Half Day Workshop

On

Maternal and Child Health (MCH)

14th Sept 2013

Organized By:

VENTURE CENTER

100, NCL Innovation Park
Dr. Homi Bhabha Road, Pune –411008

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Need Areas identified for technology intervention:

Nutrition & Probiotics

Identified need areas:

- Improving/ ensuring adherence to nutrition product/regime prescribed:
  - Improving taste & attractiveness
  - Aligning/ customizing with local habits & habitats
  - Formulations other than pills; aversion to pills
  - Formulations with lesser side effects (like problems in bowel movement)
  - Formulations with lesser visible consequences (like dark stools)
- Creating a micro-economy around nutritious & localized foods & food processing:
  - Food based business by self help groups
  - Food dehydration & preservation to make available leafy vegetables & fruits throughout the year
  - Super-cereal mixes
- Protein sources for longer shelf life/storage life
- New ways to scale "dietary modification" strategies
- De-worming strategies & mechanisms
- Delivery of Zn to diarrhea patients

Possible solutions:

- More palatable food / discourage the packet system & start self help groups who make healthy & tasty mixes locally.
- Rural microenterprises that can create a business out of nutrition & provide nutrition solutions which are at an affordable price & on a local model rather than something which is top down like sachets or dabbas or packet foods
- Village women can be taught how to include essential ingredients in their daily food recipes like green leafy vegetables, lemon (Vit. C), ragi, carrots, seasonal fruits etc which will resolve most of the vitamin & iron deficiencies in the children.
- Providing food dehydrators or solar dryers to preserve seasonal fruits/leafy vegetables will ensure that the families will have access to the essential dietary nutrients throughout the year.

Diagnostics, Data & adherence

Identified need areas:

- Easy to use & robust (maintenance free) BP machines
- Mother's BMI tracking
- Tracking adolescent growth status & its delay (if any)
- Identifying quickly pathogen causing pneumonia for a particular patient
- Monitoring a child's breathing rate
- Visible indicator of hand wash status
- Easy & cheap ways to identify & make visible pathogen causing diarrhea (rotavirus, cryptosporidium, Ecoli)
- Tools for every woman to monitor her own vital statistics like BP, Blood cholesterol, Hb count, ovulation etc at home.

Possible solutions:

- Easier diagnostic techniques to gather scientific data on the causative organisms of Pneumonia in India & development of vaccines for prevention of Pneumonia and Diarrhea based on the scientific evidence.
- Simple screening & diagnostic tools for use by dummies. For eg. A bindi which shows ovulation, as a way for family planning Or certain diagnostic strips which change color to detect problems in vital statistics , a easy to use blood oxygen monitor / BP indicator
- A tool to detect if a child is going into pneumonia like a simple battery operated contraption to detect the breathing anomalies in the child
- H_2S based strips to identify fecal contamination of waste

Vaccines

Identified need areas:

- Good quality data on causative organisms to convince Govt. of India to introduce vaccines
- Cold chain
- Pneumococcal vaccine, H1B vaccine, Measles

Possible solutions:

- Easier diagnostic techniques to gather scientific data on the causative organisms of Pneumonia in India & development of vaccines for prevention of Pneumonia and Diarrhea based on the scientific evidence

Medical, sanitation & contraception products

Identified need areas:

- Cheaper & safer sanitary pads
- Ways to dry sanitary napkins indoors
- Ways to reduce sharing or inadvertent sharing of napkins

Bleeding, BP, Child birth etc

Identified need areas:

- Ways to handle prolapsed uterus (prevention/management)
- Preventing & treating malaria
- Mechanisms to reduce transport distance time to reach hospital
- Creating local sources of blood supplies, blood banks & blood transfusion mechanism
- Local/ rural health infrastructure
- Preventing/reducing unsafe abortions
- Training for child birth at home for midwifes since 40% deliveries happen at home

Changing behaviour & habitat affecting health & sanitation

Identified need areas:

- Improved cooking stores with lesser emissions
- Reduce or avoid aversion to swallowing pills
- Promoting hand washing
- Measuring & monitoring indoor air pollution cheaply
- Reduce cases of Pneumonia & RTIs caused due to dust, mites, due to the dampness & darkness of village homes.

Possible solutions:

- Provide village homes with dehumidifiers to tackle the dampness.

Other societal & systemic issues

Identified need areas:

- Better & efficient transportation for ASHAs
- Mechanisms to allow mothers more rest time before returning to work (without loss of pay)
- Reduce high energy expenditure in work by mothers – ways to increase productivity of labor.

Detailed Report:

A Half Day Workshop on Maternal and Child Health (MCH) was organized by Venture Center on Saturday, 14th September 2013, as a part of Venture Center's campaign (Project: Vatsala) to facilitate technology development, transfer and entrepreneurship relating to maternal and child health.

The event was graced by expert speakers like Dr Rama Sivaram, Dr Shobha Rao, Dr Arun Gadre who have a rich experience from working at the grass root level in the field of MCH, eminent paediatrician Dr Ashish Bavdekar & anthropologist Dr Sanjay Juvekar.

The audience was well represented by participants from the academia, NGOs, technocrats &entrepreneurs as well as medical professionals working on-field for improving MCH.

The workshop started off with an overview of key issues in child & maternal healthcare scenarios in India by Ms Pradnya Aradhye & Dr Vandana Mhaske.

This was followed by a very insightful talk by Dr Rama Sivaram who brought a plethora of issues related to maternal & child health to the table. She spoke from her extensive experience of working at the grass root level for HEAL. The essence of her talk was that ground realities are far different from the picture we or the policy makers are aware of. Time is ripe to give up on the top down approach. It is the need of the hour to improvise & optimize the solutions as per people's social beliefs so that they are easily assimilated by the target groups.

Highlights of Dr Sivaram's talk are as below:

- Village folks/ Illiterate women do not know how to use digital/ high tech healthcare equipments even if made available to them→ Provide them with simple technology based solutions instead→ for eg. A bindi to indicate when they are ovulating as means to family planning or a colored strip to indicate the hemoglobin just by comparative analysis.
- Policy makers think they are delivering good healthcare→ but they forget to link it up to local habits & habitat→ Vertical programs are of not much use→ a horizontal optimized approach to health care necessary →stay with the target people to understand their needs & design your solutions accordingly → for eg. Providing fertility enhancers or iron tablets to girls in villages makes them prone to starting the menses early, which is a big problem for her parents as they have to marry her off early OR many pregnant ladies in the villages do not want to take calcium/ iron supplements as they fear that too much of brain growth of the baby may make it difficult for them during delivery.
- Understand & deliver solutions to their simple yet grave common problems→ for eg: address the issue that hospitals/maternity homes are miles away from the pregnant village ladies→ they have to commute in bullock carts to reach the hospital at the time of delivery → a bumpy bullock cart ride has cost many a women their baby's life OR that ASHA workers have to walk miles to reach to the houses before they can provide any help→ improved commuting options are necessary in both the cases.
- Time is ripe to give up on the top down approach→ improvise & optimize the solutions as per the peoples beliefs so that they are easily assimilated by the target groups→ for eg. as in some African countries, provide the target groups with drumstick seeds to encourage drumstick plantations, which is a good source of Calcium (especially leaves) → encourage use of healthy ingredients in daily diets like inclusion of fresh leafy vegetables, sprouts & pulses in a child's diet.
- Learn to implement better solutions to addressed problems by listening to the feedback of the target groups→ for eg. The packet food provided by the Government is tasteless & hence not eaten by most of the children or mothers→ solve this issue by making it more palatable.

This segment was followed by the distinguished speakers' presentations on Malnutrition – The Foundational Problem; Pneumonia – the largest cause of child mortality in India; Diarrhoea- second largest cause of child

mortality in India; Eclampsia and Haemorrhage in females & a structured discussion between the panellists, moderated by Dr Magesh Nandagopal.

Dr Shobha Rao in her insightful talk, spoke of "Malnutrition – The Foundational Problem" in maternal & child health. The essence of her talk was that proper nutrition is a highly neglected issue in the villages. It is important to create awareness about the best eating practices amongst the village folks & specially the women, to make sure that their diet comprises of the wholesome goodness of available ingredients.

- Dr Rao expressed concern that the Anganwadi workers or the health staff working in the villages are not motivated enough towards their work & many times lack the basic knowledge thus failing to convince the village folks towards healthy dietary practices. It is equally important to create awareness while adhering to the social & cultural framework of the target population.
- Dr Rao further spoke of an exemplary program carried out by a few social activists including herself, wherein the activists carry a portable gas from village to village & teach the village women how including essential ingredients in their daily food recipes like green leafy vegetables, lemon (Vit. C), ragi, carrots, seasonal fruits etc will resolve most of the vitamin & iron deficiencies in the children. A study carried out by one of her student shows that just by motivating a pregnant mother to eat 1 roti extra every meal reduces the chances of low birth weight by 30%.
- She insisted that distributing packaged food to villagers should be completely discouraged as it doesn't address the root cause of their faulty eating habits. Instead teach the mothers to inculcate healthy cooking & eating practices. Another important thing to be kept in mind while addressing nutrition needs of village people is to understand their social habits; know their strong & weak beliefs & design a dietary program accordingly as to what can be altered to make the people healthier.
- Dr Rao like Dr Sivaram believes that the target population needs simple technology solutions to address their problems pertaining to malnutrition. For eg: providing food dehydrators or solar dryers to preserve seasonal fruits/leafy vegetables will ensure that the families will have access to the essential dietary nutrients throughout the year.

Following this, Dr. Ashish Bavdekar shared his experience on the issues pertaining to Pneumonia – the largest cause of child mortality in India & Diarrhoea- second largest cause of child mortality in India.

- He highlighted the fact that there is no scientific data supporting the fact that Pneumonia is caused by a particular microorganism in Indian population & hence no vaccine available for the prevention of the same. Thus there is a burning need for the technology providers to come up with easier techniques to gather scientific data on the causative organisms of Pneumonia in India.
- Another area where technology can be implemented is for detecting & keeping under control the indoor air pollution due to smoke from the fire wood used in chulhas which is one of the factors aggravating Pneumonia in village children.
- Dr Bavdekar pointed to the fact that India needs better diagnostic tools when it comes to early detection to causative agent of pneumonia as well as improved awareness in the masses as to how to detect symptoms like tacheapnea or rapid breathing or in-drawing of the chest & nasal flaring in babies for an early diagnosis & treatment of the disease.
- He further mentioned that India needs to come up with generic probiotic drugs to mitigate diarrhea. Further there is a need to come out with rotavirus vaccine to decrease the deaths due to diarrhea in small children. Steps have already been taken towards development of rotavirus vaccine. Bharat Biotech in collaboration with DBT (Dept of Biotech) have positive results from a Phase III clinical trial of a rotavirus vaccine developed and manufactured in India

Following this talk, Dr Sanjay Juvekar brought up some key issues which need to be addressed to tackle the problems surrounding MCH. Highlights of Dr Sanjay Juvekar's talk are as follows:

- It is crucial for the NGOs/ social activists to understand the program & give relevant feedback to the policy makers to make the program a success. What is the best way to reach the policy makers needs to be thought through.

- Simple challenges need to be addressed first→ Like why 65% of the village population still prefers chulhas over stove→ Alternative chulhas imparting the same taste to the food minus the pollution component might be better accepted by the village folks.
- It is important to involve the Government representatives in this type of discussion forums → all our efforts must complement the Govt efforts→ only then a program can be largely successful.

Lastly, Dr Arun Gadre shared his vast experience of functioning as a gynaecologist in the rural area & the most common hardships faced by the practitioners in those habitats. His talk highlighted that rural India falls short on the following fronts when it comes to preventing deaths during delivery:

- Maternity homes are miles away from the pregnant ladies' villages→ need for a rapid & safe transportation facility→ this will surely decrease the maternal mortality.
- Faulty abortion causes maximum deaths→ needs to be tackled on war footing→ awareness/ medical training essential for general practioners who carry out abortion.
- Lack of blood transfusion facilities is a major deterrent for the doctors to provide healthcare to the patients→ patients have to be transferred to bigger hospitals miles away→ artificial hemoglobin needs to be made available even in the smallest dispensaries.
- Technology solutions can be provided to develop Hb monitoring device→ which is very simple to use→ even by the mid wives (*Aayas/dayees*)
- Another useful gadget would be an easy to use blood oxygen monitor
- Furthermore, community based health monitoring must be set up→ health awareness must be delivered convincingly to the masses in their mother tongue.

Dr Kaumudi Godbole then provided information regarding their commendable efforts to set up a helpline called as the Garbha Swasthya Helpline to provide free information to callers regarding pregnancy related issues.

In session 2 of the workshop, Dr. Satya Prakash Dash, Head, Strategic Partnership & Entrepreneur Development & Dr. Jyoti Shukla, Manager Technical (Discovery & Product Development) from Biotechnology Industry Research Assistance Council (BIRAC), A Government of India Enterprise spoke via Skype regarding the various funding options available under BIRAC for new technologies/ideas in the field of MCH.

It was well received by the participants & many questions were answered by the officials regarding the eligibility of various technologies/ initiatives for BIRAC's funding.

The workshop had a panel discussion at the end which provided more insights and perspectives on the key issues in Maternal and Child Health from people on the field and researchers. It helped in defining problems and areas where technology interventions are needed.

This session was moderated by Dr V Premnath (VP) who posed various questions to the panellists Dr Ashish Bavdekar (AB), Dr Arun Gadre (AG), Dr Sanjay Juvekar (SJ), Dr Rama Sivaram (RS), Dr Shobha Rao (SR), and Dr Koumudi Godbole (KG). Excerpts from the discussion are as below:

VP: I was quite surprised by the number of leads for technology based ideas or interventions that came up or even things which required a ground bottom up sort of approach which could be built into businesses. At the end of the day, you do need some kind of sustainable model that grows. There were many leads for nutrition based ideas today, which requires a more customised & hands on approach →but is there any scalable way? Can there be rural microenterprises that can create a business out of nutrition & at an affordable price & on a local model rather than something which is top down like sachets or *dabbas* or packet foods?

SR: I think it is possible. In fact I have been thinking always in terms of solutions from the rural community itself. I am interested in self help group leaders or mothers →They maintain their accounts in black they don't

have much education→ but are all energized now. And I have been working for almost 25 years in rural communities. And they always ask, "Tell us something to do". So if we can develop simple solutions for baby foods just like we have sweet potato, *rajgira* (amaranth seeds) to make balanced amino acid protein compositions or tackle vitamin A deficiencies by including pumpkin, carrots etc. If we teach them to incorporate these in simple models & use technologies like dryers or dehydrators to preserve seasonal fruits/ leafy vegetables, & teach them to prepare the mixes, I think it is possible that they can themselves produce these products for their own children & friends.

VP: Yes, I have marked out the dryers & dehydrators because there are people sitting on technologies who could actually use some of that. And for the customized needs as per the local habits & habitats we have seen that microenterprises do work. So you, Dr Sivaram had some ideas also, right? You were saying that some things could be done...

RS: Those were pertaining to effective nutrition. But again there is the question of sachets. We are a sachet culture. We all love 1Rupee/ 5 Rs sachets... So if good food, all the nutritional products should be made at the grass root level itself, with whatever resources are available. There are good resources available locally. It is the way people are to be educated, the way these products are to be promoted & packaged so that it becomes a part of their regular purchase. Like Dr Rao mentioned rotary, we have also helped a self help group by helping to purchase a Atta mill (*chakki*) for her. And the money that comes back, we are giving it to somebody else to buy something else. So that a woman who is facing challenges like distance etc, it is available right there at the grass root level. This is about nutrition, but I would also like to be looking at simple screening & diagnostic tools for use by dummies.

VP: Actually yes, that comes to diagnostics, which was the next thing I was going to come to. One thing that you, Dr Bavdekar mentioned was that for Pneumonia, spotting the organism by diagnostic tools & also being able to create quick data which can be used at different locations as well is a possible lead. That I have noted down as in our networks there are people who are interested in diagnostics, & who are looking at point of care diagnostics & some of them are without machines or expensive lab equipments or heavy expenditure. So those are the avenues we could explore. Others which came up in the space of diagnostics during the day. one was about BP, do the ones which are available work?

AG: they work very well.. but again the mechanical problems are there..They may not be applied correctly, they need more skill to apply it.. but if you come up with those with minimum skill, without electricity & easy to maintain, they would be a hit even in the urban markets.

VP: So Gautam, tell us why its not possible. Gautam is a biomed engineer, he has a 12 lead ECG device, which is handheld & which is getting tested by Dr Devi Shetty right now. So, why is it so hard?

Gautam: Actually it is not hard at all. I would like to disclose that right now, I worked with a CSIR lab to put in a proposal for an Indo-US grant & the challenge was about relooking & redesigning the whole aspect of BP measurement. We are looking at a glove that will give you exact BP measurement by just taking in the pulse..Hopefully it will get through. So practically everything right now has a great aspect to be challenged, except that you get funding agencies which put a blank disclaimer saying that we are not looking for the profit, we are just looking for the betterment of the society. So today, technology is locally available for the equipments to be made.. my entire ECG machine was made in Pune. And with the amount of funding opportunities available like BIRAC's 50 lakhs grant, things are looking brighter for new technologies to come up on local levels.

VP: Thanks Gautam. So the other thing moving over diagnostics..Dr Bavdekar mentioned about ORS.. What are the real issue preventing people from using it? Is there also a problem of clean water?

AB: When you make ORS, you require only potable water & not sterile water, so that is not an issue. It is more of a medical practice issue. When a parent comes to you with a child with diarrhoea, you do not write ORS on the prescription. You only tell it orally. Anything which is not written on the prescription is not taken seriously. And second thing is that ORS doesn't stop purging as such. So visibly the parents do not see the importance of ORS in curbing the diarrhoea. Now with the combination of ORS with Zinc, we hope that from parent point of view, the importance of ORS will go up. Plus initially you had big ORS packets which had to be finished in time, but now things are changing, but we still have a long way to go. Making ORS available in the right combination/formulation & in cheaper smaller sachets may help.

VP: Other angle of solutions you brought up was probiotics.. The prices are quite high actually.. Is it really so that the costlier proprietary preparations are way superior? You mentioned one specific organism which is patent protected..so is that something which is really needed to make a probiotic work?

AB: Probiotic functions are very specific. So just because one probiotic helps in treating diarrhoea, all probiotics will not help. So we look at scientific evidence & unfortunately, the scientific evidence is only for proprietary preparations. Thats the point I am trying to make.. we have a probiotics association in Karnal, we have a local factory which makes probiotics in Pune..the only problem is we do not have data on that. So how do I prescribe it, even though it is very cheap, but how do I prescribe it because I don't know if it works. No one has really looked at the Indian proprietary because the market is just flooded with the foreign proprietary medicines. So we are trying to do research on an Indian probiotic & to see & make sure that it works, then only it will be used & will be far cheaper.

VP: By the way, one of the programs BIRAC officials mentioned could also be used for testing & generating data..as a part of the delivery mechanism for some of these products.

VP: Moving over diagnostics & nutrition, you mentioned that there are nutritional problems which we need to address over many years & not necessarily during those nine months of pregnancy. So it required that we address it as a population or not as a small or a short duration solution?

SR: the issues are similar. But the solutions must be customized or community based.

VP: but do you need diagnostic means to generate data..to track what is the problem in one area versus the other area?

AB: We need to understand that when we talk of malnutrition, we do not necessarily mean under nutrition. For example, when we look at cases from Pune today, there are more cases of obesity & over nutrition than under..but it still comes under malnutrition. So anything that is geared up for that is not geared up for this. So the solution has to be customized to that particular area. So being a paediatrician in the city, my issue is over-nutrition, but Dr Rao's issues are under-nutrition. So how do we tackle both the problems under similar policies or programs is what needs to be thought about.

VP: So data generation has been a problem in most of our cases. And the problem with diagnostics in India is that the diagnostic market in India has been only few percent of the world market. So most of the manufacturers have not shown interest in India.

RS: One of the things is that we are middle level, low resource country. We have our best & our worse. What is available to me is not available to rural people. So what can be done for them? Very simple, instead of going to the large multispecialty hospitals to get their vital stats checked, every woman should be able to check her vital stats at home. This will surely prevent anaemia, pre eclampsia in pregnant women..provide with simple strip test markers. For eg. A bindi which shows ovulation, so that it's a way for family planning. Why don't we just have certain dummy strips which change color to detect problems in vital statistics? Similarly a solution for the pneumonia & RTIs is preventing infection due to dust, mites, due to the dampness & darkness of these

village homes. Why can't we provide with dehumidifiers which everyone can buy like a fan? Even the levels of indoor pollution can be monitored. They need not know if its Carbon mono oxide coming out of their chulhas, they just need to know that the gases have reached a dangerous level. Similarly Dr AB mentioned that the symptoms of pneumonia are that the nostrils flare up etc.. why can't we have a tool to detect if a child is going into pneumonia? It might be a simple battery operated contraption to detect the breathing anomalies in the child. Similarly tampons can be used to check heavy post delivery bleeding & abnormal bleeding during pregnancy in many cases. It is a used & proved remedy to check 45-50% of post partum haemorrhage. Neem based fumigation could be a remedy to prevent malaria. People should use those ticking stethoscopes; H_2S based strips to identify faecal contamination of water, child warming kits

VP: there is a Pune based company which manufactures smokeless chulhas, but there are problems which need to be addressed. Some problems are systemic as many of you mentioned & will take time to be mitigated. How do you sustain such new solutions is the key issue.

RS: We must not blame everything on the government. Certain things should be taken up by us as a community. If it is a preparation that does not fall under intellectual property or patenting, it should reach out to the masses. A very important thing that the pregnant women needs is a *dai* to take care of her. Home delivery cannot be eradicated tomorrow. This thing needs to be given time but till then why can't the help be provided to the pregnant women at her doorstep. What we need is self management & that is when adherence will come & our programs won't fail.

VP: Now before we close, in terms of technology, can I have one thing from each of you which needs to be addressed? In your opinion which is the problem which if addressed will make the biggest dent in MCH in India?

SJ: I would say the networking of all these people who are responsible & address one issue that is important to all of us.

AB: All other things will take time but vaccine is the first thing which will bring down the morbidity & mortality in Pneumonia & Diarrhoea.

SR: what also needs to be addressed is alternatives to the existing vaccines; for eg: 1 dose measles vaccine instead of two or delivery methods like painless subcutaneous injections.

AG: I will request artificial blood.

RS: I want non invasive, low tech solutions for diagnostics & screening which are cheap & easily available; which are handheld & easy to use by every person.

SR: I would like to see that every village has a microenterprise self help group. We can teach them the making of weaning foods which are rich in micronutrients.

KG: I would like to go for systems for creating awareness & education systems for the masses in healthcare.

Background Information:

This is Venture Center's campaign (Project: Vatsala) to facilitate technology development, transfer and entrepreneurship relating to maternal and child health. We aim to network all stakeholders to help initiate useful projects, start-ups etc. Campaign components include a resources page, a brainstorming session, and presentation on SPARSH (BIRAC's program on MCH).

Venture Center is a technology business incubator in Pune, India that focuses on science-led start-ups. From time-to-time, Venture Center promotes different themes and aims to create "useful collisions" between various stakeholders pursuing that theme. This campaign is part of that effort.

Campaign: Reduce Child Mortality

Goal 4 of the UNs Millennium Development Goals is to REDUCE CHILD MORTALITY (Ref: UN MDG-4, World bank data)

Target 4 A: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate

Some facts:

1. Under five (under 5 years of age) mortality rate:
    - The number of children in developing countries who died before they reached the age of five in 1990 was 100 per 1,000 live births. The number of children in India who died before they reached the age of five in 2011 was 61 deaths per 1,000 live births.
    - The target for the number of children in India who die before they reached the age of five years needs to be 39 per 1,000 live births.
    - In the developed world (eg: USA), the number of children who died before they reached the age of five was 8 per 1,000 live births in 2011.
2. Infant (under 11 months old) mortality rate:
    - The number of children in India who died before they reached the age of 11 months in 2010 was 47 per 1,000 live births.
    - The target for the number of infants in India who die before they reached the age of 11 months needs to be 26 per 1,000 live births.
3. Proportion of one year old children immunized for measles:
    - The percentage of children immunized against measles increased from 42.2% 1992-93 to 72.4% in 2009.
    - The target for the number of children who get immunized for measles by 2015 is 100%.

(Source: http://www.un.org/millenniumgoals/mdgmomentum/images/MDG-infographic-4.jpg)

Major issues relating to health of new born children in India

- Causes include pneumonia, diarrhea, prematurity and low birth weight, neonatal infections, birth asphyxia and trauma.
    - 24% of children under 5 years age died of pneumonia in 2010 (Liu et al, Lancet, 2010)
    - 13% of children under 5 years age died of diarrhea in 2010 (Liu et al, Lancet, 2010)
- It has been reported that malnutrition is one of the underlying cause for infectious diseases and acute respiratory diseases. (Ref: WHO Bulletin, Malnutrition.)
- Claimed determinants of child survival in India (Ref: UNICEF Report):

- Maternal and demographic factors
  - Education of mother
  - Age of the mother
  - Spacing between two children
  - Maternal nutrition status
  - Deliveries attended by medical professionals
- Social and economic factors
  - Economic status of the family
  - Sex of the child
- Environmental factors
  - Access to safe drinking water

(Source: http://www.epi.umn.edu/mch/wp-content/uploads/2012/10/baby-and-finger-620x474.jpg)

Scope of technology interventions required to address child mortality issue in India (Priority areas identified by Venture Center's Campaign Curator)

1. Malnutrition: Deficiency of Vitamins, Iron, Folic acid and Iodine is prevalent in Indian children. (Ref: CINI report)
   Solutions being/that can be explored:
   - Fortified low cost and easily available food for mothers as well as infants/children
2. Pneumonia: Weaker/compromised immune system of children and unhealthy cooking practice (using soot emitting cooking fuel). Causal organisms are: *Streptococcus pneumonia* (the most common cause), *Haemophilus influenzae* type b (Hib)(second most common cause),respiratory syncytial virus and *Pneumocystis jiroveci* (in case of HIV infected children) (Ref: WHO fact sheet).
   Solutions being/that can be explored:
   - Using green fuel (emitting zero soot and healthy for indoor environment)
   - Fortified low cost and easily available food for mothers as well as infants/children
3. Diarrhea: Majority cases caused by Rotavirus, other causal micro-organisms: *E.coli, Cryptosporidium* and *Shigella* (Ref: Report in The Hindu and Lancet Journal). There is a dearth of diagnostic tools and treatments (Ref: Ajjampur et al, J Med Microbio, 2008). Zinc supplements reduce duration of diarrheal episode (Ref: WHO fact sheet).
   Solutions being/that can be explored:
   - Access to safe drinking water: Low cost water filters (no requirement for electricity).
   - Easy and quick turnaround diagnostic kits (point-of-care devices).
   - Cheap and easily available vaccines against the listed pathogens.
   - Low cost and easily available supplements with combination of Zn, Vitamins and minerals.
   - Ready to use ORS (oral rehydration solution) at low cost.

Campaign: Improve maternal health

Goal 5 of the UNs Millennium Development Goals is to REDUCE MATERNAL MORTALITY and IMPROVE MATERNAL HEALTH (Ref: UN MDG-5)

Target 5A: Reduce by three quarters the maternal mortality ratio. (Reduce urban – rural/ developing – developed nations' gap)

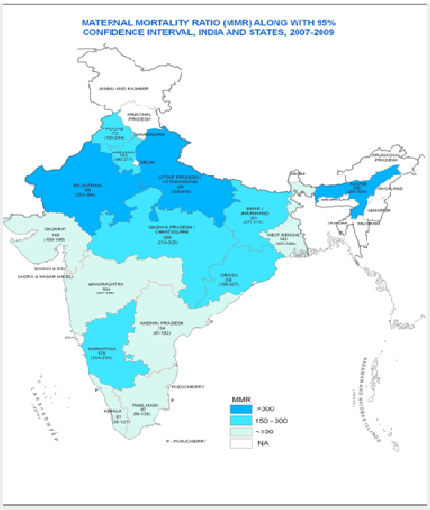
Target 5B: Achieve universal access to reproductive health (Antinatal care, family planning)

- For too many women across the globe, motherhood is far from being a fulfilling experience. It is associated with suffering, ill health and even death due to issues related to maternal health.
- When a mother dies, children lose their primary caregiver, communities are denied her paid and unpaid labour and countries forego her contributions to economic and social development.

(Source: http://www.un.org/millenniumgoals/maternal.shtml)

Some facts:

1. India has the largest number of births per year (27 million) in the world. Hence, India's progress in reducing maternal deaths is crucial to the global achievement of MDG 5. India has a target of reducing maternal deaths to 109 by 2015. (Ref: WHO)
2. However India, in spite of the economic progress the situation is grim. One woman dies during child birth every eight minutes (19% of global maternal deaths) and thus the nation has a long way to go before the UN target is achieved. (Ref: Huffington Post)



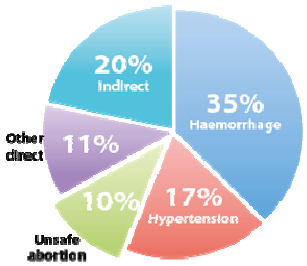
Source: Special bulletin on maternal mortality in India 2007 – 2009, Sample registration system, Office of registrar general, India. 2011
(http://www.censusindia.gov.in/vital_statistics/SRS_Bulletins/Final-MMR%20Bulletin-2007-09_070711.pdf)

Major direct causes of maternal mortality

- Major causes of direct maternal mortality are:
  - Haemorrhage
    - According to a WHO review (Survey 1993 to 2005),
      - 42% of pregnant women worldwide have anaemia which can significantly increase instances of maternal mortality due to heavy bleeding during childbirth;
      - about 50 % of maternal deaths occur because of haemorrhage and sepsis.
  - High blood pressure (Hypertension- Eclampsia)
    - Pre-eclampsia is a hypertensive disorder characterized by the presence of high-blood pressure and high protein levels in the urine (proteinuria) during pregnancy. The disorder can develop in healthy women bearing their first child and can

happen as early as 20 weeks of gestation. Delayed diagnosis can fatally affect maternal health. (Ref : Times of India, Dec 2011)

- Indirect causes include not having access to safety and benefits of institutional deliveries in India.



(Source: http://childsurvival-india.org/index.php/project/)

Major barriers to reproductive health

- Malnutrition and anaemia (Ref: Lancet online)
  - For every woman dying during childbirth many more suffer- There are long-lasting and debilitating illnesses. 36% women malnourished, ~ 55 percent are anemic. Maternal under nutrition (body-mass index of less than 18.5 kg/m ^{2}) is a life cycle issue that can result into short stature and low body-mass index affecting pregnancy and lactation.
  - Mineral / Vitamin deficiencies are major issues. Iron deficiency is the most common form of malnutrition resulting into anaemia.
  - Anaemia:
    - According to a WHO review (Survey 1993 to 2005) 42% of pregnant women worldwide have anaemia.
    - 75- 60% due to iron deficiency in non-malaria areas and 50% in malaria areas. (Anaemia could also be due to parasitic infections like Malaria).
    - Anaemia can significantly increase instances of maternal mortality due to heavy bleeding during child birth
  - Vitamin A deficiency
    - Either due to inadequate intake or infection can lead to complications like still birth, low birth weight apart from affecting vision.
  - Zinc deficiency
    - Result into complications like prolonged labor, preterm delivery.
  - Vitamin A and zinc deficiencies have by far the largest remaining disease burden among the micronutrients
  - Iodine deficiency
    - Even mild, subclinical maternal iodine deficiency during pregnancy impairs motor and mental development of the fetus and increases risk of miscarriage and fetal growth restriction

(Source: http://www.unicef.org/india/1339.html)

- Socio – cultural determinants

- Problem of exclusion (Ref: WHO):
  - The available data suggest that the marginalized sections of the society suffer from a 'social gap' in terms of health status and health services.
  - There have been attempts like Janani Suraksha Yojana by government of India. However the positive policy orientation (in terms of a comprehensive and joined-up vision) has not percolated into the implementation levels. (Ref: MoHFW-GoI)
  - Mobilization of women using the group approach as witnessed in Kerala could be an answer for promoting equity and further improvements in maternal health
- Early age of marriage and Adolescent Mothers:
  - Percent of girls marrying before the age of 18 is as high as 48% in poor population of India (the number is 29% for relatively affluent household).(Ref: TelegraphIndia)
  - Adolescents age 15 through 19 are twice as likely to die during pregnancy or child birth as those over age 20. (Ref: AdvocatesForYouth)
- Gender inequity (compounded by female foeticide)
  - Gender inequity puts girls at greater risk than boys and affects many aspects of young women's lives such as reduced opportunities for education, employment, and control over their own reproductive health.
  - This in turn affects their health resulting from lack of awareness about nutrition, birth spacing, and contraception.

Scope of inclusive and equitable innovations are needed along with awareness and sensitization over the maternal health issue in India (Priority areas identified by Venture Center's Campaign Curator)

- Some Central/state government majors are already in place.
  - For example to access remote and geographically difficult terrains, Boat clinics – Assam and govt with a private organization. (Ref: IndiaGovernance)
  - Janani Express Ambulance service (Ref: MoHFW-GoI)

(Source: http://www.ndtv.com/news/images/assam-boat-clinic-295.jpg)

- Technologies desirable for such majors:
  - Handy, battery operated equipments
  - Communication systems:
    - Due to inadequate number of health workers, doctors can provide help in diagnosis or guidance in delivery using internet based multi-media technologies. Such technologies can also aid in integration of information from various resources.
  - Affordable diagnostic/prognostic kits:
    - Eclampsia: detection of proteins in urine, monitoring of blood pressure.
  - Control of haemorrhage and family planning :
    - Intra uterine devices : safer, inexpensive and reliable
  - Affordable, quality nutrition that can be easily distributed/ Distribution systems:
    - Deficiencies like Fe, Zn and Vitamin A can be ameliorated through such majors. These can be given as tablets or fortified in food: grains, fruits and vegetables sources

Appendix 01: Workshop Outline

Technical Workshops Series – 2013

Half a Day Workshop on
Maternal and Child Health (MCH)
- Organized by Venture Center -

Potential gains	• Get an overview of key issues/ challenges and emerging opportunities • Explore potential industry-academia/research/medical fraternity partnerships in technology development and advancement to address maternal and child health issues prevalent in India. Meet and network with experts in the Pune region. • Learn about recently announced funding opportunities
Organized by	• Bioincubator at Venture Center (Bioincubator at Venture Center is supported by BIRAC, Government of India)
Sponsored by	• Venture Center
For whom	• NGOs • Industry professionals • Researchers and students • Entrepreneurs/ startups with interest • Impact/ Social Investors with interest in venture financing for MCH. • Medical doctors and clinicians
When	Saturday, 14th September 2013 09:00 - 13:30 hrs
Where	Training Room, Venture Center, 100 NCL Innovation Park, Dr. Homi Bhabha Road, Pune-411008
Contact	Ms. Lipika Biswas, Venture Center, 100, NCL Innovation Park, Dr. Homi Bhabha Road, Pune – 411008 Phone: +91-20-64011023; +91-20-25865877 Email: eventsdesk@venturecenter.co.in
Cost	• Free but prior registration is required. Register online at: http://www.venturecenter.co.in/workshops/ Attendance only on confirmation of registration. • First preference to industry professionals, entrepreneurs, investors, senior researchers, NGOs, Doctors. Students shall be allowed to participate if seats are available. • Organizers reserve the right to select participants so as to maximize learning and networking opportunities for the group.

Introduction

We aim to network all stakeholders to help initiate useful projects, start-ups etc for addressing Maternal and Child health related issues prevalent in India.

Workshop aims to:

- Provide an update of key issues relating to MCH in India.
- Explore potential industry-academia/research partnerships in technology development and advancement.
- Foster networks with industry/academic experts/doctors/NGOs.
- Introduce some recent funding opportunities

Workshop Outline

Workshop shall consist of:

- Talks
- Panel discussions
- Networking sessions

Workshop includes

- Workshop includes tea/ snacks
- Membership in mailing list to follow-up on workshop
- Participants will receive the workshop White Paper

Schedule	Session-1	
Time	Session title	Faculty
09:00-09:15	Registration and tea	
09:15-09:45	Set the stage for the event: Event introduction Quick overview of the key issues • Child health (5 mins) |Maternal Health (5 mins) • Insights and field observations on maternal and child health (15 min)	Bioincubator team • Pradnya Aradhye and Vandana Mhaske • Rama Sivaram
09:45-11:15	Structured discussion: ▪ Opening comments: Malnutrition – The Foundational Problem; Pneumonia – the largest cause of child mortality in India; Diarrhoea- second largest cause of child mortality in India; Eclampsia and Hemorrhage in females ▪ Discussion	Moderator: Magesh Nandagopal Speakers: • Shobha Rao • Ashish Bavdekar • Sanjay Juvekar • Arun Gadre
11:15-11:30	Networking tea (tea and snacks)	

Schedule	Session-2	
Time	Session title	Faculty
11:30-11:40	An overview of emerging funding opportunities	Speaker: Pradnya Aradhye
11:40-12:20	Q&A for funding schemes (via video/tele-link) • SPARSH • GCI, Gates Foundation and BIRAC	BIRAC: Satya Dash Jyoti Shukla
12:20-13: 10	Panel discussion • More insights and perspectives on the key issues in Maternal and Child Health from people on the field and researchers. • Defining problems and areas where technology interventions are needed. Where will technology intervention work within a reasonable time frame and cost? Ideas for compilation and for the workshop white paper.	Moderator: • Premnath V Panelists: • Ashish Bavdekar • Arun Gadre

		• Sanjay Juvekar • Rama Sivaram • Shobha Rao • Koumudi Godbole Rapporteur: Sneha Kanitkar
13:10-13:30	Closing comments and closure of the event	

Speakers and Panelists (in alphabetical order of last names)	
Pradnya Aradhye 	Pradnya Aradhye is currently Associate, Bioincubator, Venture Center. She has done her M.Tech in Biological Sciences and Bioengineering from IIT Kanpur. Currently she is handling all BioIncubator activites at Venture Center. She is responsible for creating a pipeline of potential and signing-up incubates for the Bioincubator. Contribute to building scientific support systems and resources for VC incubates including specific expertise. Discussions with scientists to understand their competencies.
Ashish Bavdekar 	Dr. Ashish Bavdekar completed his medical studies from B.J. Medical College and K.E.M. Hospital, Pune. He subsequently received training at Sheffield Children's Hospital, Sheffield, UK. He is the President of the Indian Academy of Pediatrics (IAP) – Gastroenterology Chapter. He has been on several IAP task force - Neonatal Cholestasis, Safe Injection Practices, Childhood Obesity and Acute Diarrhoea. He has special research interests in metabolic liver diseases, clinical nutrition, early life origins of adult disease, and human gut flora. He is presently Consultant Pediatric Gastroenterologist & Consultant in Pediatric Research Department of Pediatrics, K.E.M. Hospital, Pune, India
Satya Dash 	**Dr. Satya Prakash Dash** is currently the Head Strategic Partnership & Entrepreneur Development at BIRAC, New Delhi and is responsible for providing strategic direction to BIRAC especially in collaborative projects. He also drives the entrepreneurship agenda at BIRAC. Previous to BIRAC, he was a Senior Strategy consultant to IIM-B & IISc in understanding the ecosystem's needs for a medical-technology platform and authored an internal report on creation of a medical device incubator. Prior to this, he was the Chief Operating Officer of the nodal biotechnology industry organisation of India, Association of Biotechnology Led Enterprises (ABLE). His current interests include fostering the growth of Indian biotechnology industry.. He holds triple masters from Cambridge (UK), Leicester (UK) & Sambalpur (Orissa) and a PhD from University of East Anglia, UK. He is a recipient of the JNCASR Summer Fellowship India, British Chevening Scholarship UK, Overseas Research Scholarship UK, MBL Pioneers Fund Scholarship & C. Lalor Burdick Scholarship and was offered a Cambridge-Commonwealth Scholarship.
Arun Gadre 	Dr Arun Gadre, is a Gynecologist /Program Person/ Novelist/ Social activist. For 20 years worked in own private hospital in Lasalgaon, (a small rural town in Nashik District) Maharashtra, India.Conducted major surgeries in very harsh rural conditions like no facilities like Blood Transfusion, shortage of water and electricity etc. (admitted patients with HB 3 grams, severe pre-eclampsias, septicemias, uterine ruptures etc). He also worked as senior Technical Officer in Medical STI department in Pathfinder International for Mukta Project in Bill & Melinda Gates' Foundation's AVAHAN project for 5.5 years. Now working as associate coordinator in SATHI – CEHAT, Pune, and areas of work are patients' rights, accountability of private healthcare sector, maternal health. He has published Six books on women's health,

	published by reputed Marathi Publishers.
Koumudi Godbole 	Dr. Koumudi Godbole is a Clinical Geneticist from Deenanath Mangeshkar Hospital and Research Center, Pune. After completing MD Pediatrics she further trained at the Hospital for Sick Children Toronto, Canada and is a fellow of Canadian College of Medical Geneticists since 2004. Dr Godbole is a recipient of V. Bal Gopal Raju award of Indian Academy of Pediatrics as well as Roraty Foundation multi-year scholarship for training in Genetics. Her Marathi book introducing genetics to common man has been awarded Dr Tulpule award from Marathi Vidnyan Parishad, Mumbai.Dr Godbole has many national and international publications to her credit. Her research interest includes birth defects, developmental origins of adult onset disorders and reproductive genetics. She has been involved in multi-center projects funded by DBT and CSIR in these areas. She coordinates the birth defects registry for Pune since 2006 and has also started Grabha-Swasthya helpline to provide free information to callers regarding pregnancy related issues.
 Sanjay Juvekar	Dr Sanjay Juvekar is currently officer in Charge, VRHP, KEM Hospital Research Centre Pune and Vice Chair of INDEPTH-Network, Ghana. He has a Masters and PhD in Anthropology and bachelor's degree in Biomedical Technology as well as Chemistry. His work in Tuberculosis research on public private partnerships was the first of its kind globally in a rural set up and later on was adopted as a strategy by the public health program. Currently, he is the Principal Investigator on studies including 'Influenza disease burden in India' (IDBI study) in collaboration with NIV, ICMR, and CDC (USA); Study on Ayurveda and genomics supported by IGIB and Co- Investigator on Vaccine trials including Vaccine trial on rotavirus vaccine supported by Department of Biotechnology, India and PATH, USA.
Vandana Mhaske 	Dr Vandana Mhaske is Scientific Advisor, Venture Center, NCL Innovation Park, Pune. She is a post graduate in Biotechnology and a doctorate from National Chemical Laboratory. Area of specialization : lipid biotechnology. Her research experience includes work on alkamides, lipids with health implications at Iowa State University, USA.
Shobha Rao	Dr Shobha Rao has done her PhD in Statistics- Biometry, Field of application Nutrition and Health. She was also member of steering committee of WHO-TDR, Geneva during 1988-1991. She has been recently awarded with a National Award for 'Women's Development Through Application Of Science And Technology' for the year 2005 by Department of Science and Technology, New Delhi. She has headed Biometry & Nutrition Unit at Agharkar Research Institute, Pune since 1988 and subsequently was Head, Animal Sciences Division that included 4 Departments in ARI. She has

	undertaken various research project in Nutrition and Health related especially to children and women in rural India.
Jyoti Shukla 	Dr. Jyoti Shukla is presently Manager Technical (Discovery & Product Development) in Biotechnology Industry Research Assistance Council (BIRAC), A Government of India Enterprise. She is PhD in Life Sciences with specialisation in critical care medicine. She did her Doctorate from Bhabha Atomic Research Centre, Department of Atomic Energy, Government of India, Mumbai and continued to serve the organization till 2011. Her research experiences are in clinical cancer research and stress biology having domain knowledge in physiology and immunology. She joined BIRAC in 2012 and since then managing and coordinating variety of strategic and operational activities of BIRAC in healthcare relevant to promotion and growth of Indian Biotech sector. She is also supporting BIRAC partnership programs with Gates Foundation, WHO and World Bank and is currently nodal officer for Grand Challenges India program from India.
Rama Sivaram 	Dr Rama Sivaram has done her PhD in Art history from MS Baroda University. She is currently an independent cancer advocate heading HEAL consultancy. She has undertaken many social intervention projects. She was also member board of studies at School of Health Sciences in University of Pune. She has authored various articles and and books on Cancer, Community breast health education, health for adolescents and many more.
Premnath Venugopalan 	Dr. V. Premnath Founding Director – Venture Center and Head, NCL Innovations. He holds a B.Tech. from the Indian Institute of Technology - Bombay and a Ph.D. from the Massachusetts Institute of Technology, USA. He has also been a Chevening Technology Enterprise Fellow with the Centre for Scientific Enterprises, London Business School and Cambridge University, UK. He brings with him considerable experience in technology development and commercialization, working with start-up companies (in Cambridge-UK and India) and engaging with large corporations on research and consulting projects as project leader.

About the Organizers	
VENTURE CENTER	**About Venture Center** Entrepreneurship Development Center (Venture Center) – a CSIR initiative – is a Section 25 company hosted by the National Chemical Laboratory, Pune. Venture Center strives to nucleate and nurture technology and knowledge-based enterprises by leveraging the scientific and engineering competencies of the institutions in the Pune region in India. The Venture Center is a technology business incubator supported by the Department of Science & Technology's National Science & Technology Entrepreneurship Development Board (DST-NSTEDB). Venture Center's focuses on technology enterprises offering products and services exploiting scientific expertise in the areas of materials, chemicals and biological sciences & engineering. For more information, visit http://www.venturecenter.co.in/.
BIO Incubator	**About Bioincubator** The BioIncubator at Venture Center aims to nucleate and nurture technology and knowledge-based enterprises leveraging knowledge in the areas of biotechnology (biopharma, agrobiotech, industrial biotech, clean technology), biomedical engineering/ devices/ diagnostics, biomass value addition/ renewable fuels/chemicals/materials, bioinformatics, bio/medical services and related disciplines. **Created with support from DBT-BIRAC under the Bioincubator Support Scheme.** For more information, visit http://www.bioincubator.venturecenter.co.in/.
HEAL Consultancy	**HEAL Consultancy** HEAL Consultancy is an all women's network making inroads into educational institutions and the community reaching doable best practices within the system. HEAL is an acronym for **H**ealth, **E**ducation, **A**wareness and **L**iving. For more information visit: http://www.jiyobefikarwomen.com/heal-consultancy-professionals-in-healthcare-and-education/

Appendix 02: Workshop comments and feedback

Comments and suggestions :-	1	Full day workshop is necessary
	2	I really appreciate if this type of workshop includes child mental health and what are the factors which affect child's health in prenatal stage
	3	The discussion was a bit technical. Things like DSIR, GCI were used. Audience may or may not be familiar with the terms. It will be nice if you explore these things briefly.
	4	All the speakers were good.
	5	Excellent workshop. Knowledge upgraded. You can continue such seminars
	6	The problems should be defined for the technologists to jump in. Including some success stories from the technology point of vie. Eg: Qaiyum mats used during child birth
	7	It would be interesting if you include some technology talks as well that made the cut to the grass root level. As this talk was mostly medical fraternity's point of view, it would be nice to see if technologists have something else to say.
	8	More participation from Industry required.
	9	Most of the angels of problems were well discussed. If some gram services had been called, we would have good idea about practical problems. We can also include industry for corporate social responsibility.
	10	Programme is good but time limited
	11	Social programme and good
	12	All participants introduction is important
	13	Very Informative.. Keep it up !! BE UNITED TO OVERCOME MATERNAL AND CHILD HEALTH PROBLEMS
	14	Display agenda and topics -Subtopics of workshops of website prior to event so that participants do their homework
	15	Event is good. Please keep 1 day workshop to get depth
	16	Programme details in hand would have been better. Handouts of speakers subject would have been better
	17	Very social and innovative programme. I suggest that this should include all funding info. And proper channel details.
How do you think can these workshops be improved further?	1	More info and visual spectra
	2	By restricting speakers to their defined span.
	3	Extending the time
	4	Longer duration for talks
	5	More two way communication
	6	Distribution of content material either paper or email
	7	At least having 2 days workshop
	8	Including some case studies
	9	Can invite more social work professionals
	10	Involve more from industry who can manufacture, distribute product
	11	If advertised in local newspapers participation will be better and more representative.
	12	To spread this info. In rural level. Rural awareness is important and try to join NGO who work in this area.
	13	Introduction of participant. More ground level programme, Discussions
	14	By time management
	15	Representation of Govt. authorities
	16	PPT and lecture distribution on paper, email to participants

Appendix 03: Photographs of workshop


VENTURE
Technology
Innovation


VENTURE
Technology
Innovation
Enterprise
BioIncubator