**mHealth** or the use of mobile and wireless technologies as a strategy to support the achievement of global health objectives such as the Millennium Development Goals and Health Systems Strengthening, is rapidly advancing throughout the world. To capitalize on increased access to health services and information, improve quality of care at the point-of-care, and to create efficiencies within the health system, the mHealth Program at the Center for Global Health and Economic Development (CGHED) at the Earth Institute, Columbia University engages in the strategic design, testing, implementation, and evaluation of mHealth tools within the Millennium Villages Project (MVP) and beyond, while working to advance the enabling environment for mHealth.

In collaboration with the Department of Biomedical Informatics at the Columbia College of Physicians and Surgeons, the Department of Epidemiology at the Mailman School of Public Health, Department of Engineering and the Center for New Media Teaching and Learning, the mHealth Program develops partnerships, frameworks, and deploys systems that are being leveraged to inform global and national policy in an effort to advance health systems. Through its work with Millennium Promise and UNDP, the mHealth Program is being operationalized at the community level within the MVP sites in Ethiopia, Ghana, Kenya, Malawi, Mali, Nigeria, Rwanda, Senegal, Tanzania, and Uganda.

CHWs in Ruhhira, Uganda using an mLearning module

The Millennium Villages Project seeks to accelerate the achievement of the health-related Millennium Development Goals – namely goals 4, 5, and 6 – which aim to reduce maternal/child mortality and morbidity, and control the spread of preventable disease like HIV/AIDS, Malaria, and TB among others. The mHealth Program leverages mobile technologies to:

- **Improve access to emergency and general health services.**
- **Improve efficiency of health service delivery.**
- **Enhance collection of vital statistics on births and deaths to refine public health interventions.**
- **Improve clinical practice for enhanced health outcomes.**
- **Reduce child and maternal mortality and morbidity in Millennium Villages.**
- **Improve disease surveillance and control.**
- **Improve monitoring and evaluation of health system activities for enhanced planning and decision-making.**

**Infrastructure Deployment**

Through the support of public and private partners, MVP has been able to deploy a broad range of information and communication technology (ICT) systems and serves as a test-bed for new applications and tools aimed at the accelerated achievement of the MDGs. These systems include the deployment of Millennium Global Village-Network (MGV-Net) across MVP countries; the upgrade of network connectivity; the provision of over 1000 mobile handsets for all health workers and facilities in 10 countries, the provision of SIM cards for health workers, the creation of closed user groups and the creation of toll-free emergency lines and toll-free SMS numbers for ChildCount+ and other RapidSMS-based applications.
MVP provides an unprecedented and paralleled opportunity to layer in tools to support the work of a team of health professionals, strategists, designers, and researchers to place mHealth tools in the hands of 857 Community Health Workers and health professionals in 96 health facilities to impact the lives of 443,200 people of which the health of ~13,930 pregnant women and ~75,150 children under 5 will be monitored on a routine basis to accelerate the achievement of MDGs 4 & 5 namely improving maternal and child health outcomes.

Applications Design, Testing, Implementation, and the Movement to Scale
For the past two years, MVP has put into place the infrastructure needed and built relationships with District, Regional and National Health stakeholders to support mHealth and design, developed, and tested a number of m and eHealth tools in its sites in Africa. In the course of the past two years, four platforms have gained traction and shown results with the fifth and sixth platforms under review that cover household, clinic, and district-level support and reporting needs. These include ChildCount+, OpenMRS, Mobile Telemedicine (in Ghana), Mangrove, ODK-clinic, and RapidSMS for disease surveillance and reporting and have been applied to maternal, newborn, and child health as well as special modules including those for TB, malaria, and HIV and AIDS and the 14 reportable WHO Epidemic Diseases. Where possible, MVP has partnered with UNICEF, Google/University of Washington (Android platforms), and Grameen Foundation (MoTECH) to leverage and complement their platforms in its work and are sharing underlying technologies (components) and standards-based dictionaries across organizations.

Using a participatory design approach, the mHealth Program is actively seeking support and partnerships to leverage its existing work in mHealth across the Millennium Villages Project (MVP) to engage MVP host-country government agencies, UNICEF and other UN agencies, telecommunications companies, fellow mHealth implementers, and the Millennium Villages Project teams to scale, replicate, connect, strengthen, and evaluate the impact and cost-benefit of the following mHealth and related eHealth systems. The first opportunity to deploy mHealth at scale will be in Nigeria as part of an MDG scale up initiative in partnership with the Nigeria Government.

Research and Policy
As part of a commitment to ensure the growth of the evidence base and the enabling environment for mHealth, CGHED actively engages in a broad range of research activities. This includes a Study of Connectivity in Africa sponsored by Ericsson conducted in 4 MVP sites with the goal of understanding factors influencing the uptake of mobile phones the current and potential uses of mobile and other ICTs in achieving the MDGs. A research team at the Earth Institute is in the process of evaluating the impact of MGV-Net, including ChildCount+ and OpenMRS, on healthcare delivery systems using a mixed methods approach including a costing component to assess mHealth value to inform scale up. Research will be conducted in five (5) sites across sub-Saharan Africa during 2010-2011. In 2009 the mHealth team was engaged in both a targeted review of the mHealth evidence base sponsored by the mHealth Alliance to identify key mHealth barriers and gaps and the design of an mHealth Module for the WHO Global Observatory for eHealth’s Global Health Survey. The results of the survey are currently being co-analyzed and developed into a publication for the first-ever country-by-country status on mHealth programs.

Partnerships
The Millennium Villages Project and CGHED work in collaboration with Ericsson, Sony Ericsson, MTN, Zain/AirTel Bharti, Novartis Foundation for Sustainable Development, mHealth Alliance, International Development and Research Centre (IDRC), Rockefeller Foundation, Open Mobile Consortium, World Health Organization, UNICEF and other UN Agencies, Ministries of Health and ICT, World Economic Forum, and academic institutions throughout the world to reach these objectives.

For more information, visit:
http://www.millenniumvillages.org/about/index.htm
http://cghed.ei.columbia.edu/?id=projects_mhealth
http://www.childcount.org