Zambia’s Mobile Phones Halve the Transmit Times for Infant HIV Results, Remind Mothers of Regular Perinatal Clinic Visits

**Context**

Nearly half a million infants are born with human immunodeficiency virus (HIV) in Zambia, even though the country has one of the best HIV care and treatment systems in Sub-Saharan Africa. The government provides free universal access and treatment for those who test HIV-positive, and it recently adopted an opt-out approach to routine perinatal HIV screenings. Mother-to-child transmissions in utero, at delivery, and during breastfeeding are now being diagnosed 90 percent of the time (Seidenberg et al. 2012).

Diagnosing infants for HIV infections requires highly sophisticated DNA testing. The standard (antibody) test in local facilities is ineffective because of the presence of the mother’s antibodies in the infant’s bloodstream. A small blood sample is spotted onto filtered paper and sent to one of three countrywide laboratories that have DNA testing.

Treating an HIV-infected infant in the first 12 weeks of life is highly effective. But detection can easily take more than 12 weeks in remote communities. Untreated infants have a one-in-three chance of survival in the first year and a one-in-two chance in the second year.

The biggest barriers to turning results around faster are distance between facilities, unreliable transport, and mismanaged supply chains. In addition, a corruption scandal at the Ministry of Health led to donors—who fund most of the national health budget—freezing funding from 2009 to 2015.

**Development Challenge**

The challenge for Zambia was developing a health care delivery system, especially for remote communities, capable of testing infants for HIV infection and of producing results within 12 weeks of birth—a critical timeline for effective intervention.

**Intervention**

Project Mwana, as the project was named, capitalized on a province’s grassroots initiative for early diagnosis of HIV-infected infants and seamlessly integrated a short message system (SMS) into the national health care service delivery system. The SMS would securely and efficiently communicate test results.

The United Nations Children’s Fund (UNICEF) Innovation Team, by using free and open-source software for SMSs with collection, coordination, and communication capacities (RapidSMS), created two custom applications for mobile phone technology. One application, Results 160, returns diagnostic results immediately to rural clinics and facilitates communication between clinics and community health workers. The other application, RemindMi, improves postnatal follow-up by reminding mothers of the six-day, six-week, and six-month visits in line with Zambia’s immunization schedule. The project accounts for and works in areas without mobile networks (UNICEF 2012).
Through on-the-ground learning and iterative progression, the pilot program scaled up to a project. Both the pilot and Project Mwana were implemented by the Zambia Ministry of Health, with support from UNICEF, the Clinton Health Access Initiative, and the Zambia Prevention, Care, and Treatment Partnership.

**Delivery Challenges**

This delivery note analyzes the following key implementation challenges in the pilot phase and examines how they were overcome:

- **Information and communications technology.** Three primary factors inhibited the efficient delivery of services: distance, transport, and logistics. Three laboratories, or hubs, have DNA-testing capacity and are located between 10 kilometers and 600 kilometers from local health facilities. Remote communities do not have reliable transport and send the blood samples with drivers passing through the area. Furthermore, the cost of transport and fuel is expensive. In addition, the local health facilities and hubs are not well coordinated, and blood samples are lost in transit.

- **Roles and responsibilities.** The open-source software allowed the partners to develop slightly different tools and approaches; while the SMSs were being built, there was no clear owner. Further, the 3 separate pilots, with parallel structures and systems, covered 31 clinics in 6 districts and relayed about 400 results. Most local facilities were situated in the communities that were hardest to reach.

**Addressing Delivery Challenges**

The following steps were undertaken to mitigate the delivery challenges related to information and communications technology.

- Mobile solutions overcame distance barriers. And the solutions aligned with the national health strategies met specific health objectives, thus reaching more mothers faster and improving postnatal follow-up.
  - Simple, scalable, and effective health care for rural mothers and infants
  - User-friendly and portable to personal mobile phones, thereby extending relations among remote mothers, rural health workers, and community health facilities

- Open-source software superseded ground transport. Local and international developers created tools in iterations, consulting with health and community workers and taking into consideration, among other factors, how to maintain privacy and keep costs low for eventual scale up.
  - Open-source software that allows developers to build their own applications
  - A fast, reliable, and sustainable platform that works in mobile phone–free zones

- Simple systemic design supported complicated logistics. End users enter and receive data via mobile phones, computers, and printers. A central server at the Ministry of Health connects to the telecoms, securely coordinating information from end to end. A web interface for ministry officials and the implementing partners permits monitoring during actual time.
  - Increased communication between rural health care workers, mothers, and local facilities and between local facilities and hubs
  - Proactive monitoring for bottlenecks and accountability across government agencies
  - Patient-tracing tasks that increase mothers’ uptake of the diagnosis and results services primarily and of regular perinatal visits and birth registration secondarily

The following steps were undertaken to mitigate the delivery challenges related to roles and responsibilities:

- **Ownership.** The Zambian Ministry of Health dedicated a manager to the project and selected a person with proven technical and partnership skills. District health management teams trained local health facility workers on early diagnosis and on retrieving results from the SMS. Facility follow-up trainings and ad hoc visits provided a mechanism to troubleshoot, gather feedback, and identify systemic strengths and weaknesses. UNICEF, the Clinton Health Access Initiative, and the Zambia Prevention, Care, and Treatment Partnership crafted a common goal and shared it with the Ministry of Health, thus signaling a shared vision.

- **Pilot preparation.** Johnson & Johnson’s seed money for alleviating bottlenecks in health care delivery was invaluable, influencing RapidSMS design for monitoring during actual time. The pro bono services of McKinsey & Company helped to define a problem statement and visioning exercise and helped to support a scoping mission.
to Zambia. The pro bono services of frog™ (a technology company) facilitated six weeks of intensive innovation management expertise and a one-day workshop for public health programmers and mobile health implementers.

- **Pilot.** For five years in Southern Province, the Zambia Center for Applied Health Research and Development had been running programs for the early diagnosis of HIV infection in infants and had established a baseline of data (diagnosis return rates, barriers to service delivery, and health worker training, among others). Project Mwana built on this grassroots initiative.

- **Implementation.** UNICEF sought partners with distinct but complementary advantages. Zambia Prevention, Care, and Treatment Partnership had the oversight capacity to integrate the three pilots at the district and facility levels, thus preventing parallel structures and systems. The field presence and technical capacity of the Clinton Health Access Initiative eased the project’s new technology into mobile phone–free zones, trained community health workers, and supported general operations. UNICEF also worked with and underwrote the services of three large Zambian mobile phone operators.

- **Monitoring and evaluation.** The Zambia Center for Applied Health Research and Development, having run local infant HIV diagnosis programs, was an ideal partner to collect data for scale-up feasibility. The center monitored 10 sites for eight months, and every month the center collected and entered test result turnaround times in a database. It also retained and reconciled hard copy and SMS-transmitted test results to determine error rates, which were minimal.

**Frequent communication unified structures and systems.** In the pilot phase, collaborating partners regularly convened and aligned. They ensured that the pilot had one coordinating body (an SMS technical working group led by the Ministry of Health), one joint plan, and one common monitoring and evaluation framework. Reviews and updates occurred regularly.

- On average, infant HIV test results are returned in one-half the time as those not in the pilot program.
- Rural health workers quickly grasped and used RemindMi, with spillover effects such as increased registration of births.
- Today, this program runs in 10 districts and has 484 health facilities, 1,325 clinic staff members, and 1,902 community-based registered agents.²

**Endnotes**

1. This information in this section is drawn largely from UNICEF (2011, 2012).


**References**

