Health Care Solutions: The path ahead

1. INTRODUCTION:

The IKP Centre for Technologies in Public Health (ICTPH) is a not-for-profit research centre that aims to improve the health of poor populations by focusing on designing, developing and delivering innovative solutions in health-care concerning India and the developing world. The goal is to implement an inclusive process that scientifically integrates knowledge of factors influencing health and diseases in India, regular evaluation and impact assessment of existing health systems and integration of appropriate technology for optimal health care delivery. ICTPH aims to learn, discover and apply relevant innovative solutions for health care leading to improved health for the people of India and other developing countries and to integrate technological advances with delivery of affordable, accountable and accessible health care.

ICPTH has a three pronged strategy to address this critical task of health system design. This naturally leads to the current structure of ICTPH, with its three verticals, namely Epidemiology, Human Capacity and Health Care Solutions. This paper is intended to define the vision and the strategy which will drive activities in the third vertical, Health Care Solutions.

At ICTPH, the health care solutions team endeavours to apply the learnings from our research activities in our other verticals. The goal is to suggest ways to enhance the delivery of effective solutions, to populations which face a crisis of accessibility, using the tools of finance and technology. As part of ICTPH, the health care solutions team has a very broad mandate of aiding in the design of viable health-care delivery systems which significantly impact accessibility of health care for underserved populations and serve to bring down all costs of a comprehensive and functioning health system on the whole.

The mission of the team as a part of ICTPH is comprehensive health system analysis and design, along with targeted interventions for improvements to the existing system. The aim is to maintain an emphasis on primary care, for reasons described in this note. The mechanics of how we will be doing this are outlined in the following sections.

2. CURRENT SITUATION:

In India, expenditure on health amounts to Rs 2.5 lakh crores in FY 2008[1], which amounts to 5.4% of India's GDP[1], as compared to an average of 9% for developed nations, specifically those belonging to the Organization for Economic Co-operation and Development (OECD)[2]. Of this, the contribution from the private sector is more than 80%, and government spending at 19% of the total, compares unfavourably to other developing economies[1]. The private sector now provide about 80% of all outpatient care in India and as much as 40% of all in-patient care, in terms of the number of people treated[1]. The issue with private care is that it largely exists in the unorganized sector, where quality control remains a critical issue.

1. *Healthcare*, Ernst & Young – IBEF report, June 2007
2. OECD Health Data, 2008

India faces several worrisome health parameters, especially when compared to developed countries. Some of the following statistics from 2007 are indicative. Life expectancy languishes at 65[4], as compared to 78.9 in OECD nations[2]. Infant mortality (IMR) is a massive 55 per 1000[3], while OECD nations have collectively achieved an average of five[2]. These national averages, however, mean little, as there is a huge variation between different regions in India. For example, Kerala has achieved an IMR of 13, while Orissa remains far behind at 71[4].

A brief background about the public health system in rural locations will help in the appreciation of the need for an intervention. The public system in India is vast and diverse, with very different levels of infrastructure in different states, and even in different districts.

Any health system is typically tiered by the level of care which is provided.

1. Preventive care is focused towards advice and education of a community, with the target of improving health seeking behaviour in the population by increasing access to basic information about health, hygiene, sanitation, and care of oneself and one's near ones.

2. Primary care is the first level of access to trained medical care professionals, who advice and try to solve health issues which cannot be solved by self care. This is also the first level of care where medicines are prescribed, and simple diagnostic tests are conducted to identify conditions and illnesses.

3. Secondary care is defined as all services which require access to medical specialists, who generally do not have first contact with patients, and common procedures and surgeries conducted in a controlled environment such as an operating theatre at a hospital. These require a substantial level of infrastructure to be adequate.

4. Tertiary care encompasses very specialized treatments which are uncommon, expensive, and require a highly trained and experienced specialist, as well as sophisticated infrastructure such as an Intensive Care Unit (ICU) to be effective.

Of these, primary care is the first touch point for most people to any form of medical assistance. Repeated assertions by global thought leaders[5] in health system design stress the need to focus on primary care, defined as follows in the Alma Ata declaration, 1978:

> *"Essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and the country can afford to maintain at every stage of their development in the spirit of self-determination."*[6]

3. Registrar General of India, 2007
4. Ministry of Health and Family Welfare (http://mohfw.nic.in/), 2007
5. Dr. Margaret Chan, DG – WHO, Seminar on Primary Health Care in Rural China, 2007
6. International Conference on Primary Health Care, *Alma-Ata*, 1978

With this as a broad goal, the Indian government has also devoted a large part of its resources towards primary and basic secondary care. Government spending in national programmes under the umbrella of the National Rural Health Mission (NRHM) was to the tune of Rs. 14,500 crores in FY 2008[4]. It has designed and is implementing a three tier health care system to provide medical services up to basic secondary care for rural populations.

1. Sub centre – The first contact point between the primary health care system and the community. According to government rules, there should be a sub-centre for every 5000 of a rural population[7].

2. Primary Health Centres (PHCs) – This is the first level of formal medical care. This is also the first point of contact with a medical officer for the community, with one for every 30,000 people ideally[7].

3. Community Health Centre (CHCs) – This should function as a self-contained hospital with basic surgical facilities, serving a population of 120,000[7].

The actual number of SCs, PHCs and CHCs in Sep 2005 was about 146000, 23000 and 3300 respectively[4]. The PHC serves an average of 27 villages, and is at an average of 7 km from a rural person[4]. This situation leads to extremely high indirect costs such as transportation costs and loss of wages.

The proportion of ailing people in a 15 day sample period, was 88, of which 45 were new cases, per 1000 of a rural population[8]. The hospitalization rate, however, was 23 per 1000 people, in a reference period of a year[8]. A lack of adequate facilities at a primary level leads to a massive overburdening of tertiary care, as cases are unnecessarily referred onwards.

The total cost (TC) of the system can be defined as :

$$TC = Y_{primary} * P_{primary} + Y_{secondary} * P_{secondary} + Y_{tertiary} * P_{tertiary}$$

where Y corresponds to the number of people accessing that level of care, and P corresponding to the total resources, both public and private, allocated to that level of care. Private providers, though not corresponding exactly to the government three-tier system, can still broadly be categorized into primary, secondary and tertiary care providers, such that this equation represents the entire systemic health care costs. We can break the costs along a different dimension as follows:

$$P = P_{direct} + P_{indirect}$$

$$P_{direct} = P_{medicines} + P_{diagnostics} + P_{consultation} \qquad P_{indirect} = P_{interest} + P_{wage\ loss} + P_{transportation}$$

7. Indian Public Health Standards (IPHS), Directorate General of Health Services, Ministry of Health & Family Welfare, April 2006
8. National Sample Survey on Morbidity and Health Care of the Aged, 2004

Thus, as outlined previously, the current health system, especially in remote rural areas, functions as in Fig. 1, where patient flow is reflected in the number of arrows:

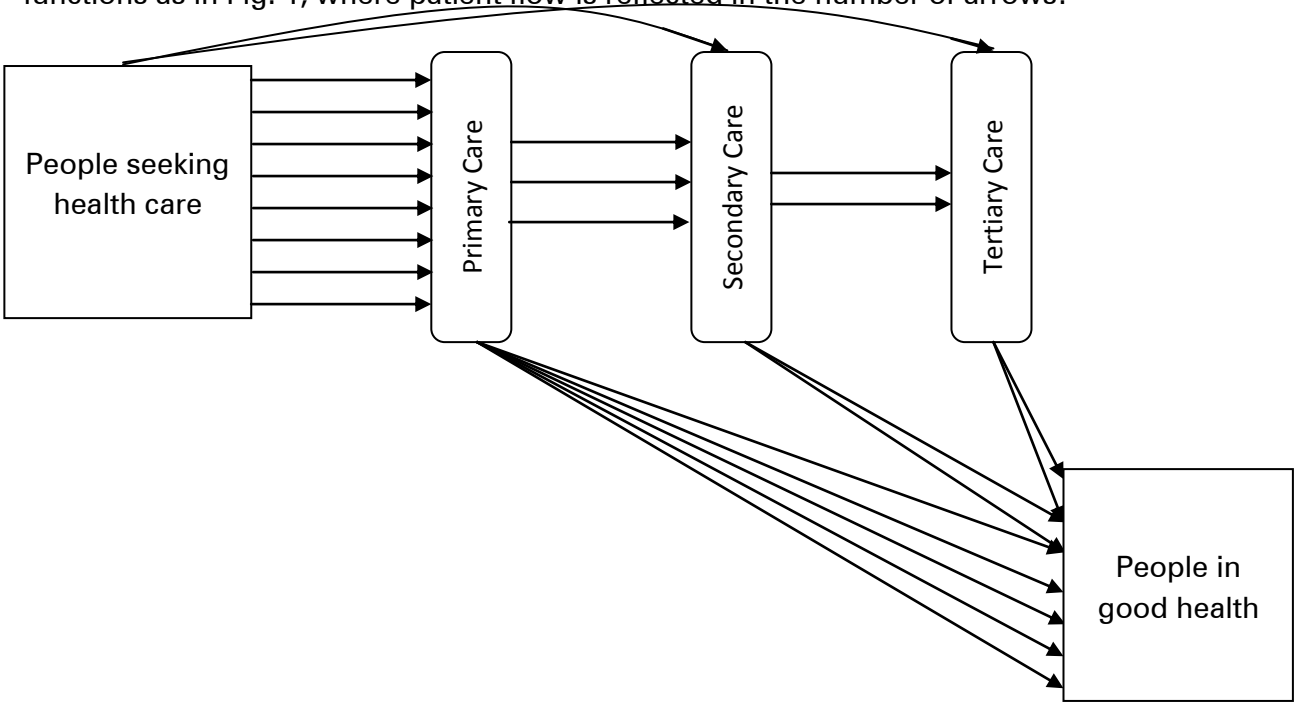


Figure 1. The current health system: large referrals to higher levels of care leading to high costs.

3. ICTPH MODEL

However, the system that we are designing is aimed at producing the outcome as in Fig. 2. As far as possible, we wish to cut down on unnecessary direct access of higher levels of care.

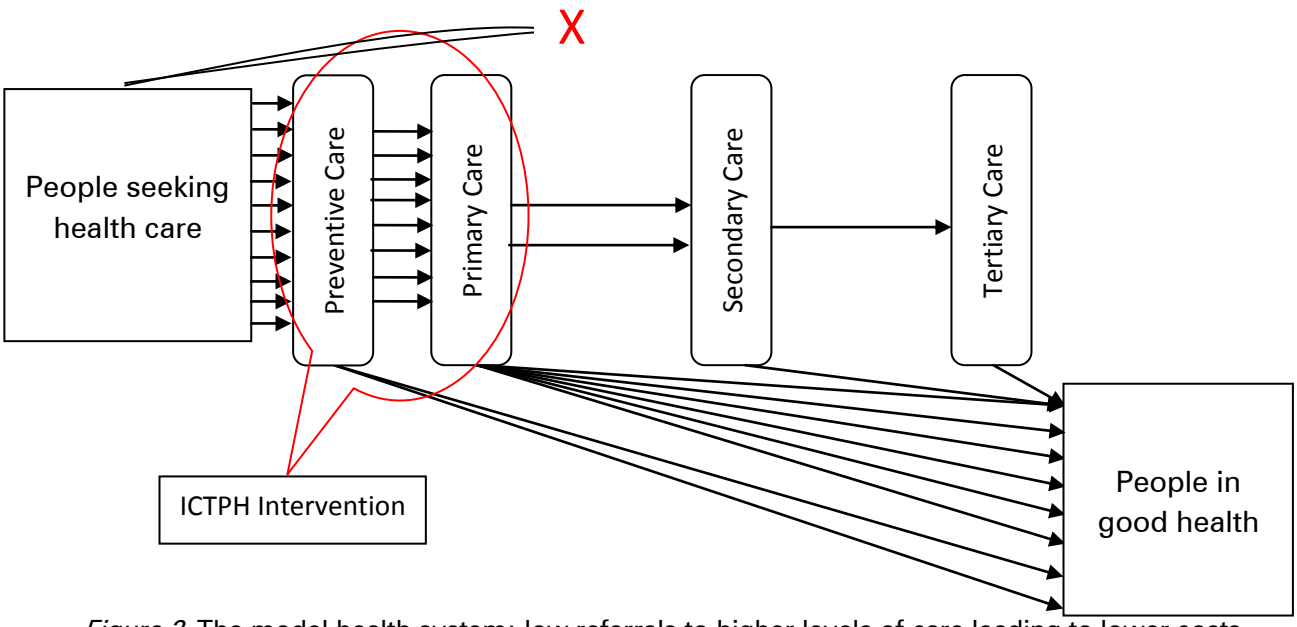


Figure 2. The model health system: low referrals to higher levels of care leading to lower costs.

The cost for hospitalization, on average for a rural household, was **Rs.8366**, of which **Rs 3040** were indirect costs[8]. Primary care, though not cheap, still counted for a much smaller average of **Rs. 448** per case, of which **Rs. 196** were indirect costs such as transportation, loss of wages, and interest costs[8]. In such a situation, overburdening of secondary and tertiary care is clearly unaffordable, and primary care should be the first focus of a health-care delivery model.

To minimise the systemic costs, ICTPH is aiming to increase $Y_{primary}$ at the cost of $Y_{secondary}$ and $Y_{tertiary}$ while simultaneously trying to impact $P_{primary}$ in terms of efficiency of use for these resources. We want to impact $P_{primary}$ so as to improve access and quality to primary care. Specifically, the $P_{indirect}$ component is the first target, as this is a dead loss which cannot be used by the system as a whole.

In this situation, ICTPH has identified three key goals towards which it seeks to achieve an impact through targeted interventions.

1. Accessibility – Health care services and infrastructure should be made available at the last mile so as to enable even remote rural populations to access health, and to promote health seeking behaviour.

2. Affordability – Services should be available at a price which would enable populations to significantly cut down on the shock that a health event causes to household finances. Dependence on out-of-pocket expenditure should be decimated, if not eliminated.

3. Accountability – A functioning system should be responsive to the needs and requirements of the population, with adequate checks and balances to audit the performance of each component, so that it becomes self correcting.

To further narrow its strategy with respect to these broad goals, ICTPH seeks to segment the specific components of the system which will be its priority and initial focus.

Components of System→ Level of Care↓	Drugs	Tests	Human Resources	Health Financing	Impact Assessment
Preventive/ Promotive	Accessibility	Accessibility	Accessibility	Affordability	Accountability
Primary	Accessibility	Accessibility	Accessibility	Affordability	Accountability
Secondary				Affordability	Accountability
Tertiary				Affordability	Accountability

Figure 3. The matrix of operations for ICTPH in terms of strategic focus.

A health care system consists of providing drugs, tests, and access to a skilled practitioner who advises and carries out procedures to alleviate or prevent medical conditions. Health financing and Impact Assessment, though not a part of the provision of medical care, are still key components of a functioning health care system. The problem of defining how and by whom goods and services such as drugs, tests and consultations are paid for is one tackled by a study of Health Financing. Impact Assessment deals with the study of the benefits that any interventions make to the health system and the outcomes in a population.

4. ICTPH INTERVENTIONS

The ICTPH model of developing Rural Micro Health Centres (RMHCs) and a Community Health Worker program is the underlying principle behind its pilot project on integrated Rural Health Care Solutions in the Thanjavur district of Tamil Nadu. This is detailed in a concept note[9], but a brief summary is provided here for reference.

The goal is to pilot a nurse practitioner-led, technology-enabled, comprehensive 'fixed price health-care' with equitable access provided through innovative organizational and financing mechanisms in the Thanjavur district of Tamil Nadu.

The nurse-practitioner model of primary care aims to use innovations such as increased use of diagnostics, lower cost delivery, electronic health records (EHR) and cheaper drugs, to impact the efficiency of the resource allocation to primary care. The goal is to significantly impact the patient flow at the primary care level itself, and drastically reduce referrals, as every incident of referral to secondary and tertiary care increases the total costs of the system, both directly, and through indirect costs such as transportation and loss of wage.

The Community Health Worker is seen as the first provider of preventive care and health education. Through careful design of a research program to understand the effectiveness of the CHW, we hope to demonstrate the value of better access to high quality preventive and promotive care, as well as the immense benefits of increased awareness and education towards improving health seeking behaviour.

As part of the health-care solutions strategy at ICTPH, we would like to critically examine the assumptions which go into building this model.

5. HEALTH CARE SOLUTIONS – FILLING IN THE GAPS

Keeping the activities of ICTPH as outlined above in mind, if we revisit the matrix in which we believe ICTPH should operate, we see missing places which the health care solutions team should cover to ensure a complete and functioning health system, as shown in Fig. 4.

9. A concept note – Pilot Project on integrated Rural Health Care Solutions in Thanjavur district of Tamil Nadu, Zeena Johar, ICTPH Publications. (http://www.ictph.org.in/downloads/Concept_Note.pdf)

This automatically tells us about some of the initiatives which are critical to ICTPH's vision, and can most appropriately and efficiently be undertaken by the health care solutions vertical.

As seen from the gaps in Fig. 4, health care solutions sees possible opportunities to make a difference in the area of drugs and diagnostics at a primary level, as well as health financing for the entire system and impact assessment for higher levels of care.

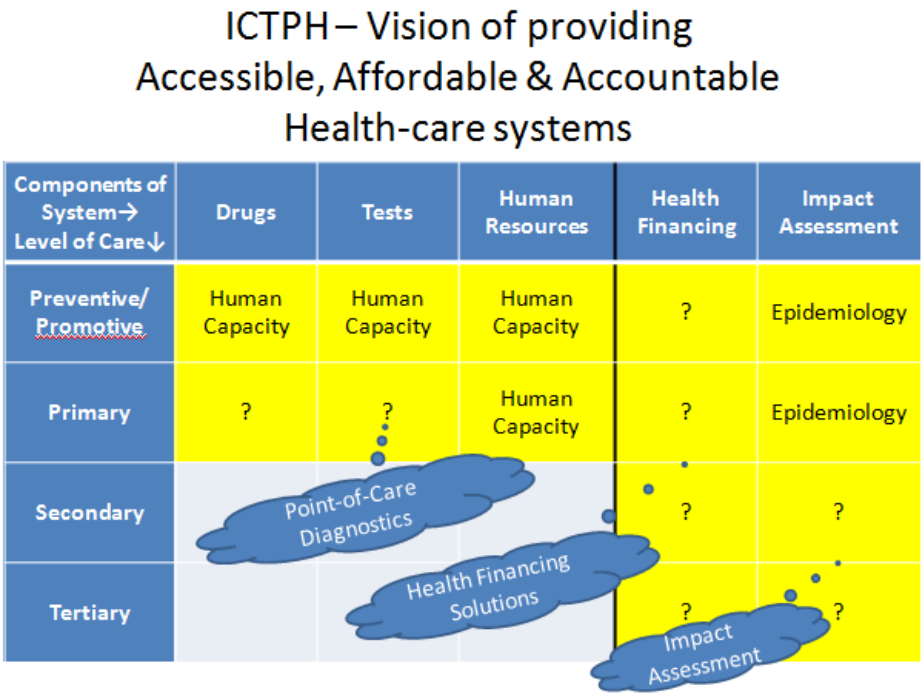


Figure 4. The matrix of operations for ICTPH in terms of the role for each vertical.

At this point, it is instructive to bear in mind the areas that lie outside the domain expertise that the health care solutions vertical envisages to establish.

Diagnostics and medicines are key components of a health system. Medicines serve a largely curative role, while diagnostics are often helpful from a preventive perspective, both in terms of correct positive diagnoses in early stages which facilitate prevention of severity, as well as correct negative diagnoses which prevent unnecessary transportation, overburdening and the consequent expenditure.

Research in improved medication is already being allocated significant resources. The global pharmaceutical industry had a turnover of 712 billion dollars in 2007[10], as compared to the in-vitro diagnostic market of 33.6 billion dollars in the same period[11]. The potential of improved diagnostic use to cut down overall health costs has led to the choice at ICTPH of focussing more on supporting diagnostic innovations than on drugs.

10. IMS Health Market Prognosis Research, March 2008

11. Espicom report, The Global Market for Point of Care Diagnostics, December 2007

6. KEY WORKSTREAMS:

As demonstrated in Fig. 4, the health care solutions vertical has identified several specific areas where it seeks to build capability. These include

1. Health financing solutions
2. Point of Care Diagnostic solutions
3. Impact Assessment design and analysis

6.1 Health Financing Solutions –

6.1.1 Current Situation:

Health financing in India is currently structured in a way which leads to huge issues of inordinate risk apportioned to the very people who can bear it the least. Out of pocket payments constitute 72% of all health expenditure[12].

This compares very unfavourably with not only developed nations, but even with other developing nations[12] as we see in Fig. 5. The goals of a health financing system include equity, risk pooling, efficiency and sustainability. The former two are ill served by a system based on out of pocket payments, which are the least effective way to tackle health shocks. A system which primarily depends on out-of-pocket payments places the greatest burden on the segment which is least able to bear it.

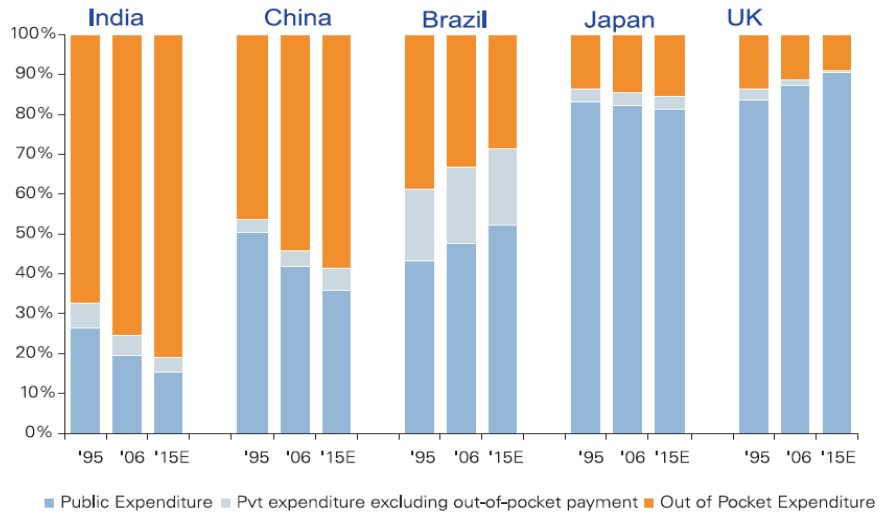


Figure 5. Public v/s Private sources of health financing. (Source: KPMG-CII report[12], 2008)

To understand the importance of health financing, we recall the large magnitude of a health shock that we had noted earlier, with each out-patient episode costing Rs 448 whilw each in-

12. Health Insurance Inc.: The Road Ahead, KPMG-CII report, 2008

patient episode as much as Rs 8366 on average[8]. The method of financing these shocks is critical to the financial health of a large number of households. Health episodes are typically financed by a combination of credit, savings, asset sales, private insurance and social insurance funded by taxes[8]. The different nature of out-patient and in-patient expenses leads to a significantly different break-up of the sources of financing, as demonstrated in Fig. 6.

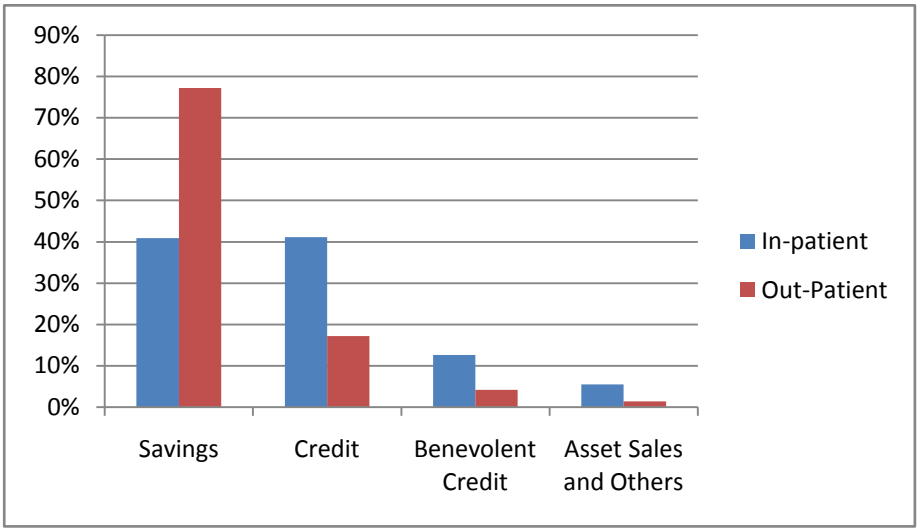


Figure 6. Sources of household health expenditure. (Source: NSSO morbidity survey, ICTPH Analysis)

Current sources of financing rely inordinately on savings and credit, as shown in Fig. 6. Insurance funds only **1.5%** of household health expenditure in India. Only **11%** of the population is covered by any kind of insurance and that too, primarily by social insurance[13].

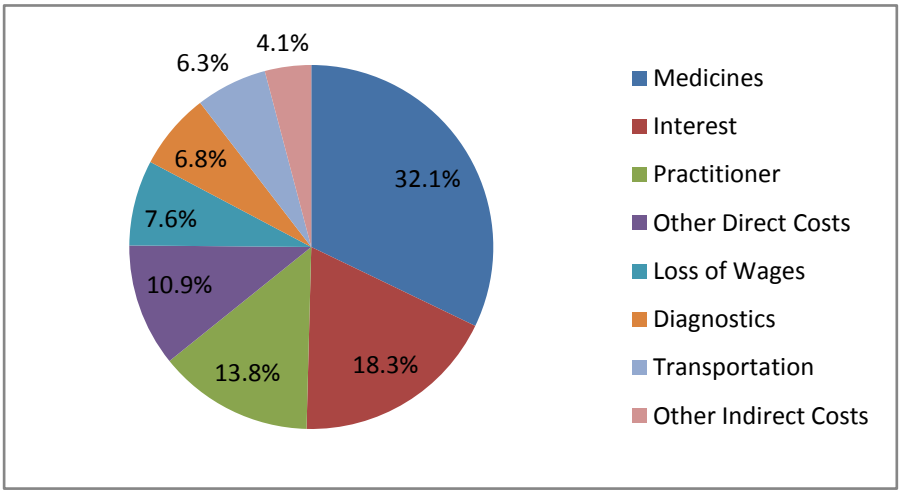


Figure 7. Major heads of household health expenditure. (Source: NSSO, ICTPH Analysis)

13. WHO National Health Accounts, India 2001. (http://www.who.int/nha/NHA_India_NHA_2001-02.pdf)

The negligible presence of insurance leads to an estimate that **20 million** people in India fall below the poverty line each year due to indebtedness incurred for health-care needs[14]. This is further complicated by the fact that credit is very expensive in rural India, and capacity to pay is further reduced by health shocks. As shown in Fig. 7, interest is a huge component of a health shock.

At ICTPH, our hypothesis is that insurance is ideally suited to infrequent in-patient events. The risk pooling offered by insurance is an effective way to tackle large costs incurred due to hospitalization. However, financing of out-patient care is a bit more complex, and the suitability of insurance to this purpose is not universally agreed upon.

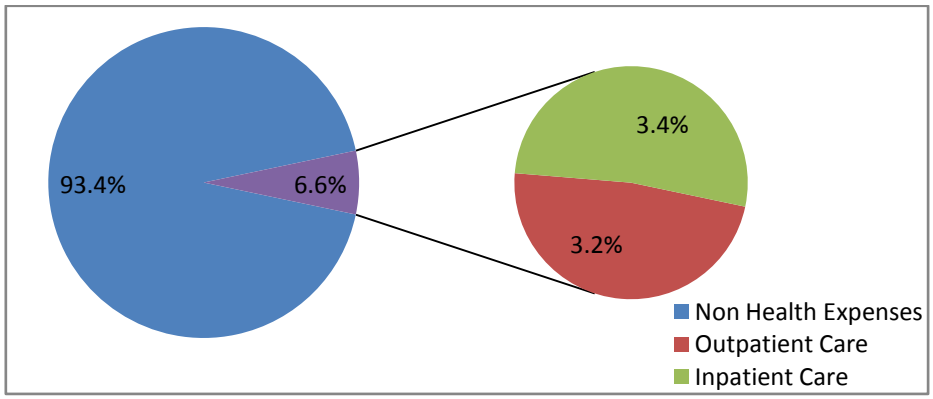


Figure 8. Household health expenditure as part of the total. (Source: NSSO, ICTPH Analysis)

Some of the options explored at ICTPH are the creative use of savings and credit to fund out-patient care. As shown in Fig. 8, out-patient care is a large component of household health expenditure, and financing it is critical to achieve ICTPH's goal of affordability. However, the sheer frequency of out-patient care (a national average of close to 1.08 episodes per person per year[8]) and the diversity of care which is available lead to issues with administration of an insurance based mechanism to finance them. For example, moral hazard is a key driver of costs for out-patient care when insured. Experiments in Singapore, the U.S. and China with savings mechanisms to limit health costs are being actively explored to tackle this problem[15].

6.1.2 Targeted Interventions:

Pertinent to the above background, health care solutions has identified some key areas around which its activities will revolve, to alleviate some of the issues with health financing, while working in tandem with ICTPH's vision. Research on health financing would use a systemic approach to identify heads of expenditure and the mechanisms of funding to devise incentives and financing schemes which would tie in seamlessly with the diverse needs of the evolving health care sector.

14. Health care in India, PriceWaterhouseCoopers, 2007
15. Medical Savings Accounts: Lessons learned from International Experience – Piya Hanvoravongchai, WHO Discussion Paper No. 52, 2002

The roadmap for health financing interventions is as follows, in the broad buckets of activities in research, advisory services and advocacy:

Research:

1. Incorporating alternative savings/credit mechanisms for funding primary care, as well as defining co-pay for insurance for the pilot in Thanjavur.
2. Evaluating a fixed price model as part of research into applicability to the pilot in Thanjavur.
3. Synthesizing the costs of the kiosks operated by a nurse practitioner with the funding schemes above to devise a holistic financing scheme for the entire ecosystem in the pilot.
4. Determining the cost-effectiveness of the Community Health Worker program through a careful quantification of its costs and benefits
5. Research into possibilities to scale this effort to a large number of villages and to other geographies in terms of sustainability of the entire business. Research into modifications which need to be made in the structure of a health financing solution to account for spatial and temporal changes in populations.

Advisory Services:

6. Design of a catastrophic insurance model for debilitating and infrequent health shocks which cannot be diversified effectively in small populations and need to be spread over large and diverse sets of people.
7. Consulting other models and initiatives in rural healthcare in the design and implementation of innovative health financing schemes specific to the required target population.

Advocacy:

8. Advocacy of financing models that are observed to be efficient and scalable with industry players, both private and public, who have the capacity to take this to scale.

In Detail:

1. Research into alternative funding mechanisms and structures – The goal of this is to propose a funding mechanism which is suitable to the pilot in Thanjavur, via case studies on similar initiatives worldwide and in India, as well as financial modelling of the implications in the current geography. The proposal will be modified based on rollout and experiences on the field.
2. Fixed price health care – Tying together primary, secondary and tertiary funding mechanisms into a single holistic financing scheme for the entire population will be the

logical next step at ICTPH, as an integration of innovations in financing of different levels of care.

3. Cost modelling and budgeting for the pilot study – Closely tied with the previous problem, this is related to operational decisions of the level of resources that are needed to have a fully functional nurse practitioner. Diagnostics tests and strips as well as drugs are key components of the variable costs, especially in the pilot phase, when we are not scaling up. Some fixed costs are equipment, lease, utilities, EHR and expenditure on practitioners (both nurses and doctors). These expenditures are not limited to salaries, but also include training. In the long run, as we scale, all these costs will become variable costs as well, significantly reducing operating leverage. Modelling these for both the short and long term is critical and tied to the previous problem of deciding a price and a mechanism to pay.
4. Cost effectiveness analysis of the Community Health Worker (CHW) – During the course of the proposed intervention in the form of a community health worker in the target populations, ICTPH seeks to measure both the costs and the benefits of each initiative. This will serve as a valuable research input for designing future CHW interventions in other locations, as well as to clarify the question on the need and the value of starting a CHW program in a region.
5. Scaling and Modifications – When we have a concrete proposal for costing as well as funding for the ICTPH intervention in Thanjavur, we would like to examine the sensitivity of such a model to changes in the geography and nature of the intervened population. At this stage, health care solutions should be able to publish the model and its effects in reputed peer reviewed journals. We would also like to stress test these models to issues which arise when scaled. These studies will involve inputs from the field, as well as collaboration with the other verticals in ICTPH to design studies to gather information which will form the basis for assumptions and hypotheses. It will remain an ongoing task as well, as we scale and move to different geographies.
6. Catastrophic Insurance – This is seen as a critical illness cover which will be operationalized in partnership with Kshetriya Grameen Financial Services (KGFS), the microfinance initiative of the IFMR Trust[16]. It will be handed out to all KGFS customers, and will provide blanket coverage to the entire population in order to achieve better diversification of idiosyncratic risk, and thus keep per person costs low. The implementation will be through a pilot, followed by rollout to all KGFS branches.
7. Consulting expertise development – Establishing a reputation in designing and implementing financing solutions for remote and resource poor populations will involve consulting other attempts in the same space. In this phase, we will tweak or significantly change the models of health financing used by ICTPH to accommodate the needs and requirements of NGOs, private sector players and government initiatives. Aiding in the

16. IFMR Trust is a private trust whose mission is to ensure that every individual and every enterprise has complete access to financial services. (http://www.ifmrtrust.co.in/)

design of innovative and effective health financing schemes will both build on the expertise of health care solutions at ICTPH, as well as aid the dissemination of the models and the research done at ICTPH. This will be an ongoing task at Health Care Solutions, which will start by the end of 2009.

8. Advocacy – Closely tied to the previous task, health care solutions will focus on advocacy of the models which we implement and observe to be effective. This will both be through dissemination via journal articles, conferences as well as direct pitches to the private and public sector which demonstrate the impact of these models in the pilots conducted by ICTPH, and propose ways to scale the effort.

Through the course of these efforts in health financing, health care solutions aims to build scalable models of health financing, and aid in their implementation across geographies and scales. The approach revolves around action oriented research, followed by revisions and fine tuning, finally followed by dissemination and consultancy to a wider audience, both via demonstration as well as advocacy.

Timelines for some of these initiatives are referred to in Appendix A.

6. 2 Point-of-Care Diagnostics

6.2.1 Current Situation

More affordable and more easily available diagnostic solutions constitute a key component of the health care system while trying to tackle the goal of accessibility. In India, where 72% of the population is rural, access to medical facilities is poor[7]. People end up travelling great distances (an average of 7 km just to get to the first level of primary care, a PHC) to get basic facilities, making transportation costs a major chunk of the total medical expenditure, as described previously. As mentioned earlier, travel and diagnostics add up to the third largest component of in-patient as well as out-patient episodes, constituting 13.1% of the former and 8.9% of the latter[8]. In several cases, additional morbidity results from the want of simple and accurate tests, and hence proper treatment.

Several diagnostic tests are available, but they are often confined to labs which are out of reach, in terms of cost and distance. The Indian government has laid down several rules regarding the availability of basic diagnostic tests and technology in the Primary Health Centre (PHC) [7]. However, quality control remains an issue, and there is a wide variability in the adherence to these standards, not only from state to state, but also from district to district. Fig. 9 shows the major tests which should be available in a PHC, as per the Indian Public Health Standards, and the corresponding prices in private facilities.

Similarly, the quality of private pathological labs is often questionable. There are more than 25,000 private diagnostic labs in India, ranging from very specialized and well equipped labs,

often attached to super-specialty hospitals, to very poorly equipped one room affairs with almost untrained technicians and unreliable processes[17].

Point of Care Diagnostics solutions : Tests currently at an ideal PHC

Test	Disease	Cost	Time taken	Technology
HB	Anaemia	15	15 minutes	Colorimeter
Sputum (AFB)	TB	35	2 hrs	Staining followed by microscopy
Smear MP	Malaria	15	20-60 minutes	Prick and drop of blood
GOD POD	Diabetes	15	20-30 minutes	Enzymatic Colorimetric method
RPR	VD	35	15 minutes	Serum Card Test
Widal	Typhoid	30	Half hour (slide/card) 1 day (Tube)	Blood serum (agglunitation reaction)
Typhidot	Typhoid	150	1 hour	Detects Antibody
Pregnancy Test		7-10	3 minutes	Detection of hCG in urine
Urine	Diabetes	15	2 minutes	Uristix (DipStick Method) / Biochemistry

Figure 9. Recommended IPHS tests for a PHC (Source: ICTPH Analysis)

At health care solutions, we conducted preliminary literature reviews and personal interviews in order to clearly define the missing links in diagnostics for remote populations[18].

The literature reviews have helped us understand and compare the situation in India to other developing countries. Large resources across the world are being devoted to support innovations in diagnostic solutions[19]. As Fig. 10 demonstrates, the most important global focus areas for new developments in diagnostics are also diseases which are extremely relevant to the Indian context. Though sleeping sickness is not a major cause of morbidity in India, tuberculosis, malaria, kala azar and venereal diseases, which constitute the largest need and potential for innovations, are extremely important diseases in India as well.

17. The Hindu. http://www.hinduonnet.com/fline/fl2121/stories/20041022004009700.htm
18. Mabey, et al.: Diagnostics for the Developing World, Nature Reviews 2, 2004
19. Foundation for Innovative New Diagnostics (http://www.finddiagnostics.org/)

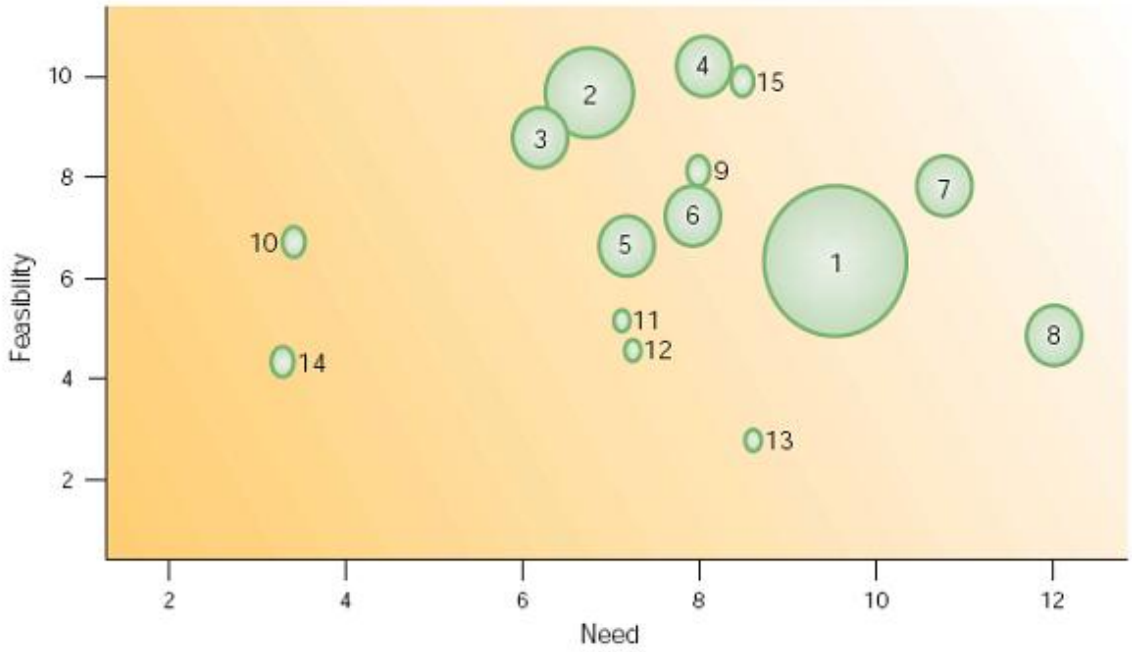


Figure 10 - Scheme to assess priorities for diagnostics development for selected diseases in the developing world. The horizontal axis shows the need for the test; the vertical axis shows the feasibility of developing such a test; the size of the circle indicates the relative burden of disease in disability-adjusted life-years (DALYs) that could be prevented if it were widely used. Both scales are arbitrary.

1 - tuberculosis case management
2 - malaria case management
3 - malaria test-of-cure
4 - syphilis case management
5 - visceral leishmanisis (kala azar) test-of-cure
6 - schistosomiasis case management
7 - visceral leishmanisis (kala azar) case management
8 - African trypanosomiasis case management
9 - lymphatic filariasis case management
10 - dengue case management
11 - leprosy case management
12 - lymphatic filariasis test-of-cure
13 - leprosy detection of latent disease
14 - Chagas disease
15 - onchocerciasis case management

Source : Mabey, et al.[18]

6.2.2 Initial Study

Following this analysis, an initial study was conducted by the health care solutions team in a location each in rural and urban Tamil Nadu. This included meeting the technicians and administrators in pathological labs, both private and those belonging to the government. For private labs, the goal was to understand the facilities available in different set-ups, and the cost and quality implications of the same. For public facilities, our main area of interest centred around an in-depth study of the national standards for access and availability of diagnostic services, as well as a field trip to understand compliance with the standards at a local level for remote rural locations. Thus, our first step towards this has been a comparative study between what is available currently at the PHC and at rural pathological labs; and what the other alternatives available in the market are.

This brief study itself showed a big difference in the services offered at the rural and urban level. A PHC mainly offers routine urine, stool and blood tests, testing for TB, malaria, typhoid

and VD. However, this is merely an ideal situation. In reality we found insufficient quality checks which take place to ensure that all of these are being provided.

This reinforces our initiative to enhance these services through outfitting our Rural Micro Health Centres with better diagnostic solutions in order to overcome this gap. The design of our RMHCs precludes the presence of expensive lab equipment or highly trained lab technicians. As this is envisaged to be a thin front end and highly accessible, even to remote populations, the situation calls for simple and easy to use diagnostic solutions which can be delivered as close to the consumer as is possible.

Thus, this points to the need to take diagnostic tests closer to the patient – a move towards Point Of Care Diagnostics. Point-of-care testing (POCT) is any testing performed outside of the traditional, core or central laboratory and conducted close to the site of patient care, typically by patients or clinical personnel whose primary training is not in the clinical laboratory sciences. Technological advances over recent years have helped POCT evolve into a vital diagnostic tool, and have expanded the medical diagnosis field to operate in every patient treatment setting. POCT is expected to expand dramatically in the next couple of years. The POC market in 2007 was estimated to be worth US$11.3 billion, and is predicted to reach US$18.9 billion by 2012, growing at around 11% a year[11].

6.2.3 Proposed Interventions

At ICTPH, the goal is to find cost effective options of POC Diagnostics without compromising on quality. Our RMHC needs to be equipped so as to facilitate better diagnosis by the Nurse Practitioner, and hence speedier delivery of treatment. Point of Care diagnosis is often more expensive per test than older technologies. Part of our vision is to enable technologies which will reduce or reverse this trend. Thus, the focus is on bringing down the direct cost of the test as well as the indirect costs like transportation and wage loss through better Point of Care diagnosis.

Further, the lower level of training used to operate POC diagnostics is another factor which has led us to support innovation in this field, as we see this as tying in with the ICTPH model and vision of Nurse Practitioners practising medicine and diagnosing ailments independently, with little assistance from trained lab technicians.

Thus, the main reasons for intervening to support innovations in the field of Point of Care Diagnostics revolve around filling two obvious gaps that were identified. The first is the lack of access and accountability at the last mile to quality diagnostic solutions, supplemented by the envisaged removal of these barriers through the planned RMHCs. The second is the lack of focused funding for point of care solutions relevant to India, with global resources being devoted to more general diagnostic solutions, and to disease areas which are not always relevant to India.

With this end in mind, the following interventions are planned by the health care solutions team, once again in the broad categories of research and advisory services.

Research:

1. Understanding the current situation and need for diagnostics from the consumer perspective, focussing on India and on remote populations.

2. Identifying key focus areas in terms of diseases and technologies which we need to target both in terms of requirements and potential growth. Studying ideas and business plans relevant to our key focus areas. This will help in completing the perspective of understanding innovations in diagnostics.

3. Using the learning from the preceding activities to draft a prospectus and proposal for a fund dedicated to supporting innovations in the area of point of care technologies.

Advisory Services:

4. Operationalization and roll out of the proposed fund in a phased out manner including hiring, connecting to entrepreneurs in the field and laying out concrete processes for the investment team.

In Detail:

1. Understanding the current situation from the demand side involves identifying the currently available best practices, the standards recommended by the government, issues and alternatives to the same, as well as availability of these tests. Cost, ease of use, ease of interpretation, sensitivity and specificity are some of the ways that different tests are compared and analysed. The learnings from this exercise are to be put in a white paper.
2. At this point, some policy decisions also need to be taken with respect to the mandate of any proposed funding intervention. Some of these can be made with an understanding of the proposed focus disease areas, while others can be inferred from the current state of technology in that particular segment. At this point, medical practitioners will be requested for inputs as well as industry practitioners, incubators, and actual ventures.
3. These inputs should help us in drafting a detailed proposal for a fund, including the business case, projections of growth and financial modelling, coupled with an operational strategy for fundraising, hiring and process setup. In this phase, initial fund raising as well as connecting to viable business plans that have already been found interesting will recommence.
4. A detailed prospectus and strategy note will aid the next phase, which includes hiring key personnel and an asset management setup for professional fundraising and investing. Gradually, the operational management of the fund will be handed over to the asset management entity.

Timelines for some of these initiatives are referred to in Appendix A.

6.3 Impact Assessment and Incentivization

As ICTPH is primarily a research organization, the effectiveness of its interventions is of prime concern to it. A critical precondition to scaling the models being tried here is to measure how well each component of the interventions have functioned. This is a very relevant question for ICTPH, and even though it is largely the core focus of the epidemiology vertical, the health care solutions team also sees an important role to play in this effort.

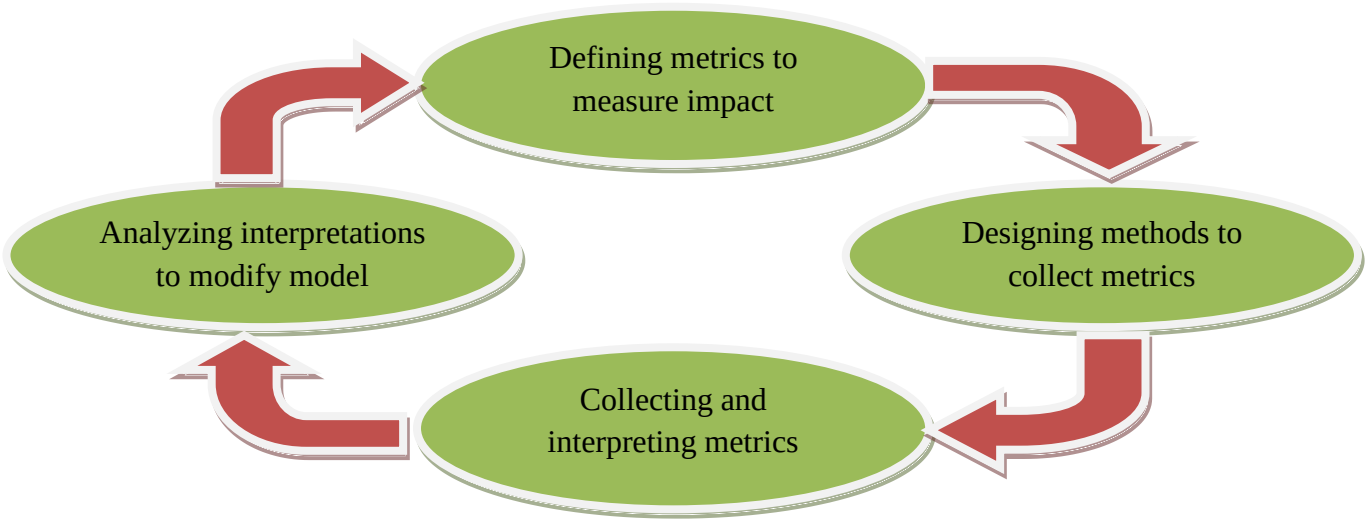


Figure 11 – Process flow for Impact Assessment

The basic design approach that we see is that measurement of the impact of our interventions will not only help us tweak and improve, or if necessary, rework our models; but also that the measured impact can be tied in through the use of innovative metrics to the incentives of our practitioners and volunteers. Thus, this question is one intimately tied to the problem of cost effectiveness, and ultimately, incentivization, which ties in to our earlier focus area on health financing.

Towards this goal, the following work streams have been identified as important, and will be shared with the epidemiology team.

1. Define metrics against which the initiative will be measured
2. Designing methodologies to accurately measure these metrics
3. Collecting the measurement of the metrics and their interpretation
4. Using the interpretation to tweak the model as well as to realign incentives of our practitioners to achieve desired effects.

The same has been illustrated in Fig. 11.

Defining the metrics for measurement and relating them to the incentives is the part of the problem which health care solutions needs to focus on, while designing ways to measure these metrics and interpreting them is something that epidemiology will look at.

With respect to the first task, clearly defining the benefits for our clients involves the measurement of the improvement in outcomes offered by the nurse practitioner as a front-end primary care delivery model. Some of these are listed here.

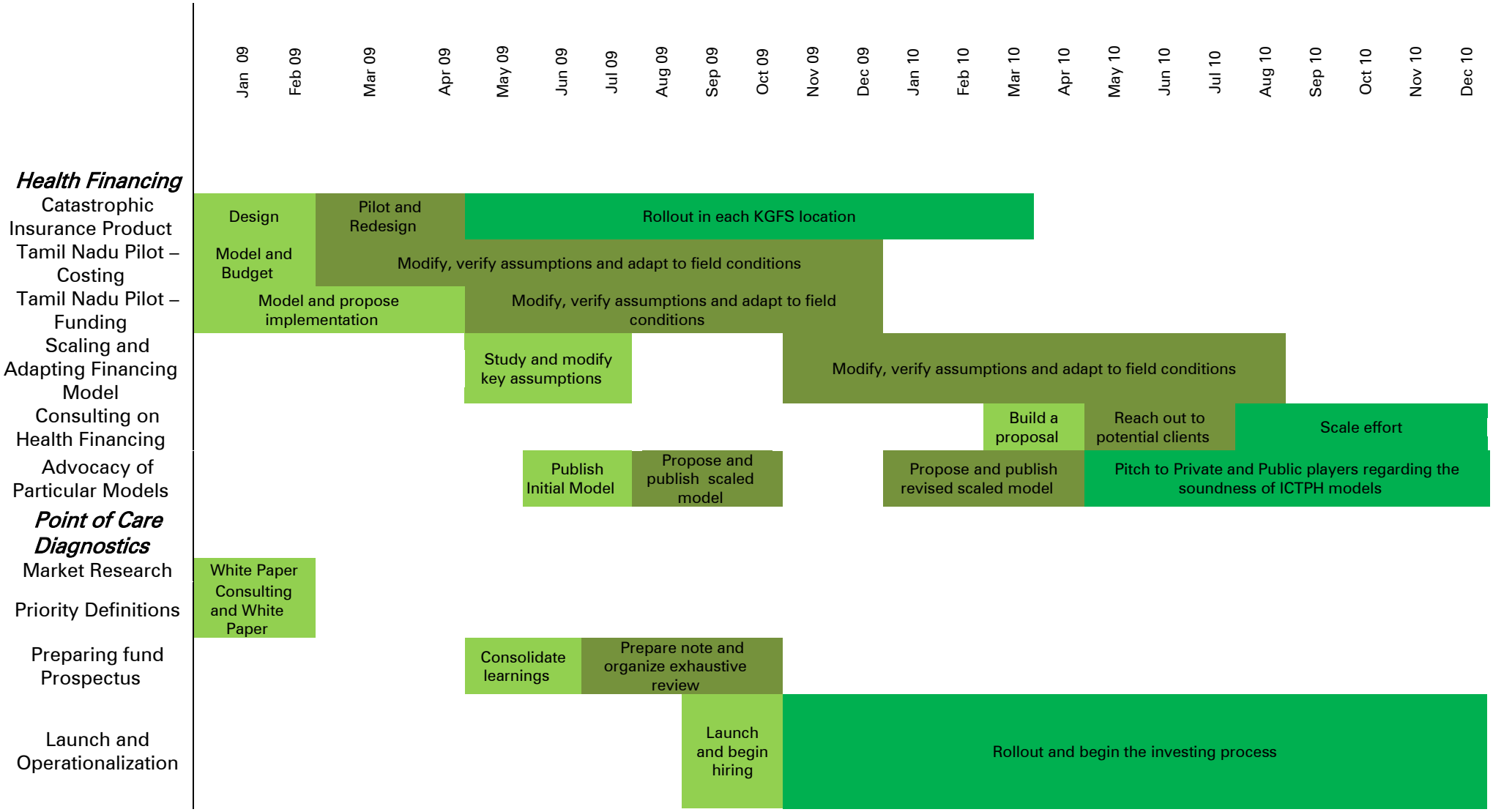
1. Reduce referral through improved diagnostics
2. Reduce transportation costs through accessibility
3. Reduce lost wages through speedy treatment
4. Reduce price of drugs and tests through supply chain reductions
5. Reduce impoverishment risk through improved smoothing and pooling of risks via financing mechanisms

Health-care solutions will work with epidemiology to study possible ways to measure the impact of our model on each of these. On a smaller scale, the same methodology can also be used to figure out the cost-effectiveness of the CHW program as we compare the benefits of our intervention to the costs and resources allocated to it. The how-to for these involve methods for economic analysis such as cost-of-illness analysis, as well as willingness-to-pay analysis, and are being discussed actively.

The final step is to relate these metrics directly to the incentives of the community health worker as well as the nurse practitioner. A careful study of behavioural economics will help us clearly define the nature of the relationship between incentives and outcomes, so as to achieve the desired goal of improved health outcomes.

Note: All weblinks current as of February, 2008.

Appendix A: Timelines



THIS PAGE INTENTIONALLY LEFT BLANK