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# IMPROVING DRIED BLOOD SPOT TRANSPORT LOGISTICS FOR EARLY INFANT DIAGNOSIS OF HIV: THE SPEED MODEL

## Background

Globally, significant progress has been made in averting new HIV infections among children.<sup>1</sup> However, challenges remain in reaching pregnant women living with HIV and their newborns with services to prevent mother-to-child transmission of HIV. In the absence of treatment, half of all infants infected with HIV will die before their second birthday.<sup>2</sup> The World Health Organization (WHO) recommends that all children exposed to HIV be tested within four to six weeks of birth to ensure that all infected infants begin treatment immediately.<sup>3</sup>

In Nigeria, the National Early Infant Diagnosis (EID) program was introduced in 2007. Since its introduction, the program has achieved tremendous growth and success, with over 1,200 health care facilities and 23 centralized

## ABOUT PRO-ACT

The Prevention and Organizational Systems - AIDS Care and Treatment (Pro-ACT) project is a seven-year project (2009-2016) funded by the United States Agency for International Development (USAID) and implemented by Management Sciences for Health (MSH) in five Nigerian states: Niger, Kwara, Kebbi, Sokoto, and Zamfara. Pro-ACT strengthens the capacity of Nigeria's public, private, and community sectors for sustainable HIV/AIDS and TB prevention, control, care and treatment integrated within the health system.

Figure 1. Hub and Spoke Model for DBS transport with the SPEEID Model



polymerase chain reaction (PCR) laboratories providing EID services and testing. The program has reached over 40,000 exposed infants since its inception. However, it is estimated nationally that only 6.2% and 4.1% of HIV exposed infants receive antiretroviral (ARV) prophylaxis and EID, respectively, within two months of birth.<sup>4</sup>

EID of children exposed to HIV during pregnancy, labor and delivery, and breastfeeding requires the collection of dried blood spot (DBS) samples. DBS is a form of bio-sampling where blood samples are blotted and dried on a filter paper, and then transferred to a designated specialized laboratory for analysis. One major challenge with the introduction of the DBS sampling technique in Nigeria was the transfer of samples collected from HIV exposed infants at facilities to the Regional PCR lab and of results to the mother-baby pair. For EID to be effective, the turnaround time (TAT) interval should be less than 4 weeks to ensure that infants who are positive and require antiretroviral treatment (ART) are provided with treatment or are referred for treatment in time. Infants who test negative would be provided with prophylactic medications, such as septrin, and monitored closely, and their mothers would be counseled on safe infant feeding practices and ART adherence.

The absence of a standardized logistic sample transfer system in Nigeria results in long TATs ranging between 1-4 months.<sup>5</sup> This delay has a huge effect on treatment outcomes for these exposed infants, and subjects parents and caregivers to psychological strain while they await the results.

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The SPEEiD Model is very safe and effective, there is nothing to be afraid of in transporting dried blood samples samples by our staff.  
*Mr Sekiri Abass from NIPOST office in Niger during Peer-Peer Mentorship session at NIPOST office Birnin Kebbi*

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To address this challenge, the Prevention Organizational Systems - AIDS Care and Treatment (Pro-ACT) project, funded by the United States Agency for International Development (USAID) and implemented by Management Sciences for Health (MSH), pioneered a new model for the transportation of DBS samples in collaboration with the Nigerian Postal Services (NIPOST).

### Approach

In 2009, the Pro-ACT project designed the Strengthening the Process and Effectiveness of Early Infant Diagnosis (SPEEiD) Model to improve timely EID services. Pro-ACT approached NIPOST to utilize its courier Expedited Mail Service (EMS) platform to transport DBS samples and test results. The choice of NIPOST was informed by its wide network of over 900 post offices, 3,000 postal agencies, and extensive mail routes covering the country, which would help to ensure that hard-to-reach communities and localities are provided with EID services.

Beyond transport logistics, the SPEEiD model also strengthened the collection of DBS samples for all HIV exposed infants from 6 weeks to 18 months of age on special filter paper. The Pro-ACT project provided basic training to health care workers in supported facilities to properly collect, dry, batch, and package DBS samples in A4 envelopes or EMS courier envelopes. All health facilities within a particular region were mapped utilizing a Hub and Spoke model (Figure 1) which ensures all designated hubs (facilities) are linked within the existing NIPOST/EMS mail routes.

Table I. Cost of shipment from EID hub site to Regional PCR Lab\*

Weight	NIPOST	FedEx	DHL	UPS
Kilograms (kg)	Cost (USD)**			
0.5 kg	\$19	\$24	\$39	\$25
1.0 kg	\$21	\$27	\$47.5	\$29

\*Based on two-way shipment of DBS samples from EID hub site to Regional PCR Lab; distance of 157 kilometers as of December 2014

\*\* Cost based on an exchange rate of \$1 USD=160 naira

Batched DBS samples are usually packaged at the service delivery point and sent on a designated day to a particular hub in the SPEEiD network. The details of all samples received are recorded at the hub before NIPOST transports samples to the designated PCR laboratory for analysis. Upon completion of the sample analysis at the PCR laboratory, NIPOST transports the results back to the hub and then the service delivery point facilities.

The SPEEiD model was first rolled out in Kwara state (population: 2.3 million, HIV prevalence 1.4%), North Central Nigeria in March 2013, with the “hub” site at the Children Specialist Hospital (CSH) Ilorin.<sup>6</sup> This hub linked to 24 “spoke” EID sites made up of one tertiary, eight secondary, and 15 primary health care facilities. The CSH hub site is linked to the most proximal regional PCR lab situated at the Obafemi Awolowo University Teaching Hospital (OAUTH) Ile-Ife Osun state, South West Nigeria.

To ensure adequate coordination and seamless implementation, a two-day start-up orientation workshop was conducted jointly for four NIPOST and 16 health facility staff, a contact directory of sites and designated NIPOST/EMS focal staff was developed, facility-specific pick-up-day schedules were generated, and data capture tools, as well as EMS courier envelopes and other resources were provided to both hub and spoke sites. To encourage knowledge exchange and peer-to-peer learning, the program also involves the NIPOST personnel already trained and implementing the SPEEiD model to serve as mentors to staff in other areas.

## Results

A review of logistics data from Kwara state after one year of implementation in February 2014 showed a reduction in TAT for return of DBS results from 3-6 months to 3-4 weeks utilizing the SPEEiD model. Furthermore, results

were received for 97% of samples (173/177) transported with this model, compared to 51% previously achieved using program staff and project vehicles to pick up DBS samples and results.

Additionally, the MSH SPEEiD model intervention had a direct impact on women, their children, and families. With improved TAT, 7 out of 173 HIV positive infants were commenced promptly on life saving ART, improving their survival rate. 166 out of 173 HIV negative breastfeeding infants were provided with septrin prophylaxis and were monitored through the transmission risk period.

Table I shows costs of the SPEEiD model and other two-way shipping options offered by other courier service platforms. The average cost of sample transfer through NIPOST was estimated at between US\$20-\$40 per batch and remains comparatively less expensive than similar courier service platforms by at least 30%.

Beyond its contributions to improved service delivery and health outcomes, the SPEEiD model offers other benefits that are relevant for policymakers and program managers in Nigeria and beyond as they work to improve EID services. Key advantages of the solution include the following:

### *Indigenous and Sustainable*

Through partnership with the NIPOST, the SPEEiD model provides a sustainable, country-wide EID sample transfer and result delivery system. It leverages local systems for improved service delivery and invests in local markets.

### *Cost-effective*

The model, which utilizes the NIPOST EMS platform, remains relatively cost-effective in comparison to other existing courier service platforms.

## 6 STEPS TO SET-UP SPEEID

- *Step 1:* Advocacy and familiarization visits to State MoH, Regional PCR labs and NIPOST territorial offices
- *Step 2:* Mapping of NIPOST offices and postal agents
- *Step 3:* Mapping of EID service delivery points using the Hub and Spoke model
- *Step 4:* Orientation and training of focal NIPOST and health facility staff
- *Step 5:* Deployment of MIS tool for data collection and reporting
- *Step 6:* Periodic Monitoring and Evaluation of the TAT and instituted logistic processes



Photo by MSH

### Wide Coverage

NIPOST is a well-functioning network of over 900 post offices and 3,000 postal agencies spread across the country. With its wide coverage, the use of NIPOST ensures that DBS samples can be packaged in any part of Nigeria and delivered to the nearest PCR lab for testing, and that results are returned to the facility.

### Ease of Replicability

With the simple step-by-step guide developed by Pro-ACT, the SPEEiD model can be easily replicated in any state or locality with existing mail infrastructure. Additionally, through the SPEEiD mentorship and peer-to-peer learning approach, experienced NIPOST staff from states where the model has been successfully implemented can share their experiences and help to mentor NIPOST staff in new scale-up sites to ensure seamless start-up and implementation. Based on its success in Kwara state, the model is now being successfully replicated in Niger, Kebbi, and Zamfara states.

### Conclusion

The SPEEiD model is a cost-effective, efficient, and sustainable sample transfer model that leverages local resources to optimize EID services. Accelerated and timely delivery of EID test results facilitates earlier provision of lifesaving HIV medication to infants infected with HIV and initiations of appropriate support for HIV negative infants through the breastfeeding period until a definitive diagnosis is determined. This intervention also has the potential to reduce anxiety and psychological stress suffered by parents and caregivers awaiting the results of their infants' tests.

By utilizing the existing mail route and wide network of NIPOST, the SPEEiD model extends timely services to hard-to-reach and underserved communities. The model has made it possible to link over 5,000 PMTCT sites with the 23 PCR laboratories in Nigeria. The SPEEiD model is a local solution that leverages existing resources, an element critical to sustaining HIV services within the context of declining external funding, and has the potential to be replicated in other countries with strong postal service infrastructure. ■

### References

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