Integrated Management of Childhood Illness (IMCI) in the 21st Century: Innovations


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COVER PHOTO: Maternity clinic in Malawi. By Dr Alasdair Campbell, member of the Edinburgh University’s Global Health Society (EUGHS).
Integrated Management of Childhood Illness (IMCI) in the 21st Century

Innovations

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Stock supply in child health clinic in rural China. Photo by Dr Kit Yee Chan, member of the Edinburgh University's Global Health Society (EUGHS).
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Executive Summary

Integrated management of childhood illness (IMCI) was developed by the WHO and UNICEF in the mid-1990s as a strategy to reduce under-five mortality. Aimed at countries with mortalities >40/1000 live births, it has been adopted by more than 100 countries. Repeated evaluations have demonstrated that IMCI can improve the quality of clinical care for sick children, but problems related to implementation at scale in low-resource settings have too often prevented IMCI (and especially integrated management of neonatal and childhood illness - IMNCI, and integrated community case management - iCCM) from achieving expected or even demonstrable reductions in mortality.

In recent years, there's been growing interest in supporting and expanding IMCI through innovations, which are much needed within many aspects of IMCI programmes to secure their successful delivery and impact. Given the range of ways in which integrated community case management (iCCM) is implemented across countries and even within some countries, the landscape of innovations and innovative approaches as part of iCCM is quite diverse. Innovations range from ways in which community health workers (CHWs) are supervised to mobile-phone based solutions to track, report and manage cases at the community level. Innovations could also be helpful in improving supply, training, motivation, monitoring and evaluation. Most importantly, innovative solutions need to be user-centered, simple, designed with end users in mind.

In this working paper, innovations across six different aspects of IMCI and iCCM are reviewed: (i) provision of training; (ii) sustaining quality improvements; (iii) reducing the cost of implementation; (iv) supply chain management and mHealth; (v) private sector participation; and (vi) planning, monitoring and evaluating IMCI programmes. In addition, a new innovative methodology, PLANET (PLANning, monitoring and Evaluation Tool), developed by the Centre for Global Health Research in Edinburgh is presented in extensive detail.

This paper is the third of a four part working paper series on IMCI. The first paper presents a review of the scientific and programmatic evidence on IMCI, IMNCI, and iCCM. The second paper examines the integration of IMCI, IMNCI and iCCM into health systems. The fourth and final paper, using modelling techniques, examines treatment gaps for IMCI and its contribution to excess mortality, with an attention to issues of equity.
Introduction

In recent years, there's been growing interest in supporting and expanding IMCI through innovations. A number of publications have proposed new solutions to improving various aspects of IMCI implementation, and several presentations at a recent evidence review symposium on IMCI and iCCM held in Accra, Ghana (March 2014) were focused on innovations (CPHS, 2014).

Given the range of ways in which integrated community case management (iCCM) is implemented across countries and even within some countries, the landscape of innovations and innovative approaches as part of iCCM is quite diverse. Innovations range from ways in which community health workers (CHWs) are supervised to mobile-phone based solutions to track, report and manage cases at the community level. Innovations could also be helpful in improving supply, training, motivation, monitoring and evaluation. Most importantly, innovative solutions need to be user-centered, simple, designed with end users in mind.

A substantial share of innovations in IMCI and iCCM today are trying to exploit mobile phone technology. In 2014, there were more mobile phones than people: 25% were basic phones, 65% feature phones and 5% smart phones. mHealth is a technology that helps people to access healthcare with the use of mobile phones. mHealth itself does not guarantee quality healthcare, but it assists. There is now a framework for developing mHealth, which can help with patient registration, assessment, patient monitoring and work planning. For technologies like mHealth to be helpful, they must be kept simple, designed with end users in mind and invest in evaluation and capacity building.

At the recent meeting in Ghana (CPHS, 2014), Peter Benjamin from mHealth Alliance reported on several mHealth-based initiatives, including MAMA (in Bangladesh, India, South Africa and other African Countries), mPedigree and “SMS FOR LIFE” – the latter being used to report on the amount of stock in the country, which is especially used in Tanzania. mCare initiative is used in the delivery of ante-natal and post natal care. "mHealth evidence.org" is the website that serves as a registry for mHealth initiatives. mHelp Expert Program supports NGO’s, with more than 50 experts in mHealth available to support countries and NGO’s. The success of mHealth is expected to be readily demonstrated through the implementation of the “Saving Million Lives” programme in Nigeria (World Bank, 2015). It is also reported that there had been a significant improvement of antenatal care in South Africa (CPHS, 2014).

mHealth is still in a relatively early phase, but it is already beginning to transform health systems, with concrete benefits. For maximum impact, mHealth solutions should be holistic, integrating multiple health system functions. Their success will depend on a harmonized mHealth agenda and close partnership between multiple national stakeholders. With regards to use of mobile phones and laptops to provide health care, the question of power (or electricity) supply is often raised. The more recent devices can be designed to run on solar energy and can operate while offline until connectivity with telecommunication provider is initiated. It is noted that all these technologies should be designed in a way that makes them compatible with others, to minimize the number of disparate platforms and to also enable them to expand outward. As innovative mHealth-based programmes mature, more attention must be paid to country’s ability to plan for programming at scale, including adapting and managing mHealth systems independently. Of particular importance are non-traditional skill sets, such as system
administrators, computer programmers and programme managers, and ensuring that Ministry of Health can retain skilled staff with these qualifications.

New and innovative methods for reporting and supervision are currently being tested, including the use of cost-effective interactive and innovative channels for online engagement. At the Ghana meeting, Nick Oliphant from UNICEF, New York, presented on the ways to improve CHW motivation and retention through innovative and entrepreneurial models. Several challenges remain, where innovations could make a difference. There is a need to identify best practices and innovative solutions to CHW motivation, supportive supervision of CHWs and CHW performance.

Innovations that facilitate community-based programming should also consider including Rapid Diagnostic Test (RDTs) and mobile technologies. Innovations could help CHW to diagnose pneumonia, and the tools are close to becoming available through mobile phone apps.

In terms of new models of service delivery, multi-sectoral partnerships and integrated innovation improves chances of sale and reach of iCCM. The concept of developing value chains instead of just supply chains alone should be tested. To address issues of affordability in remote rural areas, some level of government subsidy is likely to be required.

Follow up and change management is critical during initial implementation and scale up of new supply chain practices. Best practices from other areas of health care management, such as quality improvement approaches, can be successfully implemented at the community level. However, these innovations will require support, monitoring and possibly adaptation so that they are tailored to suit the community level and its unique supply chain challenges. Designing tools and processes for the community level is often an iterative process – especially when implementing a proven best practice from higher levels; it can work but may require adaptability and flexibility to make appropriate for the community level (CPHS, 2014).

In the sections that follow, innovations across six different aspects of IMCI and iCCM are reviewed and discussed: (i) provision of training; (ii) sustaining quality improvements; (iii) reducing the cost of implementation; (iv) mHealth and supply chain management; (v) private sector participation; and (vi) planning, monitoring and evaluating IMCI programmes. In addition, a new innovative methodology, PLANET (PLANning, monitoring and Evaluation Tool), developed by the Centre for Global Health Research in Edinburgh is presented in extensive detail.

1.1. Innovations in the provision of training

Källander et al. (2015) stated that properly trained, equipped and utilised, community health workers (CHWs) delivering iCCM can potentially reduce child deaths by 60%. Using a cluster randomised controlled trial, Källander et al. (2015) are evaluating the inSCALE project which seeks to increase CHW supervision and performance. The outcome of interest is the achieved coverage of appropriate treatment for children with diarrhoea, pneumonia and malaria, with participatory methods used to identify best practices and innovative solutions. Following formative research and stakeholder consultations, two intervention packages were developed in Uganda and one in Mozambique. In Uganda, approximately 3,500 CHWs in 39 clusters were randomised into: (i) a mobile health (mHealth) arm; (ii) a participatory community engagement arm; and (iii) a control arm. In Mozambique, 275 CHWs in 12 clusters were randomised into: (i) a mHealth arm and (ii) a control arm.
Innovative interventions based on mHealth had three components: (i) free phone communication between users; (ii) data submission using phones with automated feedback, messages to supervisors for targeted supervision, and online data access for district statisticians; and (iii) motivational messages. The community engagement arm in Uganda established village health clubs seeking to (i) improve the status and standing of CHWs, (ii) increase demand for health services and (iii) communicate that CHWs’ work is important. Process evaluation was conducted after 10 months (with end-line surveys planned at month 12 in Uganda and month 18 months in Mozambique). Main outcomes included the proportion of sick children appropriately treated, CHW performance and motivation, and cost effectiveness of interventions. The results are still being awaited. The strength of the proposed design and protocol includes a user-centred approach to the innovations. Weaknesses include the lack of a robust measurement of coverage of appropriate treatment. Evidence of cost-effective innovations that increase motivation and performance of CHWs can potentially increase sustainable coverage of iCCM at scale.

Awoonor-Williams et al. (2013) reported on the highly successful community health program developed during the 1990s by researchers at the Navrongo Health Research Centre in northern Ghana. The keystone of their approach was the deployment of nurses - termed "community health officers" - to village locations. Their trial showed that the approach reduced child mortality by half, maternal mortality by 40%, and fertility by nearly a birth - from a total fertility rate of 5.5 in only five years. These results are based on comparisons to areas that relied on existing services alone. As a result, the government of Ghana launched a national program in 2000, called "Community-based Health Planning and Services (CHPS)", aiming to scale up the Navrongo model. The new Ghana Essential Health Intervention Project (GEHIP) now aims to improve the CHPS model through further innovations, which include: (i) extending the range and quality of services for newborns; (ii) training community volunteers to conduct the World Health Organization service regimen known as integrated management of childhood illness (IMCI); (iii) simplifying the collection of health management information and ensuring its use for decision making; (iv) enabling community health nurses to manage emergencies, particularly obstetric complications and refer cases without delay; (v) adding $0.85 per capita annually to district budgets and marshalling grassroots political commitment to financing CHPS implementation; and (vi) strengthening CHPS leadership at all levels of the system.

1.2. Innovations in sustaining quality improvements

Daniels et al. (2015) noted that, within iCCM programme in Ghana, the traditional health promotion and prevention role of community health workers (CHWs) has been expanded to treatment. Their qualitative case study explored the implementation experience in Ghana. They used focus groups and individual interviews in Accra and the Northern Region of Ghana, and included locally based UNICEF staff, their partners, researchers, Ghana health services management staff, CHWs and their supervisors, nurses in health facilities and mothers receiving the service. They noted an appreciation both by mothers and by facility level staff for the contribution of CHWs, which saves mothers from the effort and expense of seeking treatment outside of the village. Concerns included CHWs being unpaid, poorly supervised, regularly out of stock, lacking in essential equipment and remaining outside the formal health system. All can negatively impact the quality of care. They concluded that there is a need to develop innovative and sustainable mechanisms to sustain the programme.
Similarly, Magge et al. (2015) suggested that impact of IMCI is threatened by gaps in quality of care (QOC). They report on an innovative nurse mentorship intervention - "Mentoring and Enhanced Supervision at Health Centres" (MESH) - in two rural districts of Rwanda, which was started in 2010 by Partners In Health and the Rwanda Ministry of Health. The authors measured change in QOC following the addition of MESH to didactic training after 12 months in 21 rural health centres in Rwanda. The primary outcome of their analysis was a validated index of key IMCI assessments. They found that the index significantly improved in two districts and that children seen by IMCI-trained nurses increased from 83.2% to 100%, while the use of IMCI case recording forms improved from 65.9% to 97.1%. Correct classification improved from 56.0% to 91.5%, and correct treatment from 78.3% to 98.2%. They concluded that MESH was associated with significant improvements in all domains of IMCI quality and that it could be an innovative strategy to improve IMCI implementation in resource-limited settings.

1.3. Innovations to reduce the cost of implementation of protocols

Rodriguez et al. (2015) explored critical issues in implementation of IMCI that arose during policy formulation through the lens of the innovation (i.e. iCCM) and of the institutions involved in the policy process in Malawi. They conducted a documentary review and 21 in-depth stakeholder interviews across institutions in Malawi. Their findings suggested several strategies that helped reduce the cost of implementation of protocols. Firstly, iCCM was compatible with the Malawian health system due to the ability to build on an existing community health worker cadre of health surveillance assistants (HSAs) and previous experiences with treatment provision at the community level. The Ministry of Health (MoH) demonstrated leadership, while the WHO, United Nations Children's Fund (UNICEF) and implementing organizations played a supportive role as knowledge brokers. Regulatory issues around HSA training as well as concerns around supervision and overburdening of HSAs were discussed during policy development. The analysis concluded that the financial sustainability of iCCM, including the mechanisms for channelling funding flows to allow implementation, is a major challenge that remains unresolved and that it deserves focus as an area where innovative approaches would be welcome.

Other important evidence with implications for reduction of the costs of implementation of protocols was presented by Oliphant et al. (2014), who conducted a multi-country analysis of routine data from integrated community case management (iCCM) programs in sub-Saharan Africa (SSA). They examined 15 evaluations or studies of iCCM programs in SSA conducted between 2008 and 2013. They found that the median percent of annual expected cases treated was 27% (1-74%) for total iCCM, 37% (1-80%) for malaria, 155% (7-552%) for pneumonia, and 27% (1-74%) for diarrhoea. Importantly, they found that treatment rates and percent of annual expected cases treated were equivalent between programs with volunteer CHWs and programs with salaried CHWs. They concluded that programs with volunteer CHWs and those with salaried CHWs can achieve similar treatment rates and percent of annual expected cases treated, but to reach this equality in outcomes volunteer programs must manage more CHWs per population, while salaried CHWs must provide more treatments per CHW per month.
1.4. Innovations through mHealth, including for supply chain management

Chandani et al. (2014) reviewed the evidence for improving community health supply chains from Ethiopia, Malawi, and Rwanda. Drug shortages are a common bottleneck to scaling up integrated community case management (iCCM), but little thought has gone into the design of supply chains. The Supply Chain for Community Case Management (SC4CCM) project conducts intervention research to identify proven, simple and affordable solutions to address the unique supply chain challenges faced by CHWs. Interventions based on Theory of Change (TOC) framework were developed in each country and tested over 12-24 months, with an assessment in 2012-2013. The project then simplified the TOC into a Community Health Supply Chain (CHSC) framework to enable cross-country analysis. The authors concluded that the greatest supply chain benefits are realized when all three CHSC framework elements (data flow, product flow, and effective people) are in place and working together. The synergistic effect of these three elements results in lower mean stock out rates and higher in stock rates on day of visit, when compared to other interventions. Although these three elements may be designed differently in different settings, streamlining and synchronizing them while ensuring inclusion of all components for each element improves supply chain performance and promotes product availability at the community level.

In relation to innovative use of mHealth applications for supply chain management, two further widely used initiatives need to be mentioned: mTrac (applied in Uganda and Zambia) and c-Stock (applied in Malawi). At the meeting on iCCM in Ghana (CPHS, 2014), Dr. Davis Musinguzi presented mTrac, a tool funded by DFID, which serves to use mobile phones and real time information for iCCM programming. He noticed that, in Uganda, people have to jump on motorbikes moving from one place to the other in search of drugs. There was also huge pile of unusable data in the form of papers and files in health centres. The use of mTrac helped with data collection and usage. CHWs could use their own phones to access information about drugs. This tool was also made available on laptops, which were distributed to district health teams. mTrac is based on information about drugs which is available from health centres. This information is sent to CHW phone and it can be viewed on a dashboard. District dashboard is easy to use and allows for data analysis. It helps to immediately stock supply for community health workers. mTrac began with 10 CHW in phase one and increased later. It receives data from 3 sources - CHWs, community members, and health facilities. Some challenges are that storage solutions for tools and commodities are not flexible enough, and that data currently generated by CHWs and other actors in the system is not consistent, and seldom turns into useful information. Up to 10,000 CHWs have now been trained in mHealth, with 70% reporting rates.

c-Stock is a RapidSMS, open-source, web-based logistics management information system for community-level health products in Malawi (CCM, FP and HIV testing). CHWs or Health Surveillance Assistants as they are called in Malawi (HSA), use their personal basic GSM phones to report stock on hand and receipts data via SMS on a toll free phone line. cStock calculates resupply quantities for health centers and HSAs receive a message notifying them either “order ready” or “out of stock” so they know when to pick their products at the health center. A web-accessible dashboard with simple, easy-to-use reports, shows stock levels, reporting rates, and alerts for central and district level managers. Data is hosted on the cloud, an inexpensive, reliable, and easy to manage option for a small scale system. cStock is currently being scaled up nationwide in Malawi (CPHS, 2014).

At the recent meeting on iCCM in Ghana (CPHS, 2014), Dr Humphreys Nsona presented an overview of c-Stock implementation experience in Malawi. CCM in Malawi is run and
managed by CHWs called "Health Surveillance Assistants" (HSAs). c-Stock was introduced to address the frequent problems of unavailability of medicines, irrational drug management process and lack of coordination in drug management. A 2010 baseline assessment showed that product availability was hampered by poor use of community-level data. The Enhanced Management approach (EM) was introduced to improve the community level supply chain, and it contained the mHealth system called c-Stock, which addressed data visibility challenges. Within this system, HSAs reported logistics data monthly via SMS with their personal phones. The system calculated resupply quantities and notified the HSA when to pick up products. The second part of EM approach are District Product Availability Teams (DPATs). These teams are made up of HSAs and district staff who set combined performance goals, use a structured approach for problem solving, and recognize improvements in performance. Evaluation results of the EM programme showed that HSAs using cStock and DPATs had 14% fewer stock outs or low stocks than other districts on the day of visit, and that more than 80% of HSAs reported logistics data to c-Stock every month. The data provided by HSAs is being used by drug stores to inform resupply quantities and by HSA supervisors to monitor performance. cStock and DPATs are now being scaled up country-wide, with committed funding for all 29 districts. The example of c-Stock and DPATs implementation showed that a clear Ministry of Health leadership and engagement of partners from the beginning was the key to building of broad ownership, and that mHealth systems need to be kept simple and suitable for the context. It also emerged that "cloud hosting” is cheap, reliable and easy to manage for small-scale systems. EM is now seen as a promising and acceptable intervention for improving medicines availability at the community level.

**Ginsburg et al. (2015)** presented "mPneumonia" - an innovative mHealth application for diagnosing and treating childhood pneumonia (and other childhood illnesses) in low-resource settings. They started from the premise that the current approach for pneumonia diagnosis in low-resource settings - using the World Health Organization Integrated Management of Childhood Illness (IMCI) paper-based protocols (and relying on a health care provider's ability to manually count respiratory rate) has proven inadequate. Furthermore, hypoxemia - a diagnostic indicator of the presence and severity of pneumonia often associated with an increased risk of death - is not assessed because pulse oxymetry is frequently not available in low-resource settings. PATH collaborated with the University of Washington to develop "mPneumonia" - an innovative mobile health application using an Android tablet. "mPneumonia" integrates a digital version of the IMCI algorithm with a software-based breath counter and a pediatric pulse oximeter. A design-stage usability field test has already been carried out in Ghana, aiming to improve diagnostic accuracy and facilitate adherence to established guidelines.

**1.5 Innovations through the private sector**

At the iCCM meeting in Ghana (CPHS, 2014), P. Anderson presented the initiative called "Living Goods", which is a private sector model for making healthcare accessible. Living Goods is committed to increasing coverage (but not to improving equity). It operates by relying on service charges and sometimes even incorporates CHWs into their system by using them to supply medications. Private sector initiatives like Living Goods helps to free up the burden on the public sector to focus on vital cases. It adopts the public sector delivery model by lowering cost through technology. Living Goods model is user centred; it designs systems based on the end users, to put community health workers at the centre, and it is meant to support CHWs. In terms of challenges, transportation is an issue (how to carry medicine around if roads are bad), and there is also no specific structure of the CHW workforce - just conventional growth. Issues of conflict of interest were often raised, especially in the case of public and private sector health
care delivery systems operating side by side. There was concern with private models like Living Goods that CHWs could feel tempted to sell free public drugs as that of private organizations, but Living Goods indicated that they ensure this does not happen by making their drugs different from that of public health systems. Most of the profit for Living Goods is expected to come from durables sold, and not from the drugs, since the initiative prioritizes provision of affordable drugs. The current model could also work if the treatments were given free and the other goods were sold, or if they provided vouchers to poorer people to obtain the goods. Living Good products, which they sell to CHWs or end users, include the following: ORS, ACT’s, Amoxicillin, Deworming, etc. (for treatment); fortified foods, micronutrients, safe delivery kits, contraceptives, etc. (for prevention); and e.g., solar lamps, clean cook stoves, consumer goods, etc. (as pro-poor durables).

There are two other private sector models of iCCM that are being used or tested that deserve mention here: Accredited Drug Dispensing Outlets (ADDO) in Tanzania and Drug Shop Attendants in Uganda. ADDO is a donor-supported initiative led by the Tanzanian Food and Drug Authority to train and license small, privately operated retail outlets in rural and poor areas to sell a set list of essential medicines, including selected prescription drugs (Health Market Innovations, 2016). Since pharmacies are located almost exclusively in major urban areas (60% in Dar es Salaam alone), small drug shops mandated to sell non-prescription medication are often the most convenient retail outlet from which to buy medicines for the approximately 75% of the population that lives in rural and peri-urban communities. Thus, the goal of the ADDO Program is to better equip such shops to provide affordable, quality medicines and pharmaceutical services in rural and periurban areas of the country. The initiative employs a holistic approach to change the behavior and expectations of individuals who buy from, own, regulate, or work in retail drug shops. For shop owners and dispensing staff, this approach was achieved by combining training, incentives, consumer pressure, and regulatory pressure with efforts to affect client demand for and expectations of quality products and services. Key program components include: (i) broad-based stakeholder support; (ii) provider accreditation program; (iii) provider training and consumer awareness; and (iv) monitoring and evaluation. The ADDO program is being expanded throughout Tanzania and its rollout is co-funded by USAID, DANIDA and the Government of Tanzania.

Awor et al. (2015) reported on the programme of "Drug Shop Attendants" in Uganda. They evaluated drug seller adherence to clinical protocols with integrated management of malaria, pneumonia and diarrhoea at drug shops in Uganda, because drug shops are usually the first source of care for febrile children - although the quality of care they provide is known to be poor. The authors used a quasi-experimental study introducing the WHO/UNICEF recommended integrated community case management (iCCM) of malaria, pneumonia and diarrhoea intervention for community health workers in registered drug shops. They were interested in the level of adherence to clinical protocols by drug sellers. The intervention area included 44 drug shops with more than 7,000 child visits. Drug shops maintained a standard iCCM register where they recorded the children seen, their symptoms, diagnosis and treatment. The analysis showed that more than 90% of the children with dual or triple diagnosis were treated appropriately. Meanwhile, 81.1% of children who were categorized as severely sick (with a danger sign) were referred for appropriate management. The authors concluded that, with the introduction of the iCCM intervention at drug shops in Eastern Uganda, it was possible to achieve high adherence to the treatment protocols, which is likely compatible with increased quality of care.
1.6. Innovations in planning, monitoring and evaluating IMCI programmes

In the 21st century, science is increasingly based on combining massive amount of information ("big data" approach), powerful computation using IT, and sophisticated statistical prediction modelling. Given that powerful computers and sophisticated prediction models are available to most research groups interested in "big data"-based research, the success of any innovation in IMCI that will rely on large amounts of collected information will depend on the amount and quality of information collected, its informativeness and standardized nature.

This generates an increasing need for transparent, fair, replicable and coordinated processes and tools that could be used to gather and analyse useful data on IMCI and advance implementation research. The key challenges are setting investment priorities to support and enhance IMCI in countries, monitoring the distribution of funding in real time, and evaluating the impact of these investments. Currently, policy-makers have access to two types of information to assist with these three tasks. The first type is rooted in epidemiology and focuses on understanding the present burden of disease and the reduction in that burden (i.e. morbidity and mortality) that a project or policy could achieve. Most recently, the "lives saved" terminology has been adopted by agencies such as the Global Fund and used to drive evidence-based health policy (Low-Beer et al., 2013). The second type of available information is economic and focuses largely on cost-effectiveness. Policy makers at the national and sub-national level have limited resources for scaling up cost-effective health interventions (Chopra et al., 2012). When planning the “best buys” for committing their resources in maternal and child health, they are faced with a complex task. They need to choose among at least several dozen interventions that target various diseases and vulnerable populations and decide on the most rational way to invest in the scale up of selected health interventions. Health investors usually like to know how many deaths (or episodes of disease) could be averted for a fixed level of investment. This type of analysis has been promoted by the World Bank (1993), the Commission on Macroeconomics and Health (2001) and the recent report "Global Health 2035" (Jamison et al., 2013).

A novel approach to planning, monitoring and evaluation of IMCI implementation - the "PLANET tool" - which could assist in generating large amount of standardized information relevant to IMCI and iCCM implementation programs is one important effort to address these challenges.

1.6.1. The PLANET Tool

A new methodology called PLANET (PLANning, monitoring and Evaluation Tool) developed by the Centre for Global Health Research in Edinburgh could be used to improve information on the delivery and implementation of IMCI. PLANET is based on a combination of two useful procedures: (i) the reduction of the multi-dimensional space of a complex system to a smaller number of core variables that capture most of the variation (e.g. using a statistical procedure known as “principal component analysis”); and (ii) the use of collective knowledge for decision-making (Surowiecki, 2004; Rudan, 2008). This approach brings transparency, inclusiveness, fairness and replicability to the process.

Principal component analysis is a statistical technique which reduces a very complex system of large number of variables to a small number of relatively independent “principal components” which still capture a sizeable proportion of variation in the system (Rudan,
by defining a set of 15 “criteria”. This effectively reduces a notoriously complex and multi-dimensional task, which could be approached through an almost infinite number of “lenses”, into an exercise in which 15 of the most important (and reasonably independent) criteria for priority setting are clearly defined. If necessary these can later be weighted according to their relative importance to the users.

Collective knowledge has been increasingly recognized as a way to address these types of challenges (Surowiecki, 2004; Rudan, 2008). Collective knowledge and crowdsourcing refer to the process of taking into account the collective input of a group of individuals rather than of a single expert (or small number of experts) to answer a question. This is based on the observation that the average of collective judgments is closer to the truth than any single expert judgment in most circumstances. The pre-requisites for this process to work are: (i) diversity of opinion (each person should have private information even if it is just an eccentric interpretation of the known facts); (ii) independence (people's opinions are not determined by the opinions of those around them); (iii) decentralization (people are able to specialize and draw on local knowledge); and (iv) aggregation (some mechanism exists for turning private judgments into a collective decision – in this case, the PLANET method) (Surowiecki, 2004). Once each individual is given an opportunity to express their opinion in a way that is treated equally with respect to the opinion of any other individual, then the personal biases that those individuals bring into the process tend to cancel and dilute each other regardless of who the participants are. What is left is information based on the accumulated knowledge, lifetime experience and common sense of those who took part. This collective knowledge illustrates that disagreement and contest, rather than consensus and compromise, among independent minds can lead to the best decisions (Surowiecki, 2004).

1.6.2 Conceptual framework

Within this context, IMCI is conceptualised as a programme in which multiple stakeholders - mainly national governments - invest a finite sum of money each year into improving survival of children in low and middle-income countries. In this process, the funding can be thought of the “energy” or “resource” required to fill the gaps in IMCI provision and deployment, while all steps through which these funds need to be taken during this process can be seen as potentially retarding forces which may cause deviations from the most effective approach. These forces do not disappear even if more money is injected into the system. The challenge is that, in reality, there is neither detailed evidence nor information required for the optimization of the process of IMCI in most settings, nor is it possible to monitor and centrally coordinate the flows of funding.

However, it is possible to develop a conceptual framework that can systematically define all the fundamentally important retarding forces that are at work through this process, and try to assess, for each initiative (based on the collective knowledge of the persons most closely informed about each step in the process), how likely it is to complete its mission, and how vulnerable it is to retarding forces (see Figure 1).

Building on McCoy et al. (2009), three functions associated with IMCI and the associated stakeholders have been identified. The first function is labelled "providing" and is concerned with the need to raise or generate funds (the funders of IMCI). The second function is "managing" and is concerned with the management or pooling of those funds, as well as with mechanisms for channelling funds to recipients (the managers of IMCI). The third function is
"spending" and is concerned with expenditure and consumption of those funds (the recipients of IMCI). It is worth noting that while this schematic establishes a clear time sequence of the key events in the IMCI process, several actors work across all three levels simultaneously. These categories nonetheless provide a useful framework for studying the IMCI process from a financial perspective.

1.6.3. Funders of IMCI programs

The first level of stakeholders of interest are the funders of IMCI programs, referred to here as donors, which could include philanthropists, government or international organizations, and the investors from the private sector and industry. Donors have become increasingly aware of the importance of measuring success in terms of political sustainability, but have not been in possession of a clear framework or technology to help them undertake this task effectively. Often their priority is on disbursing resources according to internal interests, or they find delivery data too difficult to collect accurately, or too politically sensitive (see Figure 2).
At the level of donors, several factors could hinder the effectiveness of investments. Firstly, donors could misalign the size of their support (financial commitment) with the size of the problem (burden of disease). An unprecedented amount of money is being pledged and used to fund health services throughout the world. However, several studies have shown that funding does not correspond closely to burden (IHME, 2012). For example, Shiffman (2006) demonstrates that within communicable diseases for the years 1996 to 2003, there were several neglected topics such as acute respiratory infections and malaria. Similarly, Sridhar & Batniji (2008) noted that in 2005, funding per death varied widely by disease area from US$ 1029.10 for HIV/AIDS to US$ 3,21 for non-communicable disease. The reasons for this misalignment could be due to the social construction of the problem, lobbying by vested interests or the personal interests of donors (Shiffman, 2009; Buse, 2014). Thus, the risk that the donors are misaligning their financial commitment to a disease area with the burden it causes needs to be assessed.

Second, donors could prioritize initiatives that focus on their national self-interest rather than those that support improved health in the recipient country. For example, since the Oslo Declaration in 2006, health and foreign policy have become increasingly linked. While translating health into national security language might attract attention from high levels of government, this focus has been limited to a few high-profile problems such as AIDS, pandemic influenza and humanitarian assistance and not expanded to less glamorous areas important to child survival such as health systems, malnutrition or water and sanitation. In fact, a review of six countries’ policies illustrates that most strategies tend to be catalyzed and supported by concern with surveillance and control of infectious disease (Sridhar and Smolina, 2012). Thus, the risk that an IMCI programme serves national self-interests, such as economic, geopolitical or security, rather than improved health outcomes in the recipient country needs to be established.
Third, donors could fail to coordinate their activities. The current architecture of funding of global health and development is characterized by fragmentation, lack of coordination and even confusion as a diverse array of well-funded and well-meaning initiatives which descend with good intentions on countries in the developing world (Gostin and Mok, 2009). However ambitious or well-intentioned these initiatives might be, it becomes difficult in this environment for recipient governments to develop and implement sound national plans for their country. While there is, in general, little incentive for various development partners to coordinate their activities, some programs work better through a joint strategy. Thus, the risk that partners will fail to coordinate their activities for a specific IMCI programme needs to be established.

Fourth, donors could invest in new players and models rather than strengthening and building on the existing institutional infrastructure. There has been a continuous expansion in the number as well as type of actors involved in national-level IMCI programmes. Instead of examining how the existing institutional infrastructure - specifically the WHO and World Bank - can be reformed to deliver on projects, new initiatives are launched that attempt to compensate for their shortcomings (Garrett, 2007). The WHO is unique in being governed by 193 member states and its role in setting evidence-based norms on technical and policy matters, highlighting
best practices that improve health globally and monitoring and coordinating action. Thus, the risk that an IMCI programme will result in a new institution rather than working through the existing institutional infrastructure needs to be established.

Finally, donors could fund their initiatives in a way that results in too much funding going to more costly institutions. As McCoy et al. (2009) discuss, global health is a multi-billion dollar industry, and there are clearly competing interests amongst different actors to make use of this funding. For example, pharmaceutical companies appear to benefit considerably from global health programs that emphasize the delivery of medical commodities and treatments. NGOs, global health research institutions and UN bureaucracies also have an interest in increasing or maintaining their level of income and thus tend to prefer that funding from major donors flows through them (as managers of funding), rather than directly to developing countries. Further scrutiny is needed on aid flows in global health to assess whether they are being captured by vested interests and used to support inappropriate spending on the private commercial sector or on a large and costly global health bureaucracy and technocracy. Thus, the risk that an IMCI programme will be designed in a way that results in too much funding going to costly organizations needs to be established.

1.6.4. Managers of IMCI programmes

The second level of stakeholders in IMCI consists of the managers of the programmes. These could be national government ministries, NGOs, academic institutions in donor or recipient countries, private sector (with pharmaceutical companies and biotech industries), various private or not-for-profit independent consultants and country offices of international organizations. Managers are often torn between global priorities, specifically the priorities of donors, and being accountable to local communities and the ultimate recipients (see Figure 3).

At the middle level, several factors can hinder the effectiveness of investments. First, managers could deliberately steal resources from the investment for their own benefit, i.e. the risk of corruption. The need to identify and address corruption and weak governance is often lost in the commitment to raise funds and expand services. Thus, the risk that funding from the programme will be stolen needs to be assessed.

Second, managers could inadvertently channel resources to purposes other than IMCI programme objectives because of miscommunication, lack of competence, or lack of capacity. For example, those managing the project may not have the necessary technical or administrative skills to meet key objectives. Thus, the risk that managers inadvertently channel resources to purposes other than IMCI programme objectives due to lack of competence needs to be assessed.

Third, managers could lack credible information and evidence to maximize the cost-effectiveness of investments. The basis of cost-effectiveness is that interventions should not only have established effectiveness in reducing child mortality but also represent an effective use of resources. For a certain budget, population health would then be maximized through choosing interventions that show the best value for money. Most information about cost-effectiveness, such as that generated through the WHO-CHOICE project, are available at the regional level (WHO, 2014). This creates challenges when applying these estimates to country and district level projects. Thus, the risk that managers lack good information on the cost-effectiveness of investments needs to be assessed.
Fourth, managers could route funding through non-governmental organizations or private sector bodies rather than working through governments. In the past two decades there has been a move towards funding non-state actors, especially by the newer funding institutions (Gostin and Mok, 2009). The US government, particularly through its HIV/AIDS funding, predominantly funds faith-based organizations and NGOs. Lack of involvement and leadership of developing country governments in IMCI programmes raises questions about their long-term sustainability (WHO, 2007). However, in some situations funding through NGOs or private sector bodies rather than through governments can work better but this should be carefully considered over a long term time horizon. Therefore, the risk that an IMCI programme routes funding through nongovernmental organizations or private sector bodies rather than through government needs to be assessed.

Fifth, managers could exclude the participation of local experts and the inclusion of local evidence in the processes of priority setting. Managers face strong incentives to orient ‘upwards’ towards the donors that are funding the IMCI programme (Sridhar, 2010). They have little incentive to include local experts and local knowledge. Thus the risk that local experts and local evidence are excluded in the processes of priority setting needs to be assessed.

The above are the first ten PLANET criteria to evaluate an IMCI programme. The informants for these aspects would include policy-makers in various global health institutions as well as health economic, governance and health systems experts (see Box 1).

1.6.5. Recipients of IMCI programmes

The third level of stakeholders includes all those involved in the final stage of IMCI, i.e. reaching the recipients. This may involve government health systems, NGOs, private healthcare providers, local community representatives, and recipient groups (e.g. mothers and children) themselves, including the operational workforce. At this level, several factors could hinder the effectiveness of investments (see Figure 3).

First, the primary recipient could deliberately steal funding or commodities from this process for his/her own benefit. Numerous studies have documented such problems, for example, in the procurement of health supplies, in under-the-table payments for services, and in nurses and doctors who fail to show up at their clinics but nonetheless collect their salaries (Lewis, 2006). Thus, the risk that funding from the project will be stolen needs to be assessed.

Second, the recipient could set up unnecessary parallel structures to deliver on the project rather than working through government or "horizontally". Horizontal interventions are defined as those that strengthen the health care system, improve health systems service and delivery, and address general non-disease specific problems such as health worker shortages and stock outs of medicines and supplies. Despite the consensus that IMCI should be funded and organized horizontally, some financing may be channelled vertically (defined as setting up separate systems to deliver on the objectives often related to specific diseases). In recent years much of the funding has been directed to address HIV/AIDS, malaria and TB. The imperative to show measurable results in a short-time frame results in setting in place short-term fixes that deliver on the project with the problem that relatively little funding may go towards capacity-building or working through government. Thus the risk that an IMCI programme will result in
unjustified parallel local implementation structures rather than work through the existing health system needs to be assessed.

Figure 3: The level of managers and key performance risks at this level

Third, the IMCI programme may not be aligned with local priorities or promote community involvement. The choice of an IMCI programme as a priority over other possible investments in population health directly affects recipients’ health, meaning that these individuals should also have the right to participate in deciding on the priorities and implementation of the project. If this participation is to be meaningful nationally (or locally), then the results of the participation must have the possibility of having an impact, in this case, of affecting the nature
of the project. Thus the risk that the IMCI programme will not be aligned with local priorities or promote community involvement needs to be assessed.

**Figure 4:** The level of recipients and key performance risks at this level

Fourth, some elements of the IMCI programme could be seen as unethical, inequitable or unacceptable to the final recipients. In recent years policy-makers have increasingly become aware of the disparities in health status between different groups in society and the distributional impact of interventions (*Commission on Social Determinants of Health, 2008*). In particular, concern focuses on the extent to which interventions reach and benefit disadvantaged groups, such as the poor, women or certain ethnicities or otherwise marginalized populations. Thus, the risk that the IMCI programme is not ethical, equitable or acceptable to the final beneficiaries needs to be assessed.

Finally, the IMCI programme may not be sustainable, defined in terms of ensuring required human resource capacity to deliver on targets and objectives. It is increasingly recognized that the success of local implementation is highly dependent on a strong health workforce (*Chen et al., 2004*). It is people who prevent disease and administer cures. **Thus the risk that the IMCI**
programme will lack the requisite human resources, such as trained health workers, needs to be assessed.

The informants reporting of these final 5 criteria could be representatives of operations workforce and/or the ultimate recipients. The above factors can be used as the 15 criteria to plan an IMCI programme at the inception stage, to monitor its implementation in real-time, and/or to evaluate previously conducted efforts. The resulting questions that could be asked of key informants are provided in Table 1.

Table 1: Questionnaire for implementation of PLANET tool.

<table>
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<tr>
<th>Planning</th>
<th>Monitoring</th>
<th>Evaluating</th>
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<td><strong>Level 1:</strong> Donors</td>
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<tr>
<td>1. Is it likely that the amount of financial investment may not be proportional to the size of the problem(s) being addressed?</td>
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<tr>
<td>2. Is it likely that the investment may be driven largely by the interests of the donors?</td>
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<td>3. Is it likely that the investment may have been approved without full recognition of similar investments from other donors?</td>
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<tr>
<td>4. Is it likely that investment may create even more funding mechanisms rather than using existing ones?</td>
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<tr>
<td>5. Is the investment likely to spend too much of its total budget on costly &quot;middle men&quot; organizations?</td>
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| Level 2: Managers |
| 1. Is it likely that the desired effect of the investment will be reduced through corruption and stealing of resources? |

| 1. Is the amount of financial investment disproportional to the size of the problem(s) being addressed? |
| 2. Is the investment driven largely by the interests of the donors? |
| 3. Is the investment being implemented without full recognition of similar investments from other donors? |
| 4. Is the investment creating even more funding mechanisms rather than using existing ones? |
| 5. Is the investment spending too much of its total budget on costly "middle men" organizations? |

<p>| 1. Was the amount of financial investment disproportional to the size of the problem(s) being addressed? |
| 2. Was the investment driven largely by the interests of the donors? |
| 3. Was the investment approved without full recognition of similar investments from other donors? |
| 4. Did the investment create even more funding mechanisms rather than using existing ones? |
| 5. Did the investment spend too much of its total budget on costly &quot;middle men&quot; organizations? |</p>
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<th>Planning</th>
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<tr>
<td>2. Is it likely that the desired effect of the investment will be reduced through incompetently managed allocation?</td>
<td>2. Is the desired effect of the investment being reduced through incompetently managed allocation?</td>
<td>2. Was the desired effect of the investment reduced through incompetently managed allocation?</td>
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<td>3. Is it likely that the desired effect of the investment will be reduced due to poor evidence to support decisions?</td>
<td>3. Is the desired effect of the investment being reduced due to poor evidence to support decisions?</td>
<td>3. Was the desired effect of the investment reduced due to poor evidence to support decisions?</td>
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<td>4. Is it likely that the desired effect of the investment will be reduced due to unnecessary preference for NGOs over government?</td>
<td>4. Is the desired effect of the investment being reduced due to unnecessary preference for NGOs over government?</td>
<td>4. Was the desired effect of the investment reduced due to unnecessary preference for NGOs over government?</td>
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<tr>
<td>5. Is it likely that the desired effect of the investment will be reduced due to unnecessary exclusion of local expertise?</td>
<td>5. Is the desired effect of the investment being reduced due to unnecessary exclusion of local expertise?</td>
<td>5. Was the desired effect of the investment reduced due to unnecessary exclusion of local expertise?</td>
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**Level 3: Recipients**

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<tr>
<th>Planning</th>
<th>Monitoring</th>
<th>Evaluating</th>
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<tr>
<td>1. Is it likely that the desired effect of the investment will be reduced through corruption and stealing of resources?</td>
<td>1. Is the desired effect of the investment being reduced through corruption and stealing of resources?</td>
<td>1. Was the desired effect of the investment reduced through corruption and stealing of resources?</td>
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<td>2. Is it likely that the investment may unnecessarily create parallel local implementation structures?</td>
<td>2. Is the investment unnecessarily creating parallel local implementation structures?</td>
<td>2. Did the investment unnecessarily create parallel local implementation structures?</td>
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<tr>
<td>3. Is it likely that the investment may not be well aligned with local priorities or fail to involve local communities?</td>
<td>3. Is the investment not well aligned with local priorities or failing to involve local communities?</td>
<td>3. Was the investment misaligned with local priorities or did it fail to involve local communities?</td>
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<tr>
<td>4. Is it likely that the investment may seem unethical, inequitable, or in any other way unacceptable to recipients?</td>
<td>4. Is the investment unethical, inequitable, or in any other way unacceptable to recipients?</td>
<td>4. Was the investment unethical, inequitable, or in any other way unacceptable to recipients?</td>
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<tr>
<td>5. Is the desired effect of the investment being reduced due to corruption and stealing of resources?</td>
<td>5. Is the desired effect of the investment being reduced due to unnecessary preference for NGOs over government?</td>
<td>5. Was the desired effect of the investment reduced due to unnecessary exclusion of local expertise?</td>
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1.6.6. Three applications of the PLANET tool

The PLANET tool's approach, as defined above, has three major applications. First is in planning of new IMCI programmes. Donors in particular might be considering different investment options and project possibilities to address child mortality. While the overarching concern is justifiably a reduction in the number of child deaths, running a PLANET exercise will look at other equally important dimensions that would impact on the success of the project in reducing child mortality as well as aligning with best practices, equity considerations, community involvement and acceptability.

How could the framework be used? Based on this conceptual framework we have developed a questionnaire (see Table 25-1) that can be used to engage three groups of respondents. These would include those with knowledge of health governance, economics and health systems as well as policy-makers intimately involved with the execution of the programme. It would also include those at the local level who are likely to be involved with the delivery of the programme as well as the actual beneficiaries. All relevant stakeholders would be given this questionnaire and asked to respond independently and anonymously based on their knowledge of the project. The process could be conducted by technical experts in a transparent way (e.g. each vote counts equally). The outcome would be a comprehensive list of the strengths and weaknesses of particular programmes against many criteria, based on the collective input of technical experts. Additional criterion or questions can be added or substituted in to ensure covering all aspects relevant to that specific programme. Analysis of the respondent data would, taken together, provide a complete picture of the strengths and weaknesses of the programme that would be made available publicly.

Given that donors would be running this exercise using the expertise and accumulated knowledge of respondents, an additional step is necessary. Donors would need to define the context of the exercise based on their anticipated outcomes, the population they are targeting, the time-frame they are working under as well as stating how much risk they are willing to take to reach certain outcomes. For example, the Bill & Melinda Gates Foundation might be willing to take a major risk for a high-payoff while public donors such as the UK government might be looking to minimize risk and under those conditions to maximize health outcomes. The outcome would be a comprehensive list with competing priorities ranked according to the combined scores they received in the process. Such a list would be helpful because it provides an overview of the strengths and weaknesses of competing options in child mortality reduction against many criteria, based on the collective input of technical experts. The list can also be
adjusted by taking the values of many stakeholders into account such as occurred during the extensive experience with the implementation of CHNRI in health research prioritization (Rudan et al., 2008).

Second, PLANET can be used to monitor ongoing IMCI programs and receive real-time feedback on their implementation. Third, PLANET could also be used to evaluate the success of previous IMCI programmes. Evaluation is often neglected and efforts such as by the Center for Global Development to fill this gap have focused on the creation of new institutions with the capacity to undertake this kind of work (Centre for Global Development, 2013). The implementation would be similar to that described above using a modified questionnaire (see Table 25-1).

1.6.7 Strategies for data collection

Exploitation of collective knowledge is now possible and moreover easier and cheaper than ever before. Information / communication technology becoming a digital utility enables us now to seek input from hundreds or thousands of independent individuals at little higher cost than asking one person. It is possible now now, in real-time, in almost every country or setting collect feedback or opinions from billions of people who actively use mobile phones (with the proportion of smartphones rapidly growing) (International Telecommunication Union, 2013). This can be done through text-message, automated phone calls, dedicated apps, email or the internet in a device or platform agnostic manner. It is certain that this is redefining not just the norms of who provides a feedback or communication of their assessment of a programme and how and when this is done, but also how healthcare programmes are delivered or consumed. The PLANET questionnaire is currently being developed into an app that would be freely available to all governments, international institutions and individuals looking for a simple, tech-friendly tool to plan, monitor and evaluate healthcare programmes.

The PLANET tool has several major advantages over existing efforts in planning, monitoring and evaluation. First, it presents a standardized methodology that can be used for planning, monitoring and evaluation of any type of healthcare programme, but it also has sufficient flexibility to be tailored to the context of specific initiatives. PLANET would be an additional tool available to policy-makers, along with LiST (for health care/interventions) (Steinglass et al., 2011) and CHNRI (for health research) (Rudan et al., 2008) which will involve local experts and incorporate issues of local context in the process of determining priorities in a transparent, user-friendly, replicable, quantifiable and specific, algorithm-like manner. Second, it is simple to implement and with the development of mobile-phone software, should be able to be run anywhere in the world at low-cost. The low-cost of input means it can be run multiple times resulting in real-time monitoring of IMCI programmes. Third, while respondents are protected through anonymity in feedback, the results are provided transparently. Finally, the exercise gives equal voice to all those involved in the process of development from the donor (e.g. in London, Seoul or Seattle) to a manager and to a recipient (in rural Uganda, Dhaka or Antigua). The voice of local stakeholders, including operations teams and beneficiaries, is included in every exercise.

The use of these types of novel methodologies can lead to more rational planning, higher quality evaluation as well as more knowledgeable future decision-making, especially given that IMCI initiatives have traditionally lacked formal tools to examine delivery and implementation. The use of such tools would promote attention to objective evidence on
planning, monitoring and evaluation leading to more effective aid and ultimately better evidence on reduction in child mortality across the world and how this relates or could relate to specific development efforts.
References (in alphabetical order)


