Information Communication Technology tools for frontline workers to improve maternal and child health in Bihar, India

The challenge

In Bihar, India, frontline workers (FLWs) are deployed by the government to provide family health services to women and children; these services are aimed at reducing local rates of maternal, newborn, and child mortality; fertility; and undernutrition.

FLWs who provide these continuum of care services (CCS) can mobilize communities to seek and use care services, but they are not always equipped with appropriate data to identify and monitor clients, make referrals, provide counseling, or identify danger signs.

Accredited social health activists and anganwadi workers are the FLWs that provide health services at the community level in Bihar. Without ICT tools, the expected practice is to use paper-based home visit registers to track visits and interactions with beneficiaries. FLWs without ICT tools therefore lack a way to seek real-time information that they need to do their jobs and serve their beneficiaries effectively.

The solution

CARE International introduced an ICT CSS intervention in Bihar, India, beginning in mid-2012 to increase the coverage and quality of services that FLWs provide, enhance their communication with beneficiaries, and facilitate supervision of FLWs.

The ICT-CCS intervention was implemented as part of the ongoing Ananya program created by the Bill & Melinda Gates Foundation to improve maternal and child health (which began in 2011). The intervention included introduction of a mobile phone tool for FLWs, along with training and technical support.

The ICT-CCS tool combines registration of beneficiaries, scheduling of home visits, and guided protocols, along with audiovisual job aids. FLWs enter client informationinto the tool, including registration and subsequent visits, that is processed by a back-end server that manages the scheduling of home visits for each pregnant woman and mother with young children in each FLW's coverage area and provides FLWs with reminders about the timing of home visits. The tool also includes checklists and videos that are intended to support the FLWs in communicating health-related information to beneficiaries during these visits.

Project dates
2012 to 2015

Location
Bihar, India

Health focus area
Maternal and child health

Partners

Dimagi

CARE International

BBC Media Action

Grameen Foundation

MOTECH

Mathematica Policy Research

Bill & Melinda Gates Foundation

Further information

Borkum E, Sivasankaran A, Sridharan S, et al. Evaluation of the Information and Communication Technology (ICT) Continuum of Care Services (CCS) Intervention in Bihar. Princeton, NJ: Mathematica Policy Research; 2015. https://www.mathematica. org/our-publications-and-findings/ publications/evaluation-of-the- information-and-communication- technology-ict-continuum-of-care- services-ccs

Impact

Figure 1 shows the logic model for the ICT-CCS intervention. The expectation was that if FLWs understood and used the tools, they would improve their service provision, which in turn would result in improved health behaviors and lead to positive health impact.

Mathematica Policy Research evaluated the pilot intervention through a randomized control trial after two years of implementation. The study measured the value-add of the ICT-CCS tool by examining whether the introduction of the tool let to changes in how FLWs provided services and in beneficiary behavior and practices.[1] Seventy health subcenters were divided into treatment and control groups (35 subcenters in each); the treatment group received the ICT-CCS intervention and the control group did not. The study used qualitative and quantitative data collection methods to understand differences between the treatment and control groups.

The study found that CARE's intensive training on the tool was effective in increasing FLW understanding of and use of the tool, although use of the different ICT-CCS features varied by user. The tool led to some improvement in coordination of FLW home visits and increased job confidence. There was a statistically significant increase in FLWs asking other FLWs to conduct a home visit when they were unable to do so (p-value = 0.018). Other measures of coordination increased in the treatment group compared to the control but not at a statistically significant level. Increase in job confidence was shown by a statistically significant increase in percent of treatment group FLWs who reported that they thought they had the skills required for their jobs (p-value = 0.039). However, the intervention was less successful at improving supervision practices. There was no statistically significant difference between treatment and control groups for frequency of meetings between FLWs and their supervisor outside of subcenter meetings. There was also no difference in frequency of supervisors joining FLWs on home visits or percent of supervisors reviewing home visit registers or work phones at subcenter meetings.

There was also evidence that the intervention improved the frequency of interactions between FLWs and beneficiaries—a goal of the intervention package—and improved the quality of the interactions, albeit to a lesser extent. In the treatment group, more beneficiaries received at least two FLW home visits in the final trimester, home visits within one week and one month of delivery, and a complementary feeding home visit. Beneficiaries in the treatment group were more likely to receive advice on exclusive breastfeeding and complementary feeding but not on other topics like antenatal and newborn care. There was also a statistically significant increase in beneficiaries reporting that a FLW used job tools during home visits, but there were no differences in average duration of visits or whether the FLW spoke to other family members during the visit.

The intervention also improved health behaviors in the areas of antenatal care, child nutrition, and reproductive health, as well as some impacts on delivery and newborn care. For antenatal care, the intervention significantly increased the proportion of beneficiaries receiving at least three antenatal care visits, the proportion of beneficiaries using iron supplementation during pregnancy, and birth preparedness practices. For delivery and newborn care, there was a significant increase in the proportion of mothers breastfeeding immediately after birth. For child nutrition, there was a significant increase in reports of children aged 6 months or older eating solid or semisolid food and that the child started eating solid or semisolid food by 6 months of age. For reproductive health, there was a significant increase in the use of permanent contraception methods and ever using temporary modern contraception methods (no difference in current use of temporary contraception methods).

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1 Borkum E, Sivasankaran A, Sridharan S, et al. *Evaluation of the Information and Communication Technology (ICT) Continuum of Care Services (CCS) Intervention in Bihar*. Princeton, NJ: Mathematica Policy Research; 2015. https://www.mathematica.org/our-publications-and-findings/publications/evaluation-of-the-information-and-communication-technology-ict-continuum-of-care-services-ccs

FIGURE 1. Logic model for the ICT-CCS intervention in Bihar, India

Activities/Outputs

ICT-CCS mobile phone tool provided to FLWs (ASHAs/AWWS), which includes:
- Registration and management system to track, manage, and plan interactions with beneficiaries across the continuum of care
- Synchronization of home visit schedule for FLWs in the same catchment area
- Checklist to gather information about relevant behaviors and prompt the FLW to provide time-appropriate messages
- Videos to explain key family health messages to beneficiaries
- Feature to enable FLWs to review their performance in terms of completed and outstanding home visits

Extensive training on use of the tool
- Formal subcenter-level trainings
- One-on-one support for FLWs who require it

Technical trouble-shooting support
- Support provided over the phone or in person

ICT-enabled tool provided to FLW supervisors
- Supervisory phone for ANMs and LSs enables monitoring of the timeliness of FLW home visits and changes in key health indicators in their areas

Proximal Outcomes

Understanding of ICT-CCS tools
- Improved capability of FLWs to use mobile phone technology
- FLWs understand how to use the ICT-CCS tool
- ANM and LS understand how to use the supervisory tool

Use of ICT-CCS tools
- FLWs use ICT-CCS tool to plan and conduct home visits
- ANMs and LSs use supervisory tool to monitor and support FLWs
- Technical issues with the tools resolved

FLW service provision
- Regular and timely FLW interactions with beneficiaries based on automated schedule
- Comprehensive and accurate information provided to beneficiaries
- More effective communication of information to households
- Greater job confidence
- Improved coordination between ASHAs and AWWs
- Improved supervision and data-drive management by ANMs and LSs

Intermediate Outcomes

Barriers to adoption of key family health behaviors addressed
- Could involve improved knowledge, better awareness of available services, timely reminders, persuasion to overcome cultural barriers, etc.

Increased adoption of key family health behaviors along the continuum of care:
- Antenatal care (e.g. number of visits, consumption of IFA tablets)
- Delivery (e.g. place of delivery, birth preparedness)
- Newborn care (e.g. cord care, thermal care, immediate breastfeeding)
- Nutrition (e.g. exclusive breastfeeding, complementary feeding)
- Routine child immunizations
- Reproductive health (e.g. use of modern contraceptive methods)

Impacts

Mortality
- Reduced maternal mortality
- Reduced neonatal and infant mortality
- Reduced under-5 mortality

Health outcomes
- Reduced total and age-specific fertility rates
- Reduced child stunting and wasting

Note: ANM, auxiliary nurse midwives; ASHA, accredited social health activist; AWW, anganwadi worker; CCS, continuum of care services; FLW, frontline worker; ICT, information and communication technology; IFA, iron-folic acid; LS, lady supervisors.

Scale and future health system applications

In India, the ICT-CCS intervention piloted in Bihar laid the groundwork for a larger scale-up of mobile health (mHealth) tools nationwide. The Integrated Child Development Scheme, launched in 1975, is one of India's national flagship programs to support the health, nutrition, and development needs of children and women. This support takes place through a network of anganwadi centers that provide services to pregnant women, children, and their mothers. Following the 2015 results of the ICT-CCS intervention, the Government of India began to strengthen the Integrated Child Development Scheme in seven states using an mHealth intervention called Common Application Software, which was installed on smartphones with accompanying multilevel data dashboards. This system is intended to be a job aid for FLWs, supervisors, and managers. It aims to ensure better service delivery and supervision by enabling real-time monitoring and data-based decision-making.[2] Scale-up is continuing, as of February 2020, more than 625,000 anganwadi workers across 28 states have been using the application for service delivery.[3]

Future scale-up of the ICT-CCS intervention to other geographies and for health applications outside of maternal, newborn, and reproductive health is certainly possible. To our knowledge, the full ICT-CCS intervention package as described in this use case has not been applied in other settings; however, individual data science assets that are part of this use case have been widely applied in other contexts.

CommCare was the mobile data collection and service delivery platform that was implemented as part of this use case to register and monitor beneficiaries, track immunizations, schedule home visits, provide health information directly to beneficiaries (through checklists and videos), and monitor performance of FLWs. CommCare is used by more than 2,000 projects across 80 countries for mobile data collection and reporting.[4] For example:

+ **In Tanzania, FLWs use CommCare to assist with danger sign identification and referrals.**

+ **In Uttar Pradesh, India, FLWs use CommCare for real-time guidance on counseling and decision-making, as well as for time-sensitive alerts.**

+ **In Guatemala, the CommCare platform is used to receive continuous training and to perform community health promotion and prevention activities.**

+ **In Zanzibar, traditional birth attendants use CommCare to record permissions for emergency transport from family members and to facilitate payment for transportation.[5]**

Most recently, CommCare has been used to support the response to the COVID-19 pandemic. Dimagi created a template application to implement the World Health Organization's First Few X (FFX) cases protocol.[6] As of March 30, 2020, 500 organizations have downloaded the application.[7] At the time of publication, Dimagi is also working on additional template applications, trying to secure free messaging to support self-reporting workflows for positive COVID-19 cases, and pursuing WhatsApp integration.

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2   Nimmagadda S, et al. (2019). Effects of an mHealth intervention for community health workers on maternal and child nutrition and health service delivery in India: Protocol for a quasi-experimental mixed-methods evaluation. BMJ Open. 9. e025774. 10.1136/bmjopen-2018-025774. https://www.researchgate.net/publication/332039883_Effects_of_an_mHealth_intervention_for_community_health_workers_on_maternal_and_child_nutrition_and_health_service_delivery_in_India_Protocol_for_a_quasi-experimental_mixed-methods_evaluation#pfa

3   "Anganwadi Workers Were given Smart Phone for ICDS-CAS." Fresherslive. Fresherslive Current Affairs, March 13, 2020. https://www.fresherslive.com/current-affairs/articles/anganwadi-workers-were-given-smart-phone-for-icds-cas-24927.

4   https://www.dimagi.com/commcare/

5   CommCare. "The CommCare Evidence Base for Frontline Workers Overview." August 2019. https://www.dimagi.com/toolkits/commcare-evidence-base/

6   https://confluence.dimagi.com/display/commcarepublic/COVID-19+Template+App%3A+WHO+FFX+Protocol

7   Digital Square Webinar: Global Goods Adaptation for COVID-19 Response. March 30, 2020. https://path.zoom.us/rec/play/vpJ4cLqop243HILDuASDAvYrW9S7K6usgScb8_UEzRm8VXAGNIamNeBBMbbewJNnd8VplC77G3m4hu0O?autoplay=true&startTime=1585575432000

✅ Implementation considerations

Connectivity and mobile phone usage

During implementation of the ICT-CCS intervention, FLWs did report some technical issues such as poor internet connectivity, which limited ability to synchronize records with the main server, as well as logistical challenges, including delays in receiving funds to cover internet charges. Potential users of the intervention package should ensure that internet bandwidth will be sufficient in the local area and that there are backup systems in place in case of outage. To resolve the challenge of refunding FLWs for internet costs, users should consider implementing a mobile payment scheme to reduce lag time.

Although not specific to the ICT-CCS implementation in Bihar, other programs using CommCare have reported issues with using mobile phones if there is no convenient way to charge or fix them if they break.

Health worker burden

FLWs who were part of this intervention were required to fill out paper registers, while learning to use the new ICT tool and implementing it. Because of this, some FLWs reported that the tool added to their workload. Users who consider introducing this tool should consider workload burden on health workers and build in staging or other mitigation strategies to reduce the drain on FLW time. It should be noted, that if successful, the intervention is intended to provide a net reduction in FLW workload with the efficiencies that would result from ideal use of the tool.

Training and support

Results from the pilot evaluation highlight the importance of the training approach that provided intensive support to familiarize FLWs with the ICT-CCS tool. The training approach implemented by CARE International is included as a data science asset within this use case. Future applications of this use case should ensure that sufficient training and support—both formal and informal—are provided for end users. The training and support offered should be tailored to the end users' starting comfort level with technology. In the case of the Bihar implementation, many FLWs had little to no experience with mobile phones beyond making phone calls.

⊟ Data science assets

PRODUCT	**PROCESS**

CommCare mobile health platform

- ⊡ **Data Collection**
- ⊚ **Data Transformation**
- ✲ **Data for Impact**

CommCare is an offline-capable mobile data collection and service delivery platform designed for everything from simple surveys to comprehensive longitudinal data tracking.

A straightforward application builder allows for easy digitization of surveys and forms, as well as the integration of decision support, notifications, and SMS (short message service, or text) messaging. Programs can be scaled from the community to the national level, thanks to simple device deployment and translation features.

In the Bihar ICT-CCS system, CommCare served as the phone-based interface for FLWs. The interface includes forms, checklists, videos, and data collection tools. Beneficiary information entered in CommCare is sent to a central cloud server. MOTECH is a back-end server that integrates beneficiary data that have been entered in CommCare and manages schedules for each beneficiary, which get updated back to the FLWs' phones.

The CommCare ICT-CCS tool includes features to register and monitor beneficiaries, track immunizations, schedule home visits, provide health information directly to beneficiaries (through checklists and videos), and monitor performance of FLWs. These features include:

- » **Beneficiary registration form.**
- » **Home visit scheduler.**
- » **Immunization scheduler.**
- » **Beneficiary management form.**
- » **Interactive checklists to guide FLW-beneficiary interactions.**
- » **Videos for education / behavior change communication.**
- » **FLW performance report.**

For more information

https://dimagi.com/commcare/

> Mobile data
> collection tool

> Data management /
> business processes

> Decision support

PRODUCT

PROCESS

MOTECH open source enterprise software

Data Collection

Data Transformation

Data for Impact

Hosting services

Dimagi's MOTECH is a CommCare-based interface that supports the integration of scalable mobile services and health information systems.

MOTECH implements the OpenHIE (open source health information exchange) standards, which are emerging as the global standards for interoperability of health information systems and registries. MOTECH is designed to enable integration with a set of self-service features, which enables the sharing of data between systems to be configured without software developers or code changes. MOTECH supports integration with District Health Information Software 2 (DHIS2) and Open Medical Record System (OpenMRS).

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For more information

https://motechproject.org/

PROOF

Randomized controlled trial to evaluate the ICT-CCS intervention:
Study design, research protocol, and data collection tools

Data Collection

Data Transformation

Data for Impact

Research methods

Research protocols

Mathematica Policy Research conducted a randomized controlled trial to evaluate the impacts of the ICT-CCS intervention in the Saharsa district of Bihar.

The research protocol and study design included evaluation questions, specifications on data collection processes, sample selection and size, and analysis methods. The evaluation used a mixed-methods approach that included quantitative data from surveys with FLWs and beneficiaries and qualitative data from field visits and senistructured interviews with implementing partner staff, FLWs, and beneficiaries.

The evaluation was designed to answer the following questions:

» **What was the ICT-CCS intervention, and how was it implemented? To what extent did FLWs understand how to use the new ICT-based tools? What were the practical challenges or barriers to using the tools?**

» **What was the impact of the ICT-CCS intervention on FLW-household interactions? Did ICT-based tools lead to an improvement in the quantity and quality of FLW-household interactions?**

» **Did the intervention lead to improvements in maternal and child health outcomes among beneficiaries? Did ICT-based tools lead to improvements in key health outcomes across the family health continuum? If so, were these improvements larger for certain subgroups of the population than for others?**

For more information

Borkum E, Sivasankaran A, Sridharan S, et al. Evaluation of the Information and Communication Technology (ICT) Continuum of Care Services (CCS) Intervention in Bihar. Princeton, NJ: Mathematica Policy Research; 2015. https://www.mathematica.org/our-publications-and-findings/publications/evaluation-of-the-information-and-communication-technology-ict-continuum-of-care-services-ccs

PEOPLE

Training approach for frontline workers

Data Collection

Data Transformation

Data for Impact

FLWs' understanding of the ICT-CCS tool increased over time, the result of an intensive training effort by CARE International.

Methods and approaches for learning

Dimagi (the firm that built the CommCare mobile data collection platform) initially trained one CARE ICT coordinator at each subcenter, who then conducted trainings for the FLWs. The training approach used in the ICT-CCS intervention was much longer and more intensive than the common week-long, one-time trainings on mHealth tools. The ICT tool was a new way of working for the FLWs, which required a longer training, with gradual learning over time. The training was built specifically to address the modules included in the ICT platform and was implemented in waves to improve retention.

One critical aspect of the training approach was the use of a practice mode and follow-on learning. The practice mode allowed FLWs to try out simulated beneficiary interactions as needed without the pressure of real-life data collection. Follow-on learning included access to a suite of video and audio resources. FLW supervisors were also able to see the data that FLWs in their supervisory group were collecting and inputting. Finally, the approach prioritized the eventual transfer of supervision to national health system staff in the interest of scale-up and sustainability.

Based on interviews and demonstrations with FLWs two years after the ICT-CCS intervention began, there was a high level of understanding on how to use the home visit scheduling feature and the checklist function. The high understanding was attributed to CARE's effort to provide ongoing training and mentoring opportunities inside and outside of formal meetings. Formal meetings consisted of 16 three-hour long training sessions over eight weeks for FLWs to learn the basics of the tool. CARE staff were able to connect FLWs who would benefit from additional instruction to informal mentoring opportunities before the next training session. This helped prevent the FLW from becoming increasingly behind their peers and allowed them to join the next formal learning session at the same level of understanding as the rest of the group.

For more information

Borkum E, Sivasankaran A, Sridharan S, et al. Evaluation of the Information and Communication Technology (ICT) Continuum of Care Services (CCS) Intervention in Bihar. Princeton, NJ: Mathematica Policy Research; 2015. https://www.mathematica.org/our-publications-and-findings/publications/evaluation-of-the-information-and-communication-technology-ict-continuum-of-care-services-ccs