

coverage and quality of critical interventions. A key constraint in many low resource settings is the lack of available health facilities capable of delivering critical MNCH interventions, leading to large investments in expanding physical infrastructure and human resources. Efficient allocation of resources requires information about the existing availability of services and key gaps in service configuration. However, this information is not often available. The University of Manitoba's Centre for Global Public Health is implementing a Technical Support Unit embedded within the Government of Uttar Pradesh (GoUP) to provide support for the planning and implementation of MNCH programs under the National Health Mission. There is a specific focus on 25 high priority districts (population approximately 60 million), which contribute disproportionately to maternal, neonatal and infant mortality. To improve the GoUP's planning and scale-up of the availability of MNCH services, we mapped facilities in the public and private sectors to assess availability, identify gaps and develop a planning roadmap for efficiently increasing service availability through the National Health Mission.

**Methods:** We conducted a rapid, large scale mapping and assessment of health facilities in the public and private sectors in 25 high priority districts of Uttar Pradesh in India. The mapping tools were designed to capture details of population, physical infrastructure, staff, drugs, equipment, supplies, services (antenatal care, delivery, postpartum, postnatal, abortion, newborn and child health), certain service statistics and use of facilities' untied funds. The mapping occurred over a three month period and covered a total of 7,560 public facilities (90% response rate) and 1,150 private facilities (63% of those identified as providing delivery care). Consent was obtained from the primary respondents at the facilities.

**Findings:** The mapping found that only 44% of an estimated 429,315 deliveries occurred in public facilities (39%) or identified private facilities (5%). The large majority of deliveries in public facilities occurred in block (sub-district) level facilities (52%) or district hospitals (15%). There were large gaps in the availability of delivery points, general infrastructure, human resources, equipment, drugs and supplies in the public sector at all levels of care, with large disparities between and within the 25 districts.

**Interpretation:** Facility mapping data were used to develop a strategic plan to expand service delivery points across the state and within each district, through a mix of enhancing the signal functions of existing facilities and activating dormant delivery points. This planning was incorporated into the National Health Mission project implementation plans at the district and state levels, and these plans are being tracked through ongoing assessments of the expansion of service availability.

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### The innovations initiative: Technological approaches for addressing maternal, newborn and child health

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**Program/Project Purpose:** As the use of technologies in public health becomes increasingly acceptable and feasible, it is essential that their application reflects the needs of specific target populations and incorporates multidisciplinary approaches. Innovations for Maternal, Newborn & Child Health (MNCH), running from 2009 to 2016 in five countries in Sub-Saharan Africa and South Asia, is a novel initiative that tests creative solutions to understand and overcome barriers to MNCH

services. Two projects, Health Center by Phone (CCPF) in Malawi and Care Community Hub (CCH) in Ghana, exemplify the potential of mobile health technologies (mHealth) to address obstacles to health service access and delivery. We will present the findings and scalability of CC PF and the design and potential of CCH.

**Structure/Method/Design:** CC PF, recently completed, consisted of a facility-based toll-free hotline and text message reminders to connect women, caretakers and children to health workers via mobile phones. The intervention targeted a catchment population of four health centers in the Balaka region of Malawi, providing 35,000 pregnant women and 25,000 children access to the services. CCH, recently launched, aims to improve motivation, job satisfaction and professional development among frontline health workers through a mobile application. The intervention districts were selected based on collaboration with the Ghana Health Service and the Grameen Foundation to incorporate the CCH in the contexts of their current programs. All health workers in the selected districts were enrolled.

**Outcomes & Evaluation:** A positive effect of CC PF was observed on aggregate home-based care practices for MNCH and facility-based care for mothers. There was a negative effect on aggregate facility-based care for children, resulting from a substantial reduction in visits for fever, thereby reducing facilities' burden for symptoms that could be treated at home. CCH employed a human-centered design whereby the targeted end-users developed the content of the mobile application. It includes six concepts to support nurses to develop professionally, provide quality care, connect with others, manage work, improve well-being and feel appreciated.

**Going Forward:** The Innovations approach, illustrated through these pilots, provides invaluable insight for implementers and policymakers on mHealth to improve the quality of MNCH delivery and outcomes. CC PF has demonstrated that mHealth can work to improve MNCH even in low resource settings. CCH has highlighted the importance of context, community ownership and capacity in the design of technological interventions and their sustainability.

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### Genotyping malaria parasites to understand malaria transmission

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**Background:** Despite decades of control efforts, malaria remains a global burden, with more than 600,000 deaths annually, and more than half of the world's population at risk for infection. The renaissance of genomic research has offered public health programs new opportunities to better address malaria elimination and eradication. Current efforts call for identification of specific epidemiological break points, for which genetic analysis can offer more specific guidance about the status of the parasite population in response to control efforts. Genetic tools for elimination allow sensitive identification of malaria reservoirs and hot-spots even among populations with asymptomatic disease. These tools can also track the emergence and spread of drug resistance in response to selection pressures. Furthermore, these strategies can be used to identify and track individual malaria parasites. These approaches are most useful