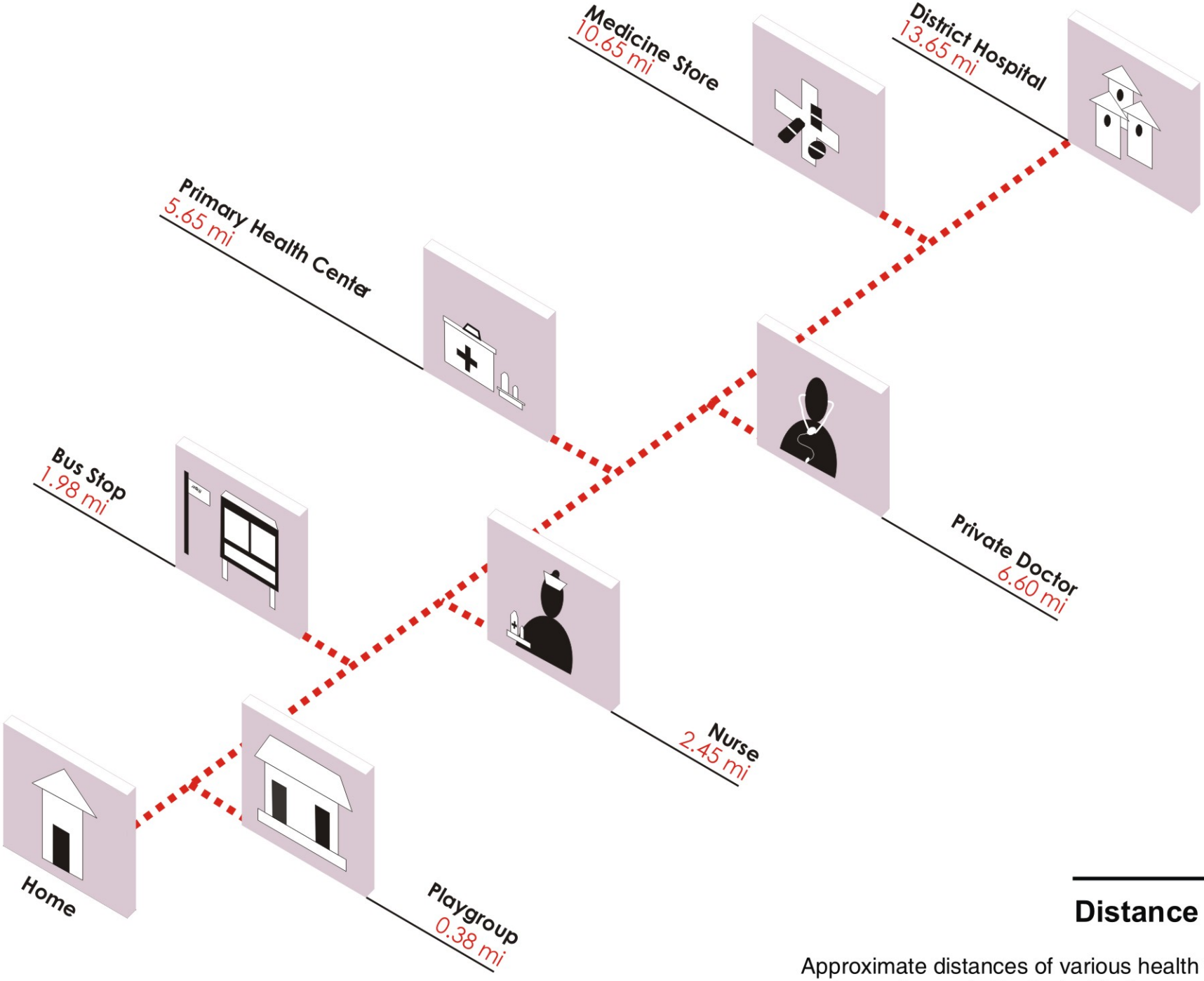
Bazaar is a typical market place to sell agricultural crops and various other goods. Most of times woman takes part in selling crops at these bazaars while her husband work in field. It is an ideal platform for social campaigning as well public announcements.

### Community Square

This is the most common place in village or any community setting where people frequently pass by or chitchat during their outside activities. At times this place is used for local announcements.

### Festive Ground

India is a country of festivals. There are several festivals in which only woman can take part. During the course of time some additions and alterations can observe in way of celebrations. These are seasons made by woman for woman.




## Distance Chart

Approximate distances of various health facilities from a house in the typical Indian rural setting

# Design Prologue

During this research, several loopholes are identified, that clearly specify the lack of authenticity and accountability in recording child and mother's health information. As specified by the Ministry of Family and Health Welfare (MoFHW) India, the system of health information data recording and processing is practiced widely by an ANM worker throughout India. This results in enormous scale of impact on outcome from existing Health Management Information System (HMIS). Evidently the state of Maharashtra is not an exception to this problem, which is currently suffering from a high child mortality rate.

Previous discussions about existing issues with HMIS clearly set the context towards this problem. This thesis study further tries to demonstrate a design approach to revive current health information system to make it more reliable and effectual from a service provider's perspective.

## Goals for proposed system design

1. Monitoring of Health Status:
    - Giving idea about mother's and child's health
    - Informing about new health plan to roll in
    - Giving feedback on current and new health strategies

2. Provision of Services:
    - Providing information about efficiencies of health services
    - Identifying loopholes in existing operating health plan
    - Making recommendations to remove clichés in operations

3. Drug stock and consumption:
    - Indicating existing drug stock level
    - Triggering alert to required medicines
    - Identifying certain pattern in drug consumption

4. Equipment status availability:
    - Indicating usage of existing equipment
    - Identifying need to the provision of new equipment
    - Providing feedback on health equipment

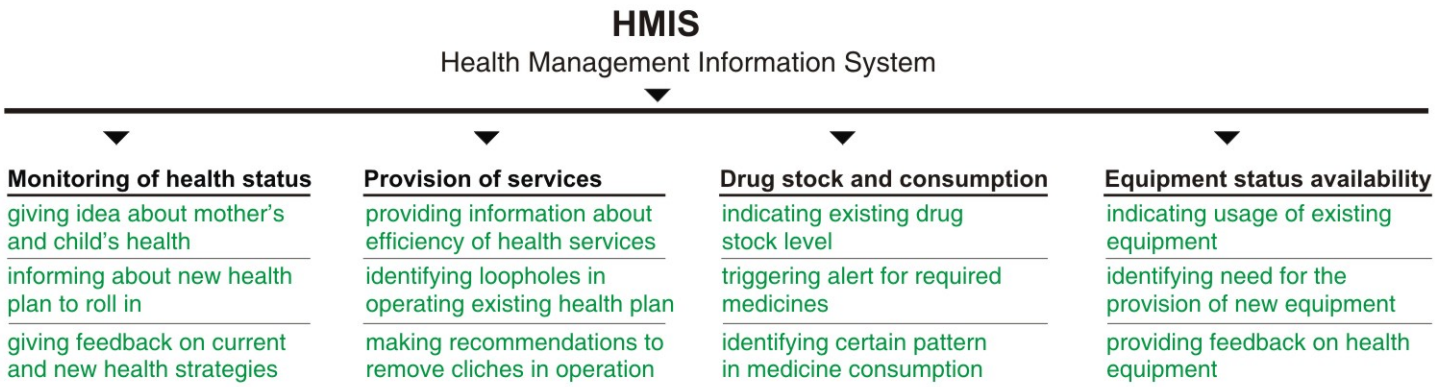
The Auxiliary Nurse Midwife (ANM) worker is most important and basic source to collect the health information from mother; and thus undoubtedly a catalyst between health service providers and sufferers. Considering the fact that ANM worker is most important person in operating Health Management Information System for Child's and Mother's health, she becomes the central figure in entire system design process.

**Schematic of proposed system design**


The design framework for this study has two important criterions: first, proposing new system for health data collection and feedback that connects the dots between health service provider and sufferer and second, identifying the sources of visual communication in existing rural environment and using

them effectively for community health awareness. Considering the scope and intent of this study major emphasis is given on designing health information system to greater extent while some ideas are proposed for community health awareness based on research conducted in this area.

## System design offerings



# Health Awareness

The research on a contextual study of life in rural India gives rise to the idea, that there is a definite need to give health care information in most visible, concise, and informal environment.  Pursuing this idea further, a product environment has been suggested in this study, which is most commonly observed in daily rural life and has a definite potential for effective deliverance of strong visuals regarding personal health. This design proposal has two important aspects: first, is to find sample products those are most common part of daily rural life and second, is to use health care information symbols specified by UNICEF in juxtaposing manner to support the idea of health care awareness.

## Part I: Product Environments

**Domestic Environment**

The bamboo mat is the most commonly seen product in rural houses. This product is usually placed as permanent spread for seating in living areas. Children use this mat for seating while doing their studies as well as it functions as most common seating to welcome guests. Product material quality, its function and portability makes this product most visible in domestic environment.

**Learning Environmnet**

The graphite slate is one of the most common products used for writing in schools. Typically this product has high possessive value and high retainabilty among school going kids. Women those go for night schools also uses the same slate for writing purpose. The portability of this product and wide spread use makes it most visible product in rural learning environment.

## Commercial Environment

Typically vegetables that sold in weekly market are packaged with jute string or put loosely into customer's carry bag. Due to high volume transactions packaging for vegetables has become frequently seen product in rural commercial environment.

## Working Environment

Synthetic bags used for packing fertilizers and seeds are frequently reused as favorite container to carry various stuff in daily life, like wood logs, animal fodder, forest produce etc. Typical material quality of these bags increases the product life much longer and allows its usage in domestic and commercial environment in all seasons.

The act of identifying various product environments is helping us in understanding the visual quality and acceptability of the product in daily lives of Indian rural people. These identified products are used as surface or canvas provider in displaying the message of health awareness in symbolic manner. Intention behind this act is, the message attached with these products should be seen most frequently and provokes the audience to think sincerely in making applicable changes towards healthier life. The act of awareness will lead the path to better community health.

## Products

Bamboo Mat

Writing Slate

Vegetable Packaging


Fertilizer Packaging

## Part II: Communication Symbols

'Facts for Life' is combined edition published by UNICEF, WHO and UNESCO in 1989. As mentioned in the report, the aim of the report is to make the life saving knowledge easily available to everyone. It stresses the most important fact that, people have a right to know to prevent child deaths and diseases, and to protect women during pregnancy and childbirth.

Certain symbols are used in this report to convey the message of health importance in concise and effective manner. Some of them have been adopted for the purpose of this study and based on their visual language few more are designed to display in identified product environments.

### Symbols Adopted From UNICEF's Report

डास नकोत
(No Mosquitoes)

हात धुवा
(Wash Hands)

बाळाचे वजन करा
(Weigh child)

डॉक्टरांना दाखवा
(Show to Doctor)

निरोगी बाळंतपण
(Safe Motherhood)

स्वच्छ पाणी पिणे
(Drink Clean Water)

### Newly Proposed Symbols

नियमित शाळेत जा
(Go Dispensary)

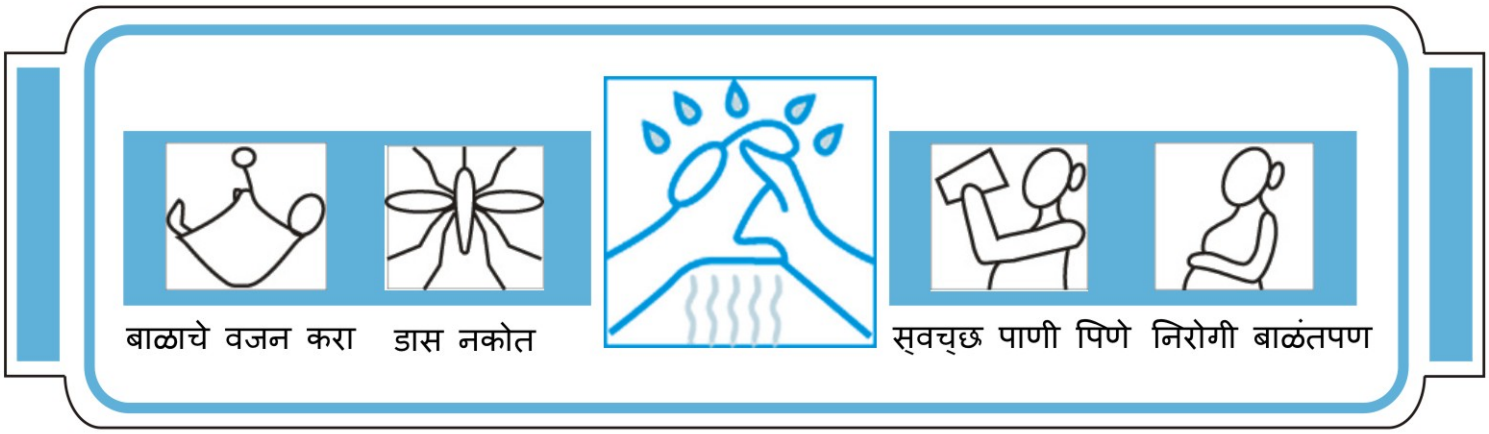
नियमित दवाखान्यात जा
(Go School Regularly)

नियमित दुध पिणे
(Drink Milk Regularly)

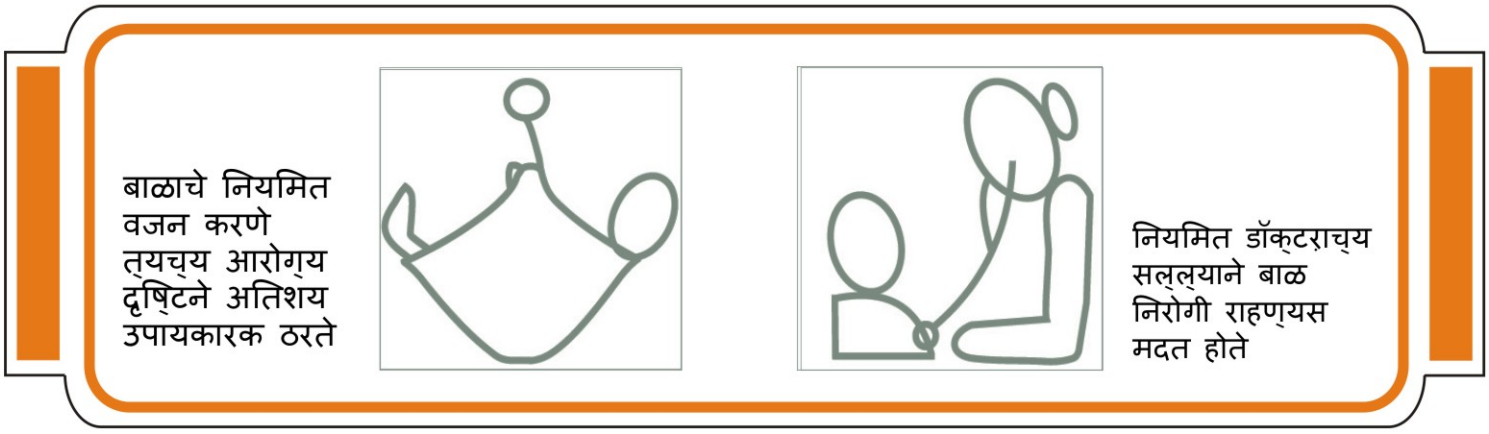
नियमित आहार
(Regular Diet)

## Design Proposal I

### Vegetable Wrap Band




**CONCEPT 1**



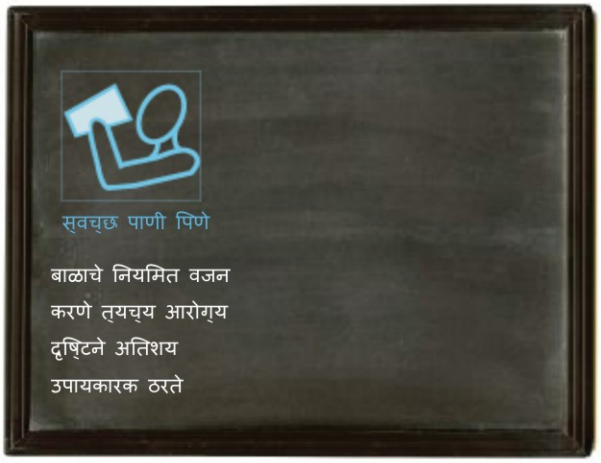

**CONCEPT 2**


**CONCEPT 3**

## Design Proposal II

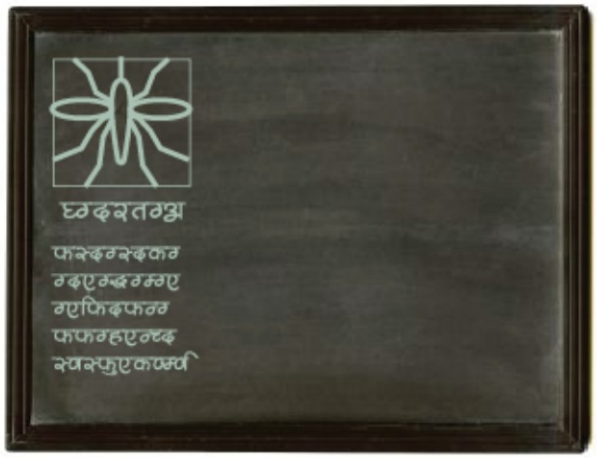
### Graphite Writing Slate

Front




Back

**CONCEPT 1**



**CONCEPT 2**

**CONCEPT 3**

## Design Proposal III

### Bamboo Mat


**CONCEPT 1**


**CONCEPT 2**

## Design Proposal IV

### Fertilizer Packaging Bags


**CONCEPT 1**

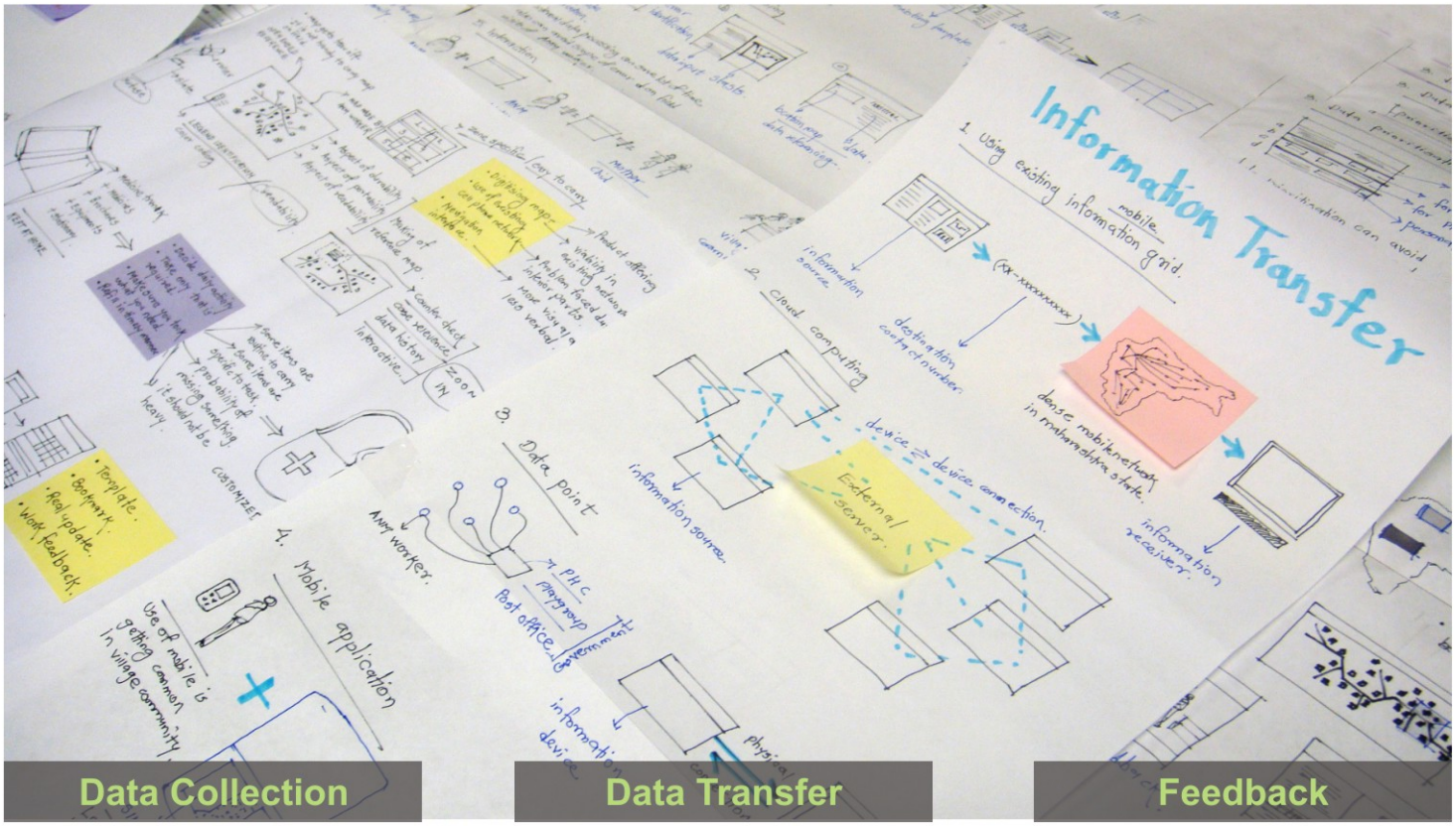

**CONCEPT 2**


**CONCEPT 3**

The outcome of this design proposal is based on the belief that people are most likely to trust the information and act on it as they are getting the information through many different sources. The information is provided in most familiar environment and the symbolic language is promoting the viewer to discuss about the iconography, ask questions and in the process of clarification spread the message in interactive environment. Also the long life cycles of most of these products help the viewer to retain the information for longer time and meantime gain more information through other sources.

These design concepts are only specimen templates to explain broadly about how can we create a product environment, which is conducive enough to propagate the massage of health awareness in rural Indian community. While taking the advantage of existing product, efforts have been made to retain the primary function and design integrity of original product. The effective outcome of this idea can only be observed, when these concepts are scaled up by identifying various other products combined with health messages. Depending on different regions in India the product group and message content language has to be changed.

# Design Proposal




**Data Collection**

- Controlled navigation system
- Standard data collection template
- Co-ordination between health agencies
- Interactive way of data collection
- Effective internal data processing

**Data Transfer**

- Standardized data transfer medium
- Real time data transfer and feedback
- Data prioritization during transfer process
- Data segrigation

**Feedback**

- From ANM worker to others
- From others to ANM worker

The most important outcome of this research study is a response to existing health data collection and data processing practices carried by Auxiliary Nurse Midwife (ANM ) worker. After talking with people residing in rural area, conducting interviews with NGO representatives and government officials and most importantly spending time on field with ANM worker; provides most valuable insights that lead to a proposal of system design for health information management.

**Three important considerations of proposed system design are**

1. Effective data collection
2. Real time data transfer
3. Periodical feedback

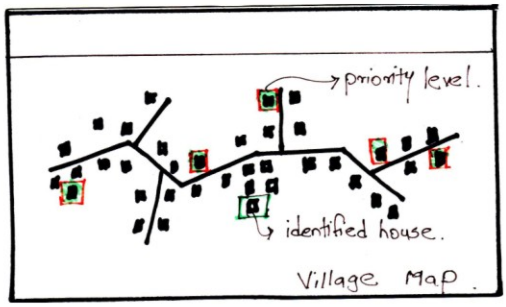
Design aspects of each point are further discussed with the help of a schematic diagram of proposed device, which is the fundamental component of the system. The physical aspects of proposed device and the design interface are discussed in successive chapters.

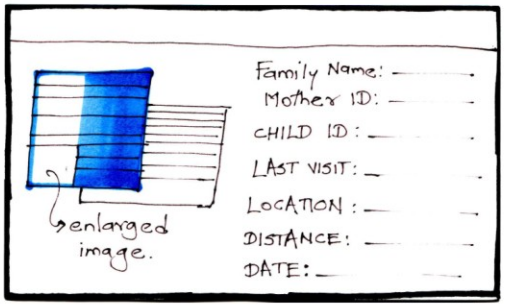
## Effective data collection

a. The controlled navigation system for effective data input.
b. The standard template across various stages of data collection system.
c. High level of co-ordination between different health agencies.
d. An interactive way of data collection for better efficiency.
e. Effective internal data processing capability.

## A. Navigation System

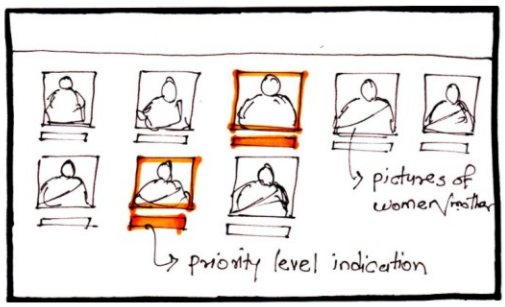
### Location Specific Navigation System

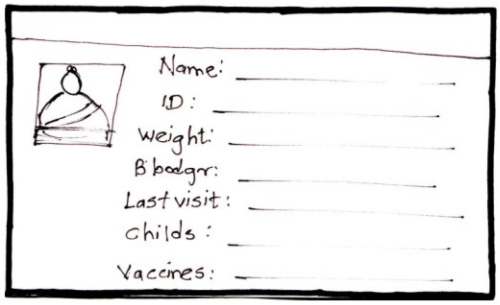



Based on the map of village, the ANM worker will get the priority level updates about the houses she will be covering on any particular day. Arial view of entire village settlement will help the ANM worker in keeping track on expanding families in that particular village.

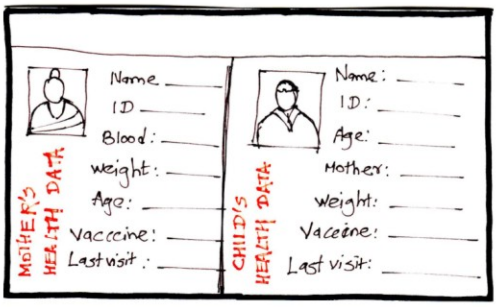
### Case Specific Navigation System

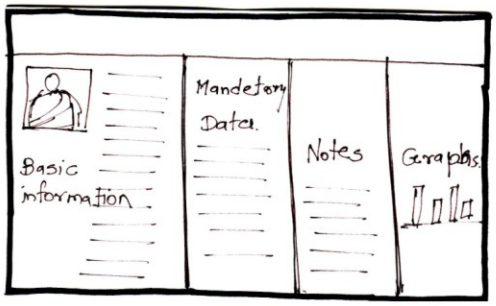



This navigation system is based on the photo gallery created by the ANM worker, by clicking the pictures of mothers and their children. The highlighted pictures suggest that these specific cases require quick attention amongst rest of the cases that the ANM worker will be attending on any particular day.

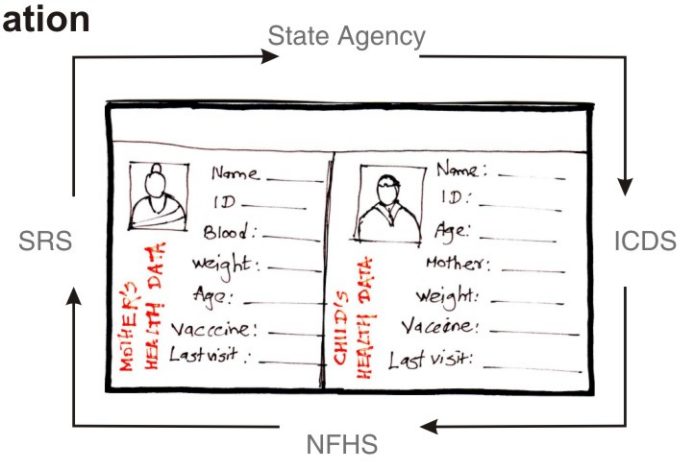
## B. Standard Template



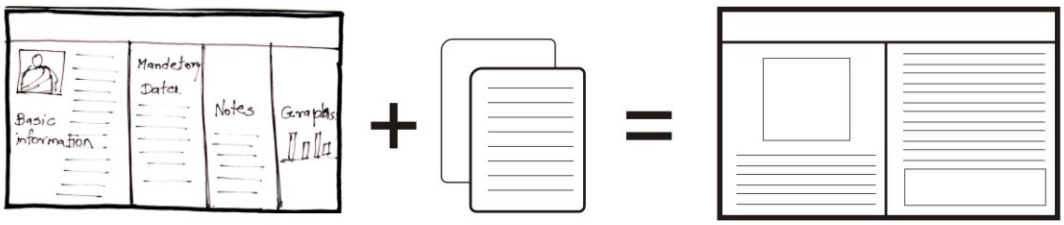



The advantages of having standard data collection template are data prioritization for quick viewing, effective navigation to save total time spend in recording information, and output standardization for precisely interpreting data results.

## C. Co-Ordination



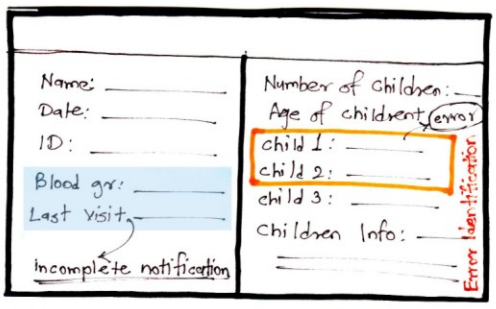

Common data collection format across different health data collection agencies will help in cross checking and interpreting the collected data with maximum co-ordination.

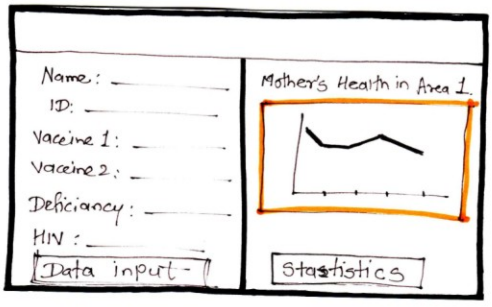



**Existing Template** **Newly Introduced Plans** **Advance Data Template**

With the periodical introduction of government's various health plans and schemes, the existing data collection template will require to accommodate newly introduced data requirements with more advanced template.

## D. Internal Data Processing



Internal data processing can save considerable amount of time for ANM worker during her home visits; also it can avoid scope of error in data collection process.

## Real time data transfer

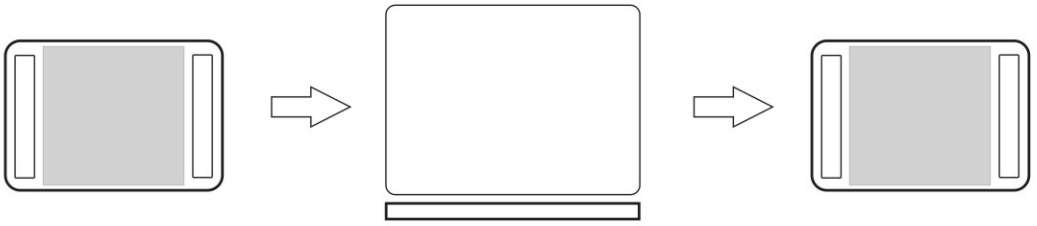
a. Standardization in data transfer medium

b. Real time data transfer and feedback

c. Data prioritization during transfer process

d. Data segregation

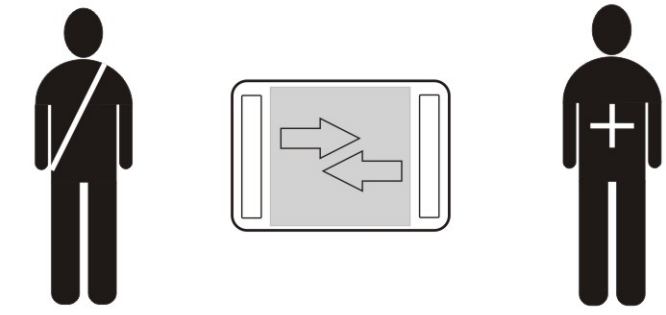
### A. Standardization



Data collection device Computer Data collection device

As data collection process is getting transferred from manual into digital format, it creates standardized way of data transfer up to higher tiers of data collection and processing units. There is enormous advantage of real time data transfer, as data been getting processed quickly and eventually reaction time on collected results is getting expedited.

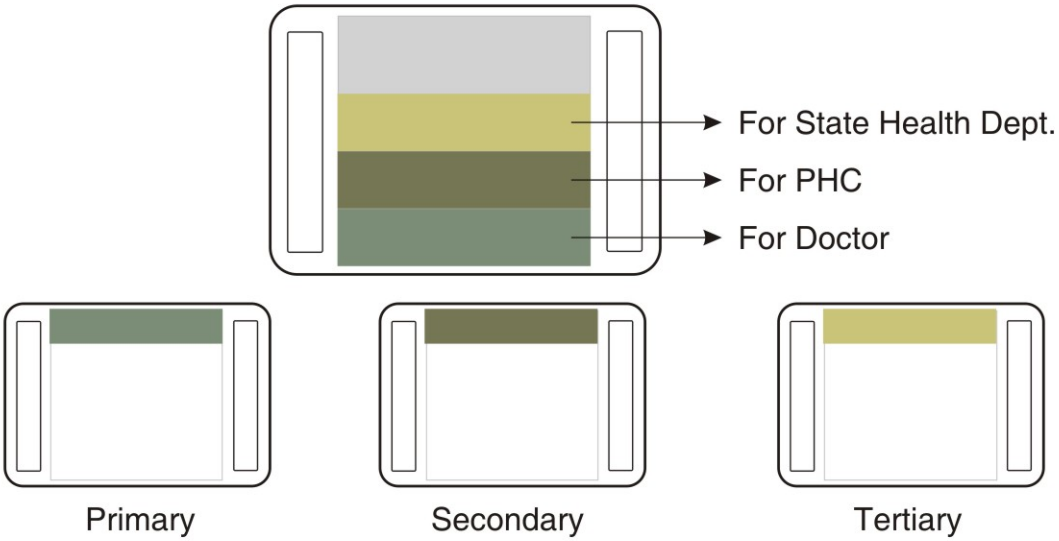
### B. Realtime data transfer



ANM Worker Data collection device Doctor

Data collection device will increase the communication frequency and time between ANM worker and doctor; in result it will strengthen the process of data transfer and feedback.

## C. Data Prioritization and Segregation




Data prioritization can avoid unnecessary repetitiveness and process only required data. While data segregation can make it easy to track back any collected data and it can increase data processing speed.

## Feedback

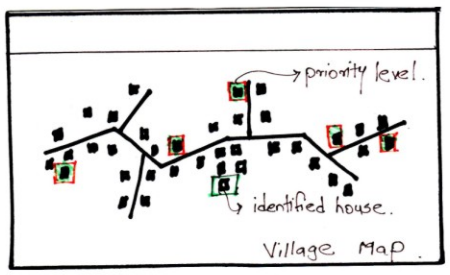
a. Auxiliary Nurse Midwife to Others

b. Others to Auxiliary Nurse Midwife

## A. Auxiliary Nurse Midwife to Others

Zone specific feedback system

Macro Zone




Micro Zone

Zone specific data feedback system will make the system more organized and easy to control.

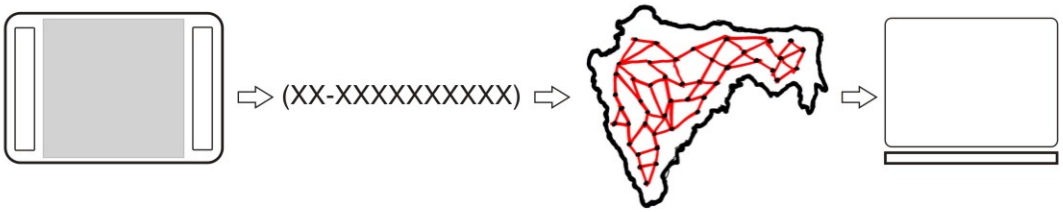
## B. Others to Auxiliary Nurse Midwife

Standardized system will help ANM worker to receive the feedback on her data collection device in the organized manner.

How will information/data transfer will take place?

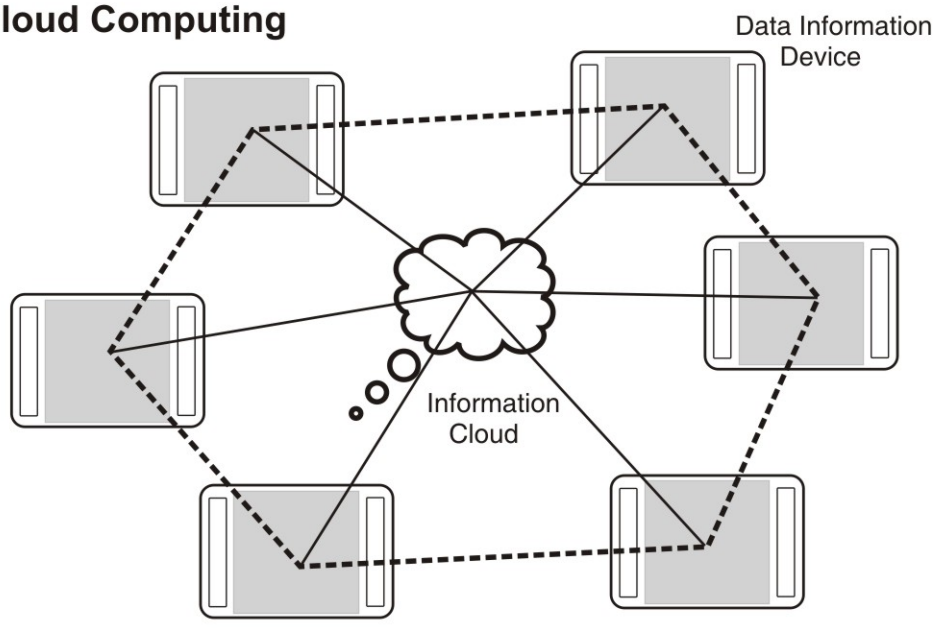
Considering the scope of research work, only few ideas are discussed to deal with the information/data transfer aspect of health information management system. The foundation of these ideas is based on the existing mobile network reach in rural India and ambitious future plan by Indian Government, to satisfy the ever increasing demand of future network connections.

## 1. Using Existing Mobile Grid Network




Low bit and compact software platform is been suggested for newly proposed digital information system. The intention behind this software platform for data input and transfer is first, it should not create uncontrolled situation by excessive load, on hooking with existing mobile network and second, it should be just sufficient to work smoothly with current communication infrastructure in rural India.

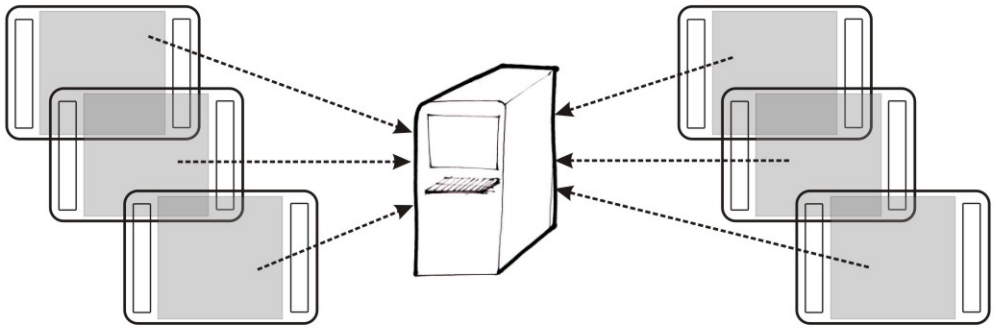
## 2. Cloud Computing



> *“Cloud computing describes computation, software, data access, and storage services that do not require end-user knowledge of the physical location and configuration of the system that delivers the services.”*
>
> Wikipedia

This revolutionary technology can be aptly applicable for proposed health data collection system. Cloud computing provides wireless, uninterrupted external server with high capacity and in process give right platform where scalability of proposed system can be effectively executed.

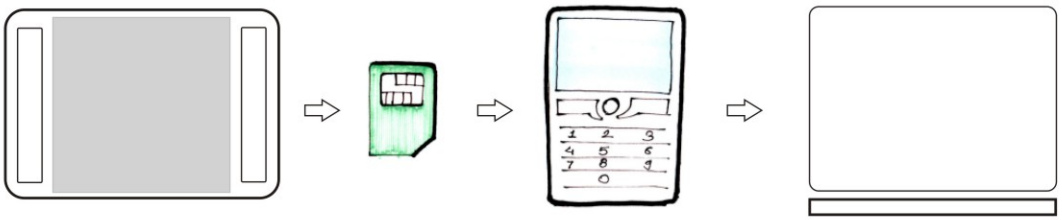
## 3. Data point or Information Kiosk



Data Collection Device  Data Point  Data Collection Device

Absolute mobility of data collection device gives an advantage to plug this device with any other devices depending on access and requirement. This particular idea discuss about the possibility of external data point or information kiosk, which is an electronic station used for uploading and downloading data, specifically designed for data collection device. This kiosk can be installed at Primary Health Center or Regional Post Office or any such government places which is accessible for ANM worker.

## 4. Mobile Application



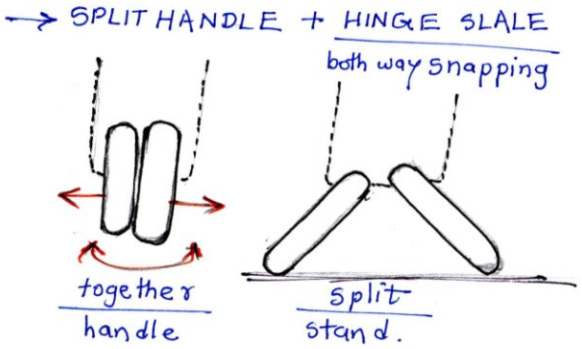
Data Collection Device  SIM Card  Mobile Phone  Information Receiver

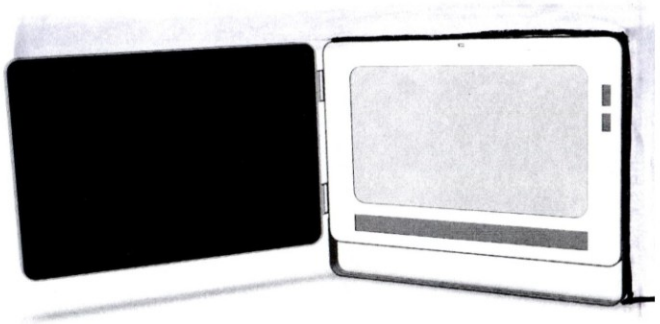
Enormous penetration of mobile communication, continuous enhancement in mobile technology and long term ambitious plan by Indian Government to support mobile mode of communication makes it possible to use this technology for data transfer. With the use of dual SIM card system, data can be transferred in compact format to information receiver.

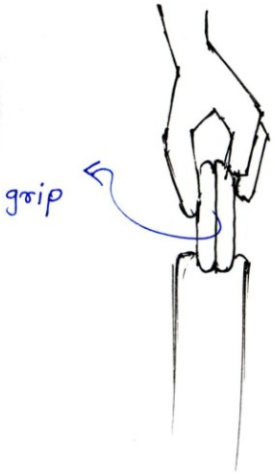
As mentioned earlier we will discuss in detail what is data information device is, design consideration for this device and interaction design wire frames in successive chapters.

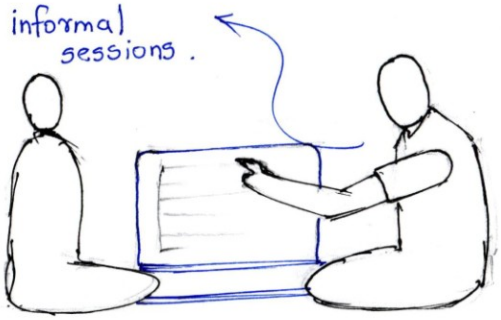
# Design Development

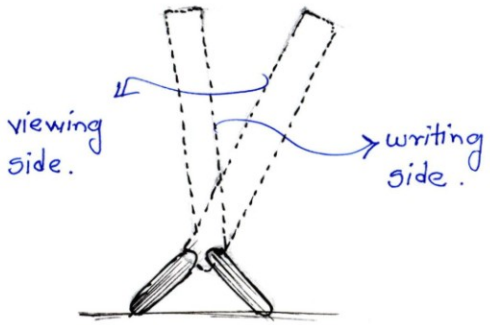
‘Arogya Pati’ is an electronic slate designed as the instrumental platform for proposed health information management system. Product utility, function and portability are driving considerations behind design decisions. Product interface it strictly kept to optimum, after considering the product literacy of the user and basic function for which this product is going to be used for. An electronic slate is going to be a key product within proposed system, which has attribute of physical sharing between the users attached with it.



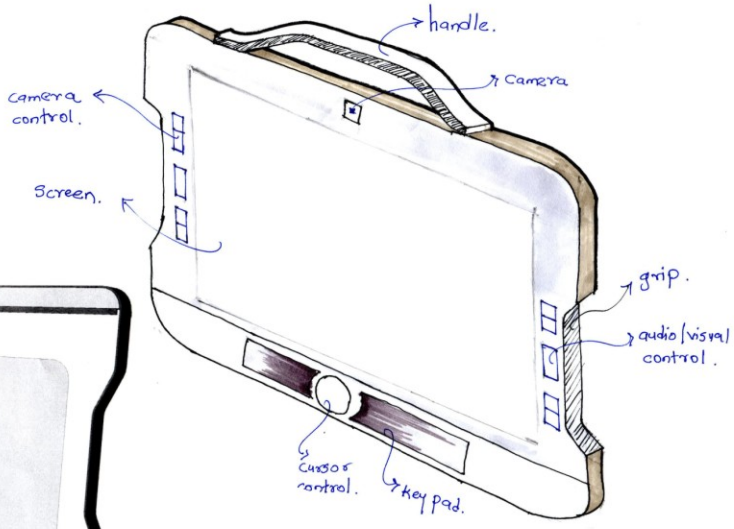



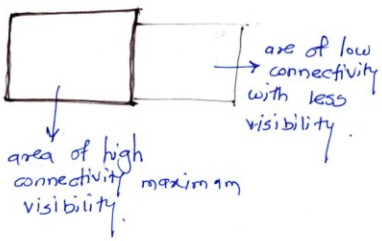


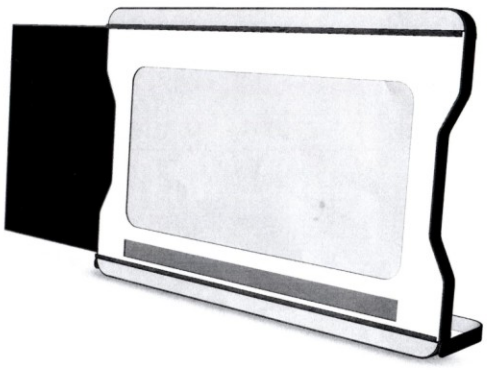




- idea of writing and keeping data manually
- protection cover for the screen
- Scemantic value of carrying slate.
- completly detachable surface of to reduce weight.
- customize message board for everyday viewing.

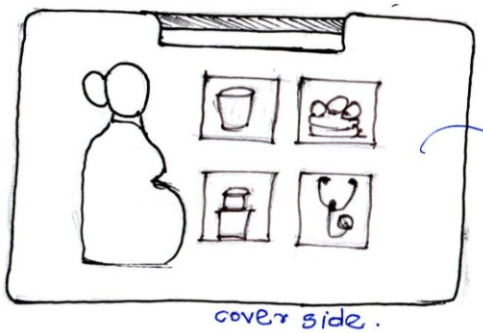


→ BAGGAGE GRIP

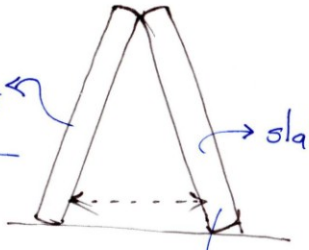
sturdy inbuilt round bar for better performance and control.



printed message

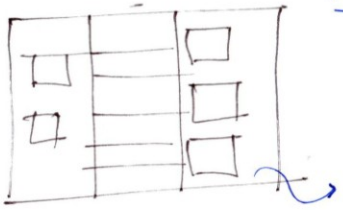
cover side.

viewing screen



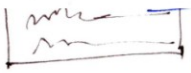
slate

supporting element



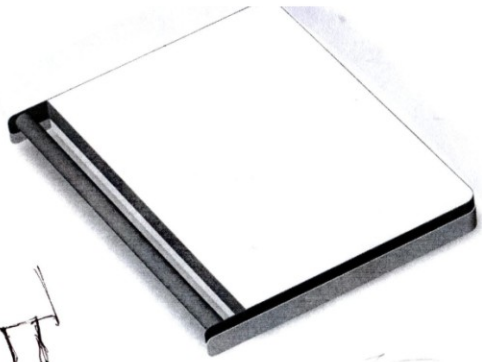
printed info on slate.

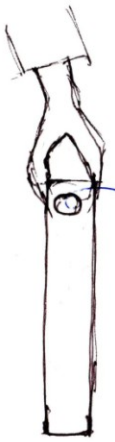
open like a book



info.

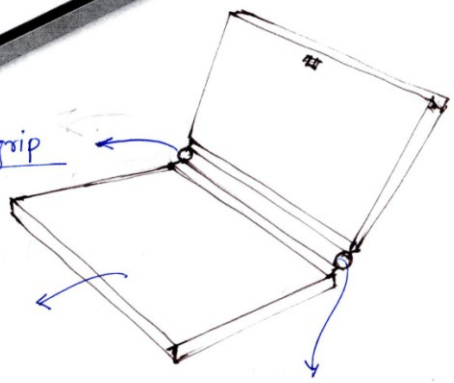
digital and analog info board.





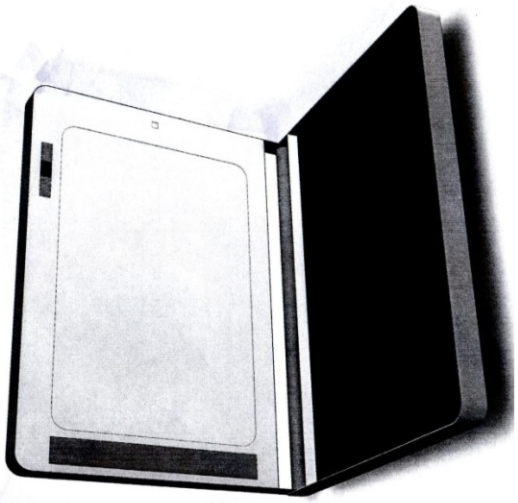
handle

grip

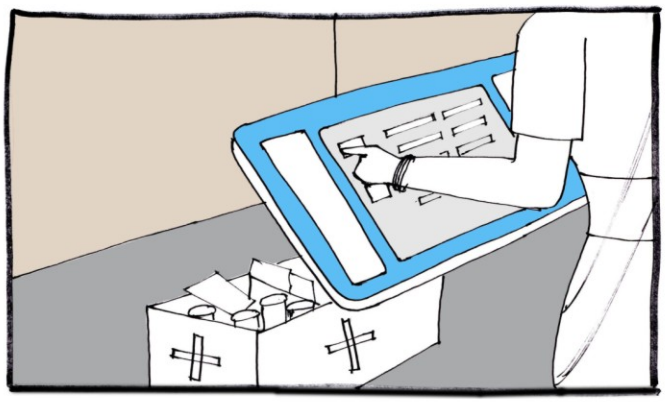


writing slate

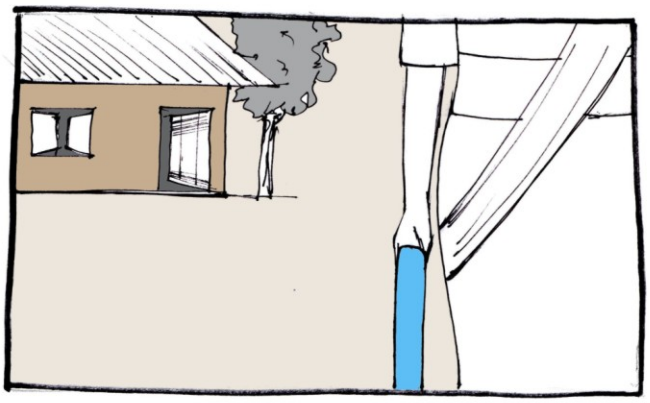
supporting element for screen.



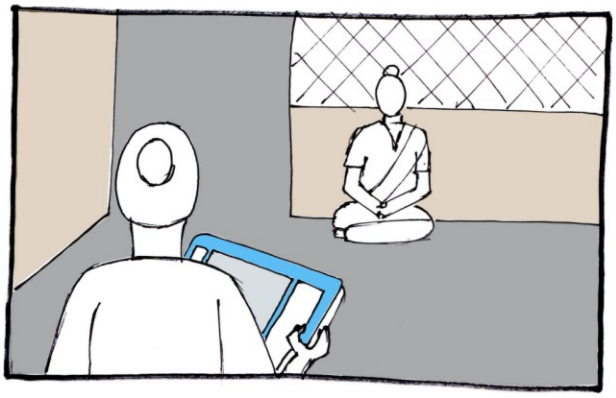

**Arogya Pati**
health Slate



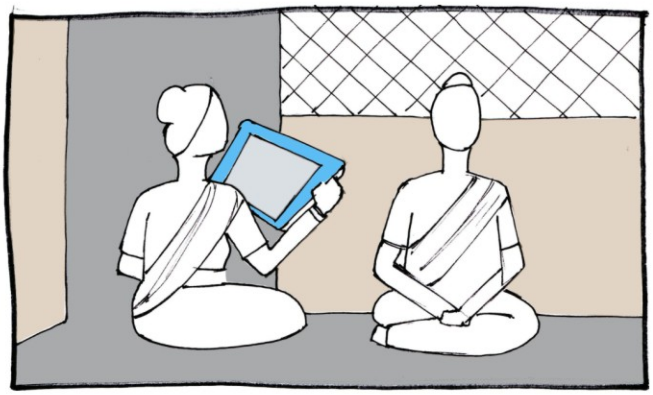
ANM worker sorting out her medical kit on her health slate, according to home visits she will be making later today.



ANM worker walking through village carrying her health slate with her.

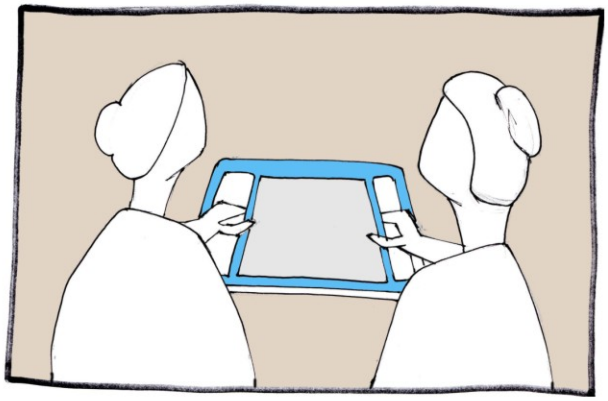


As ANM worker reaches her first home, she greet the mother and take out her health slate and getting ready to take records.



ANM worker asking questions to the mother, about her health and pregnancy. She is engaged in entering the data on her health slate

ANM worker taking picture of a pregnant woman for her own record. This picture will get identified with woman's identification number



ANM worker sharing audio-visual information with the pregnant woman, about things to do and don't during pregnancy

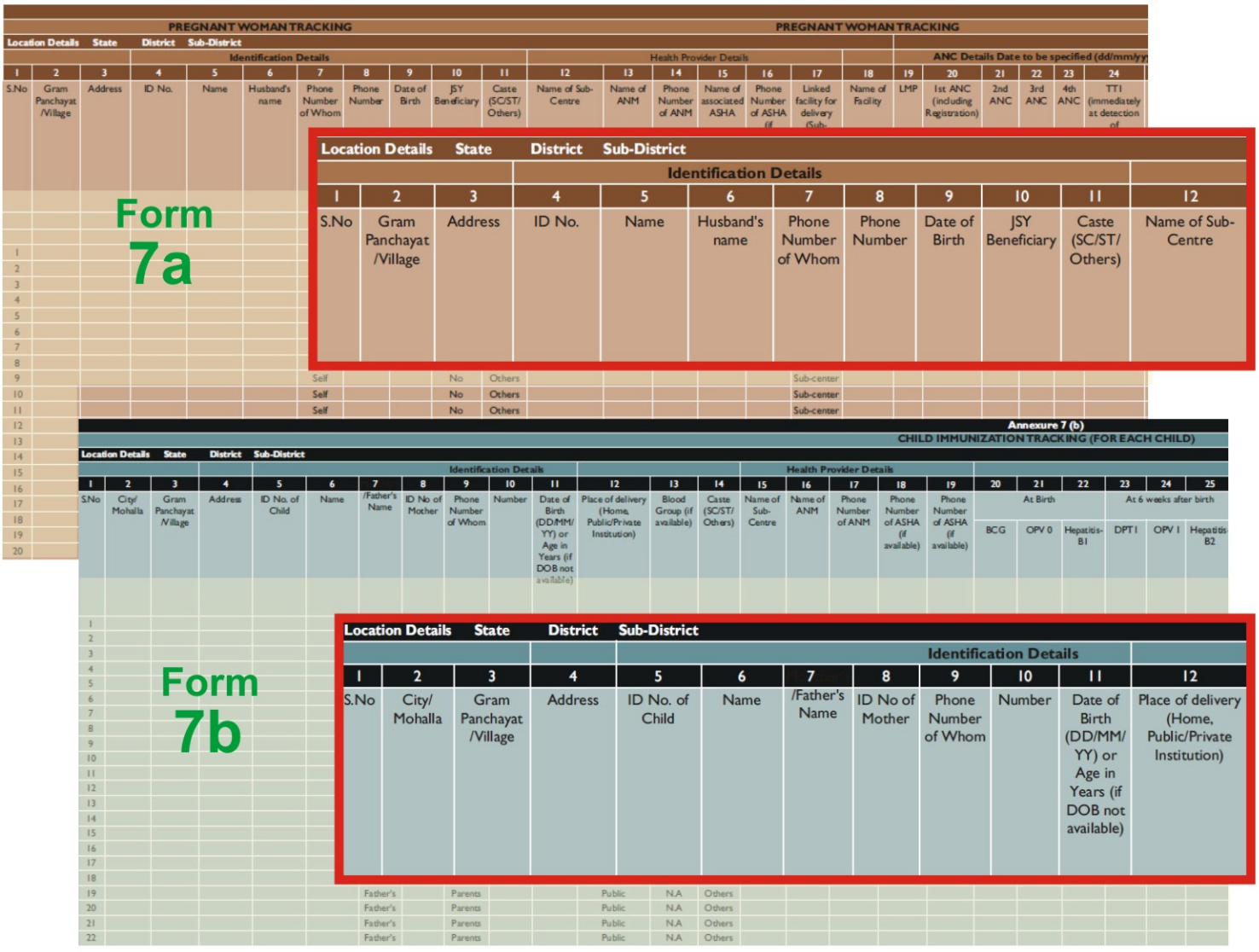

JAN 22, 2011
HOME
1.50 PM
ANC DETAILS
DATA
LMP
(Last Menstrual Period)
1st ANC
2nd ANC
3rd ANC
4th ANC
DAYS
30 DAYS
TT1
TT2
Name:
Husband:
Age:
Weight:
Height:
Blood Gr.:
Birth Date:
JSY: Y/N
Caste:
Contact:
ANM DETAILS

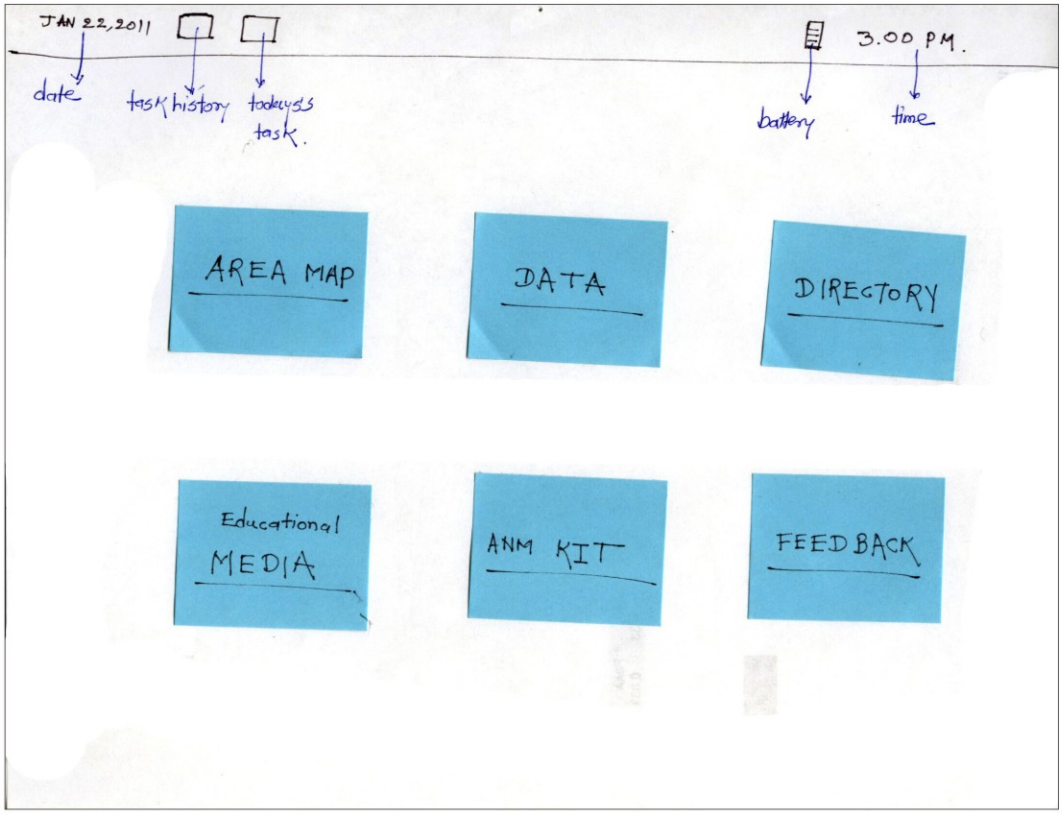
# User Interface

User interface (UI) for the proposed product is based on two important factors. First, the product interaction literacy of the Auxiliary Nurse Midwife worker and second, the possibility of extending the proposed system application within rest of the states of India.

As prescribed by the Ministry of Health and Family Welfare (MoHFW), India; all mother and child related health data collected by various national and state level agencies is based on form **7a** and **7b.** Different segments, relating to collection of comprehensive health information mentioned in these forms creates basic guideline for clustering data information, which is used for UI design. For design demonstration and understanding purpose UI is designed in English language, but kindly consider that keeping the designed iconography, UI can be translated in multiple regional languages.

Currently used forms for health data collection by MoHFW



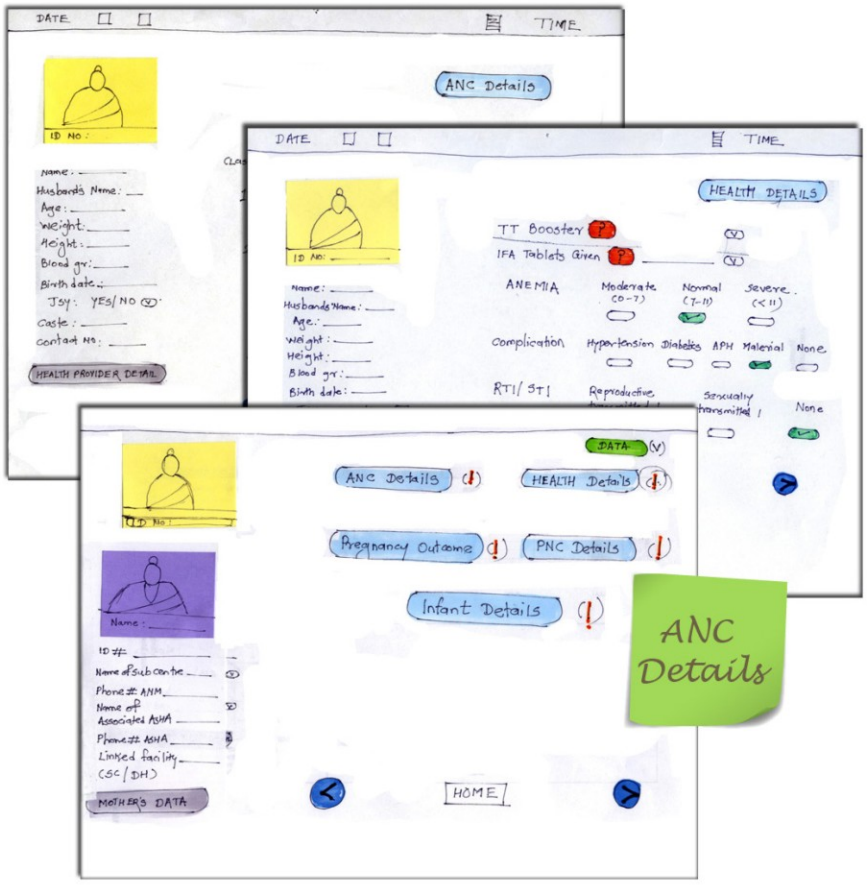



Six primary clusters of information management


Map based navigation system for quick help

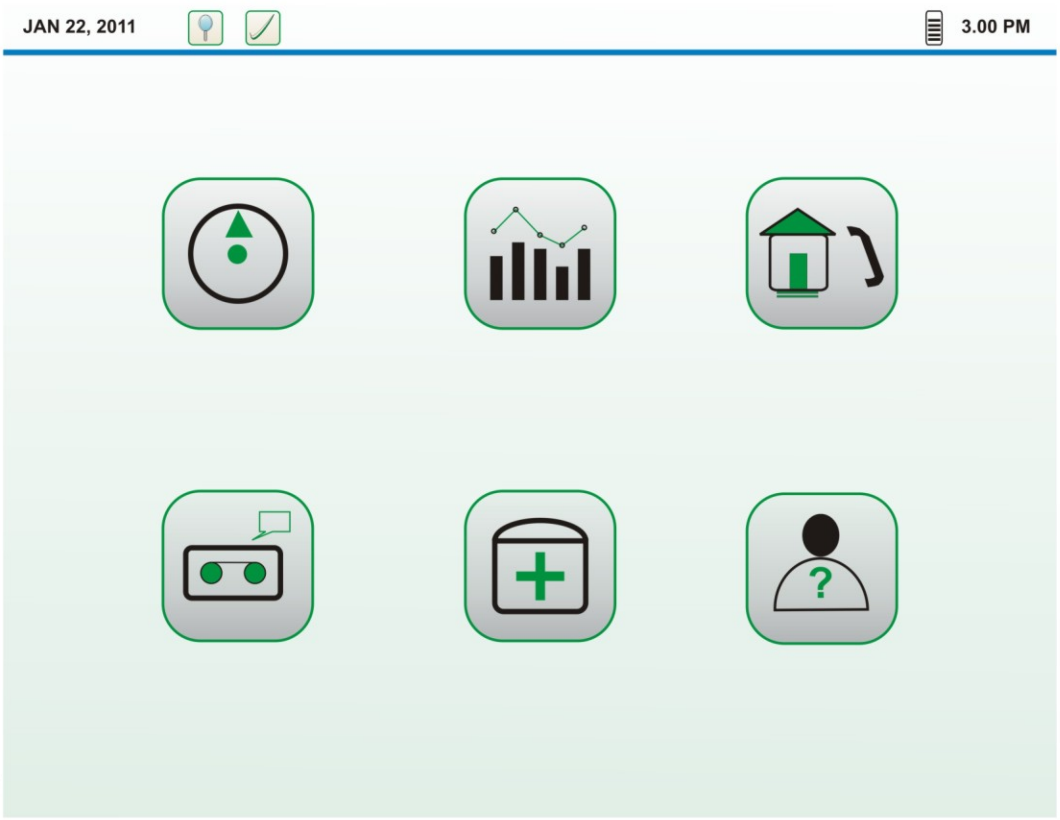

**Area Map**:
This will help ANM worker to get updated health emergency plan for her area, so she can schedule her daily visits more effectively.


**Media**:
One of the most important aspect of digital system is ANM worker can carry audio-visual health related messages with her. The way of sharing the information will be much fast and interactive.




**Anti Natal Care (ANC)**:
The most important section where mother's health information is maintained , based on MoFHW criteria

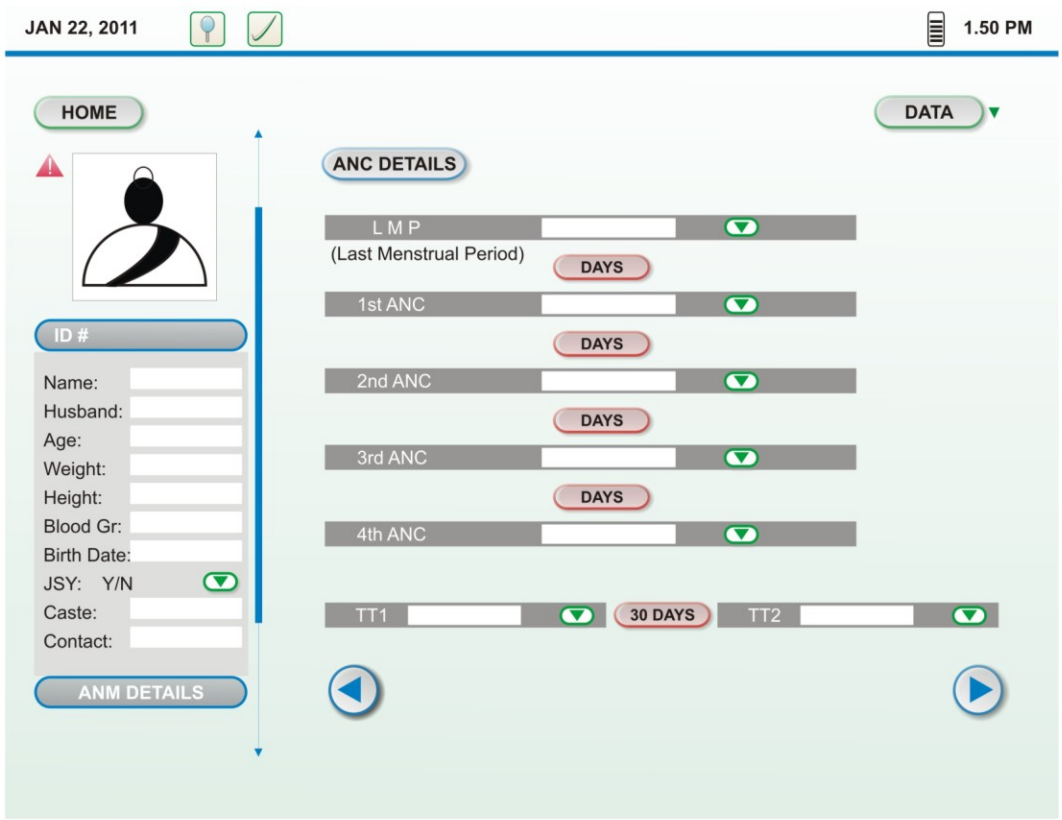

**Directory**:
Centrally accessed mother and child's health directory provide complete health information and track back facility for quick reference.



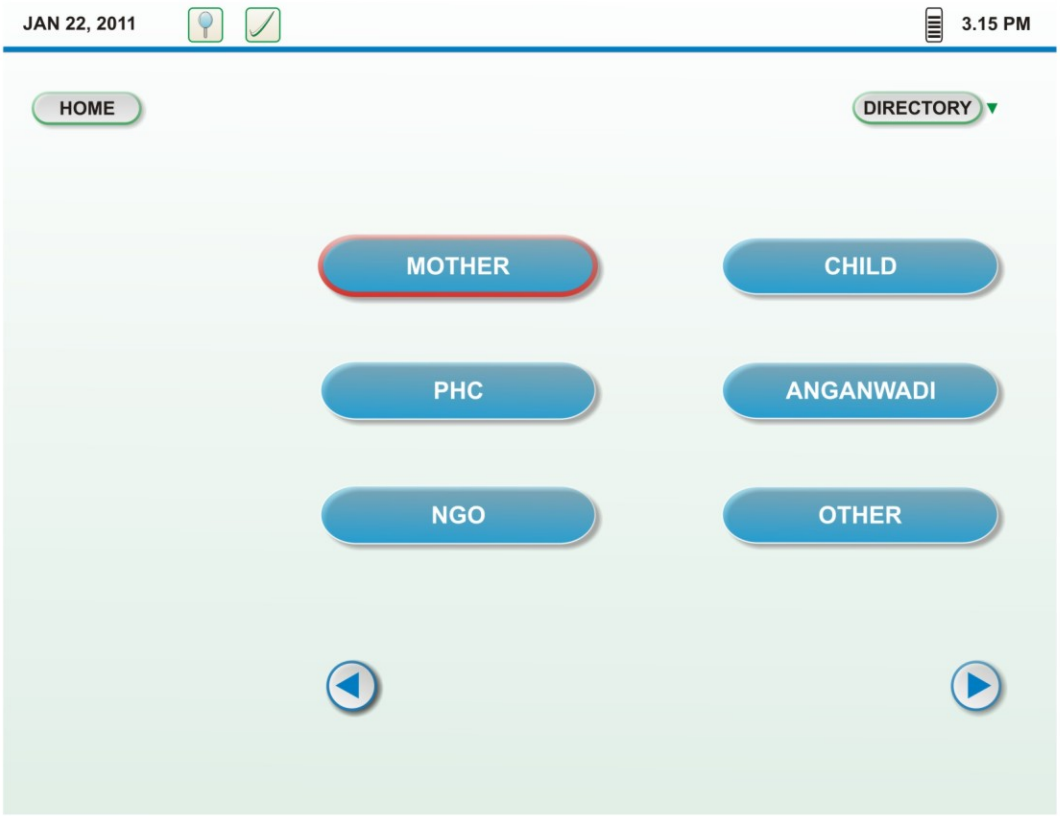

clear layout and easily identifiable iconography makes the navigation process more user friendly


color tags laid out on geographical map, makes the emergency message more clear

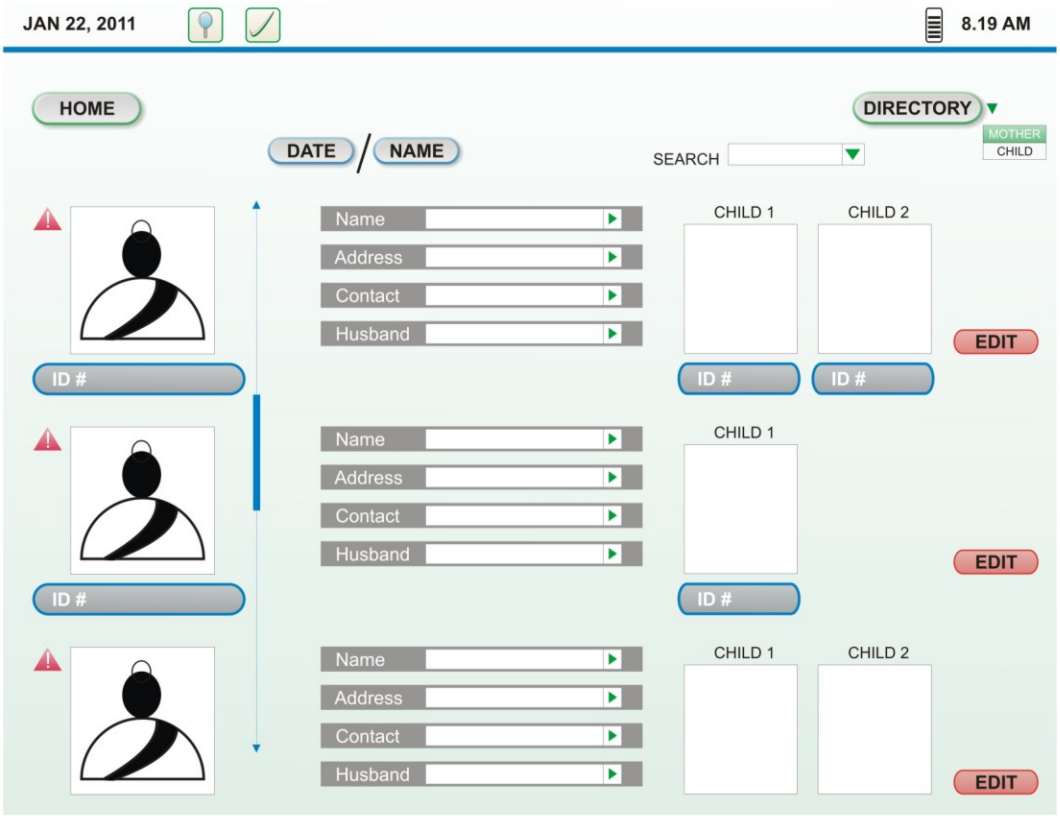

designated screen space for case details on the left, help the user as permanent reference through navigation process




standard information layout with quick reference keys make the data interpretation process more effective




bulk of information is segregated and structured in a way to make it accessible in the precise form, at appropriate place




condensed information about the case supported by pictures makes the directory most usefull feature during navigation

# Design Consequences

Newly designed health information system has minimum components with maximum utilization of existing communication infrastructure. Product along with interface is specifically designed pertaining to the requirements of the system, this approach leads to the complete task attention from the user by negating the scope of error. After considering the harsh operating environment with uncertain power supply conditions, the electronic equipment is proposed to be charged with a solar or cell phone batteries.

The scope of the proposed design system can be found instrumental in public health system by various ways. Few of them are mentioned bellow:

**Message Board:**
People from surrounding community can put their request with local authority to have controlled access over health records. This will help to keep the information transparent, as well individuals who are willing to help the under served can get an idea about what is happening in their surrounding.

**Crowd Sourcing:**
With government permission, health information data can be radially available to Medical Institutes, Universities and NGOs for improving public health.

**Mobile Reporting:**
There is no need to carry health card every time as the unique identification number will be generated by the system for each child and his/her mother. In this way individual's health record can be easily accessible with all primary health centers (PHC) and district hospitals.

**Triggered Messaging:**
Depending on the case urgency a message can be triggered to ANM's cell phone. This will make ANM's services more accessible and effective.

**Virtual Help Group:**
With the help of electronic device  that ANM worker is using for health information collection, she can also share her experiences, actions or remedies about health problems she has observed on the field with other ANM workers; which in other case is not possible.

**Information Tracking:**
Medicine and other vital information, triggered event alerts, inventory updates, continuous monitoring, early detection and prevention is all possible in proposed health information management system.

**Data Visualization:**
With the help of central pool of data and advanced technology, proposed system has capability to visualize health related data more effectively. This will particularly be helpful in better understanding of problems, overcoming language barriers and create easy to share data with different health professionals.

**Outbreak Mapping:**
Populated data points will reflect the severity of the specific problem, and hence it will send alert to various health supporting systems at the state and the national level in sighting certain health pattern.

As any other designed solution, the success of this proposed system is completly based on effective implementation in rural parts of Maharashtra. Through the research I had conducted and evidence based design process I followed during entire course of my thesis, I can firmly say that, solution I have proposed has an extensive application during planning, implementing and feedback stages of social health care services in developing and under developed parts of the world. The system further strengthens, as it keeps Auxiliary Nurse Midwife (ANM worker) at the center; who is unanimously consider as a key factor in various child health programs run by UNICEF (The United Nations Children's Fund).I am looking further to bring this project in public domain through my blog and start raising some voice to initiate the dialog with local authority; where I see my efforts can help in saving a life before its too late.

# Credits

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## Tool Kit

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**Design Revolution Tool Kit**
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**IDEO Method Cards**
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