



# USAID | DELIVER PROJECT

## Zambia: Implementing the End Use Verification survey using mobile phone technology

November 2009



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# **Zambia: Implementing the End Use Verification survey using mobile phone technology**

November 2009

### **USAID | DELIVER PROJECT, Task Order 3**

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### **Abstract**

In November 2009, the USAID | DELIVER PROJECT office in Zambia, with technical assistance from the home office, conducted the End-Use Verification activity to assess the performance of the logistics management and supply chain systems for selected essential drugs, malaria and family planning commodities.

The survey was used in conjunction with the ongoing Essential Drugs Logistics System Pilot in Zambia, and overall objective was to assess how the logistics systems managed selected commodities at public health institutions, as well as provide a snapshot of how malaria was being diagnosed and treated at lower level facilities. This report presents the findings of the assessment as well as the short- and long-term recommendations to successfully implement the End-Use process, as well as the use of EpiSurveyor for regular data collection purposes.

Cover photo: USAID | DELIVER PROJECT staff use EpiSurveyor to gather data at a health facility in Kafue, Zambia. 2009. Mike Frost.

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# Acronyms

ACT	artemisinin-based combination therapy
EDLS	Essential Drugs Logistics System
GSM	Global System for Mobile Communications
JSI	John Snow, Inc.
MIT	Massachusetts Institute of Technology
MOH	Ministry of Health
MSH	Management Sciences for Health
MSL	Medical Supply Limited
NMCC	National Malaria Control Center
PMI	President's Malaria Initiative
RDT	rapid diagnostic test
SCMS	Supply Chain Management System
SD	Secure Digital
SIM	Subscriber Identity Module
SPS	Strengthening Pharmaceutical Systems
TA	technical assistance
USAID	United States Agency for International Development





# Executive Summary

In November, 2009, the USAID | DELIVER PROJECT in Zambia worked with two advisors from the project's home office to roll out the use of mobile phones enabled with EpiSurveyor to capture data at 40 health facilities during the President's Malaria Initiative's (PMI) End-Use Verification activity.

End-Use Verification is a quarterly activity designed to provide quick, actionable information concerning the health of the malaria supply chain, as well as a snapshot of how malaria is diagnosed and treated at lower level health facilities. The findings are used to help guide decision-making and policy preparation, and are shared with PMI at the central level, as well as the Ministry of Health and in-country partners working to combat malaria. The activity in Zambia was expanded to also include family planning commodities and selected essential medicines.

The use of mobile phones enabled with EpiSurveyor for data collection had previously been recommended for use with this activity to cut down on the time needed to carry out analysis and share findings, following a USAID | DELIVER PROJECT pilot of the software in Ghana that demonstrated its ease of use, and the potential to dramatically decrease the time needed to dedicate to this activity.

Following a week of training in Lusaka, four teams comprised of at least two data collectors from the USAID | DELIVER PROJECT spent a week traveling to five different districts around Zambia, gathering supply chain and malaria case management data from health facilities. This data was then analyzed using the automated tools provided by EpiSurveyor, and shared with PMI, USAID and in-country partners.

The success of this activity in Zambia ensured that EpiSurveyor would continue to be used in subsequent round for the End-Use activity, as well as for other monitoring and evaluation opportunities.

Based on the observations made during the activity, some possible next steps are listed below to be used to plan future interventions.

- The DMO based on the findings presented above, have decided to improve their monitoring and supervision efforts by including logistics and inventory management, malaria case management, and accurate reporting in their performance assessment activities.
- For a logistics system to operate smoothly orders must be submitted, filled accurately, and delivered in accordance with the established schedule. There were reports from health

facilities that orders were not being received on time or if received the quantities are inadequate.

- Due to high staff attrition rate, NMCC to coordinate and conduct regular trainings on malaria case management for new staff coming on board at health facilities. Some of the facilities had personnel that were not trained in malaria case management because they just been hired and the manuals were not available for reference.
- The USAID | DELIVER PROJECT, in collaboration with NMCC, will carry out further monitoring and supportive supervision activity in other districts during the ED/Malaria pilot logistics system evaluation exercise starting mid January 2020 and present findings to stakeholders for necessary action by next quarter starting January, 2010.
- The use of the mobile phones in data collection should be encouraged in future. This will make data gathering, analysis and result generation quicker and done in near real time.

# Background

## Introduction

In 2008, the President's Malaria Initiative (PMI) tasked the USAID | DELIVER PROJECT and Management Sciences for Health's Strengthening Pharmaceutical Systems (MSH/SPS) program with developing a process for assessing the availability of malaria commodities at the health facility level. These partners agreed upon a standard set of indicators and created a written guidance with a tool for gathering the necessary inputs, calling it the End-Use Verification Process. PMI requested that the End-Use Verification Process take place at least quarterly in each of the 15 PMI focus countries, beginning in the second quarter of FY09. In order to streamline data collection and ease the quarterly reporting burden for this activity, the use of mobile phone-based data collection software, EpiSurveyor, was piloted in Ghana in July and August of 2009 (see Frost et al. 2009). The success of this pilot led PMI to seek to implement the use of EpiSurveyor in other countries carrying out the End-Use activity, with the intention to phase out paper-based data collection. Zambia was one of the first countries selected to apply the new technology, in November of 2009.

## End-Use Verification Overview

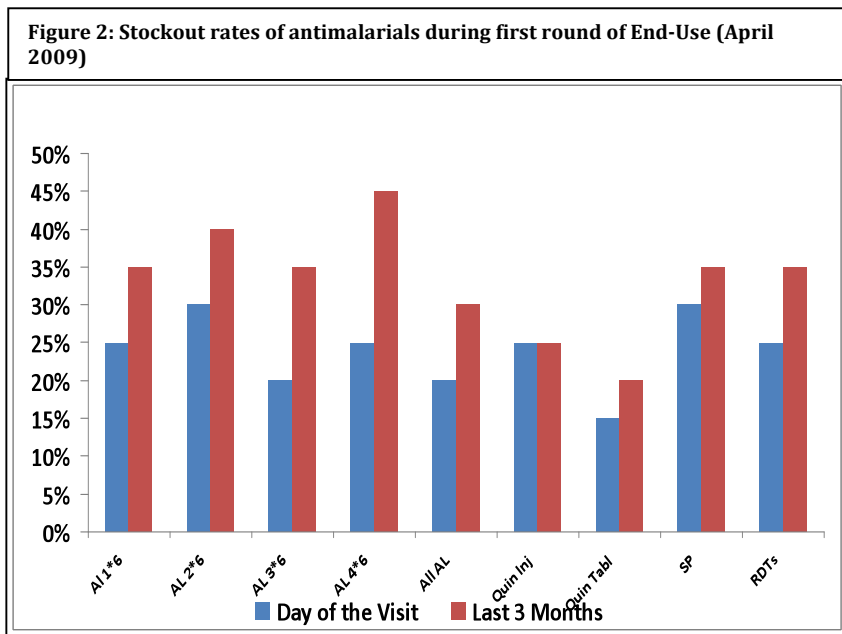
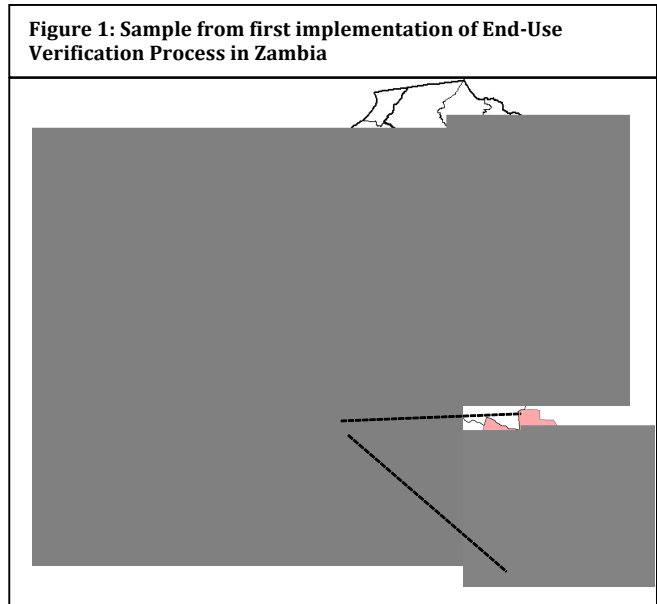
The End-Use process was developed by PMI in collaboration with the USAID | DELIVER PROJECT and MSH/SPS, and is used to assess the availability of malaria commodities at the end-user level, as well as provide a snapshot of how malaria is being diagnosed and treated at a given set of health facilities. Because many countries already employ some approach to monitoring product availability at different levels within the health system, the End-Use process is modified from country to country to fit the given context and include additional commodities beyond just those needed in a malaria program, with the intent to complement and strengthen a country's monitoring efforts rather than replace them. The supporting documents for the process include suggested approaches for a sampling methodology, key indicators to track and a recommended tool to collect the data needed to calculate those indicators.

The results of the process are intended to inform policy makers and planners about the effectiveness of the health system in making malaria commodities available to those who need them. It can be used to strengthen National Malaria Control Programs (NMCP) and Ministry of Health (MOH) supervisory efforts, gather information to help satisfy audit requirements, verify the availability of commodities and provide timely, actionable information for the detection and correction of issues surrounding programmatic implementation. The process is designed to be implemented on a regular basis, with results available shortly after data collection in order to quickly allow corrective action to be taken.

In Zambia, the End-Use process was first carried out in the spring of 2009, and was incorporated into the monitoring visits that the SCMS/DELIVER country office, Medical Supply Limited (MSL) and the MOH carry out regularly in 16 districts for the Essential Drugs Logistics System (EDLS) pilot program. As part of the End-Use process, data was gathered from 20 health facilities from 8

districts in the Lusaka and Western provinces, and the information was used to generate indicators relating to product availability and expiries.

This first round of End-Use Verification in Zambia was also used as an opportunity to evaluate the new process and provide feedback on how it could be improved. One observation related to the difficulty of gathering the data needed for the required malaria case management indicators, which were to be calculated using information about the number of patients presenting with fevers at the health facilities that were visited, the number and methods of malaria diagnoses, and the resulting treatment.



As had been shown previously during the pilot of End-Use Verification in Tanzania (see Chimnani and Frost, 2009), gathering this kind of information on paper was quite time consuming, lengthening the stay at health facilities and potentially decreasing the number of health facilities that could be visited in a week. Furthermore, during the analysis of the data, the case management component was especially difficult, as it required recombining multiple characteristics of the patient information to create very specific indicators, such as the number of

children under age 5 who presented with a fever, were diagnosed with uncomplicated malaria, and treated with an ACT. This kind of analysis, while conceptually simple, was arduous to create using information gathered on paper, adding days to the time needed to produce the regular report for this activity.

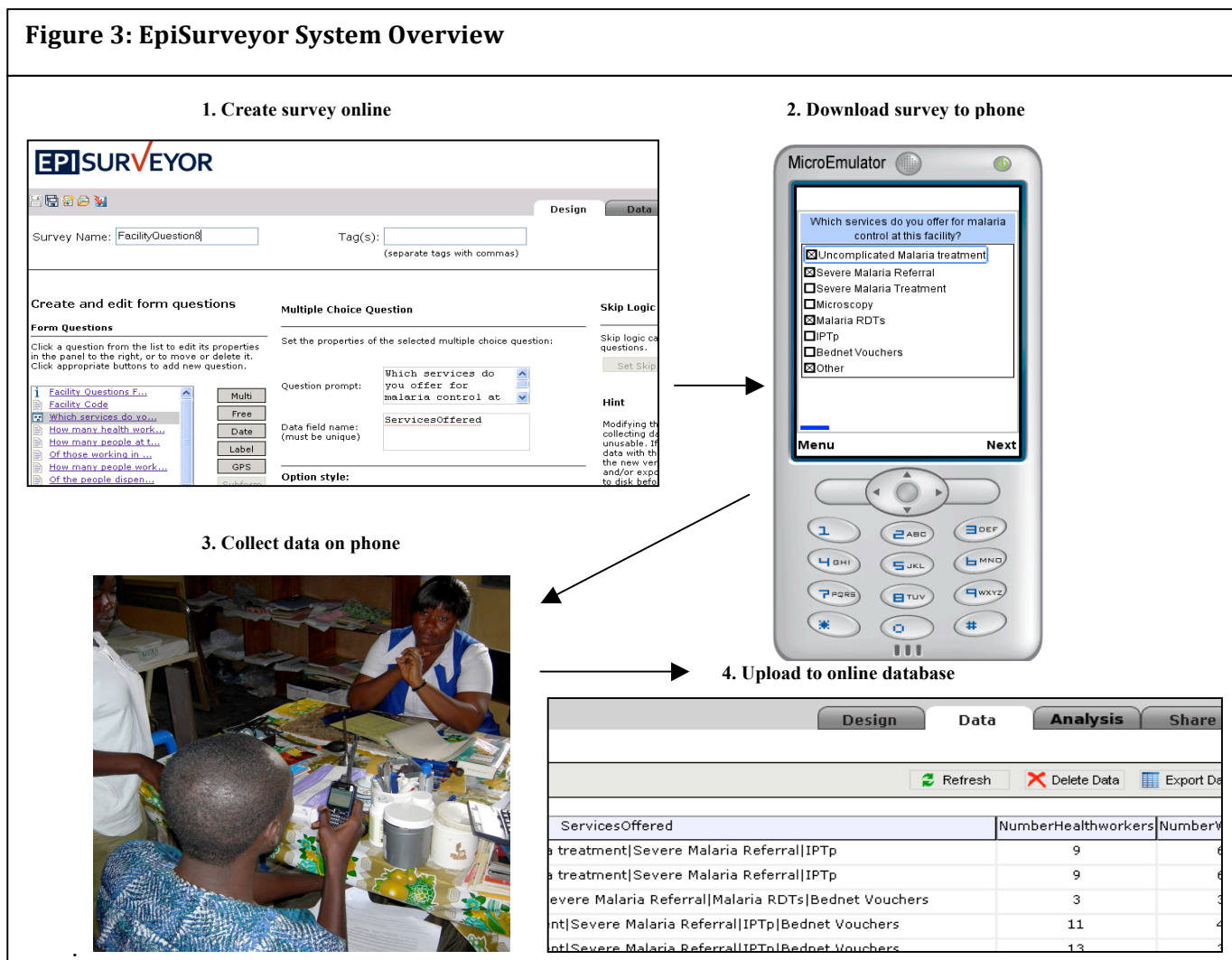
The results of the Tanzania pilot indicated that the time and amount of data required to generate the necessary indicators and compose an appropriate report for this portion of the activity, when

combined with the analysis requirements for the other components, created a substantial hurdle toward regularly implementing the End-Use activity. Based on these findings, PMI and the USAID | DELIVER PROJECT sought new methods to alleviate the analysis burden of the End-Use activity, and with this focus in mind, entered into discussions with DataDyne, developers of the EpiSurveyor software.

## EpiSurveyor Overview

EpiSurveyor is a software suite that allows the user to create surveys via an online interface, download the survey to a mobile phone, collect data at health facilities using the cell phone, and upload the data gathered back to a remote server, where it can be accessed online.

**Figure 3: EpiSurveyor System Overview**



Because EpiSurveyor allows those gathering data to carry out the data entry function while at a health facility, it has the potential to greatly reduce the amount of time needed to process the data and deliver the findings, which is typically one of the greatest bottlenecks of any survey. The USAID | DELIVER PROJECT carried out a proof of concept test with a single phone in Tanzania during their second round of End-Use Verification in the Spring of 2009, and based on the findings from

that test, contracted with DataDyne to add several additional components to the software that would improve the user experience, increase the quality of the data that was collected and decrease the likelihood that any data gathered by the phones could be lost. Among other things, these improvements included the ability to back up data from the phone to a laptop via a cable or Bluetooth connection, the ability to review data on the phone and on a laptop prior to uploading the server, and the ability to download multiple forms at a time, decreasing the amount of time the user needed to remain connected to the internet.

## Episurveyor Pilot

Upon completion of these additional software components, a full-scale test of the EpiSurveyor application was carried out during the first round of End-Use Verification in Ghana during July and August of 2009 (see Frost et al. 2009). To conduct an appropriate assessment of the viability of using EpiSurveyor to replace paper-based data collection for the End-Use activity, the test consisted of comparing the experience of paper-based data collection during the activity with that carried out using EpiSurveyor. Based on these comparisons, the pilot was designed to assess three quantitative and qualitative aspects of using the software on mobile phones:

- *Time*: compared the time lapsing at a facility while using the phone to the amount of time it took to gather the data using paper
- *Data Quality*: compared the data quality between that uploaded to the online database from the mobile phones, and that gathered on paper and entered in an Excel database
- *Ease of Use*: evaluated comments and observations made by data collectors using the mobile phones

### Time

The average time lapsed at a facility where the teams gathered data on paper was two hours and 22 minutes (ranging between 45 minutes on the low end, and four hours and 20 minutes on the high) whereas the average time lapsed at a facility for the teams using only EpiSurveyor was one hour and 57 minutes (ranging between one hour and 15 minutes, and two hours and 25 minutes.)

**Table 1: EpiSurveyor Test in Ghana (TIME)**

PAPER	Average Time
Team A	2:57
Team B	2:58
Team C	2:25
Team D	1:30
<b>Overall</b>	<b>2:22</b>

EpiSurveyor	Average Time
Team E	1:57
Team F	1:57
<b>Overall</b>	<b>1:57</b>

Resource and time constraints prevented the EpiSurveyor teams from visiting the same number of facilities as the Paper teams, but the findings were sufficient to conclude that the use of mobile

phones did not add time to length of stay at a facility, and likely decreased the amount of time that was needed.

## Data Quality

In order to assess the quality of the data gathered using EpiSurveyor, the team conducted a comparison of the data in the EpiSurveyor database with what was collected on paper and entered into Excel by hand. The data used for comparison was selected across the different End-Use forms and across the four EpiSurveyor testers, using data gathered during the first three days of data collection.

The results indicate that there was very close parity between the EpiSurveyor database and the data gathered by paper and input by hand. From the 412 different fields compared, 6 discrepancies were discovered, which represented a 1.5% difference between the two methods. See Table 2 for an example dataset.

**Table 2: EpiSurveyor Test in Ghana (DATA QUALITY)**

		A	B	C	D	E	F	G	H	I	J	K	L	M	N
<b>Tester 1</b>	EpiSurveyor	1	0	0	0	1	0	0	1	0	1	1	0	0	1
	Excel	1	0	0	0	1	0	0	1	0	1	1	1	0	0
<b>Tester 2</b>	EpiSurveyor	1	1	1	1	1	1	0	1	1	1	0	1	0	1
	Excel	1	1	1	1	1	1	0	1	1	1	0	1	0	0
<b>Tester 3</b>	EpiSurveyor	1	1	0	0	0	1	0	1	1	1	0	0	0	0
	Excel	1	1	0	0	0	1	0	1	1	1	0	0	0	0
<b>Tester 4</b>	EpiSurveyor	0	0	1	1	1	1	1	1	0	1	0	0	0	0
	Excel	0	0	1	1	1	1	1	1	1	1	0	1	0	0

It is important to state that these differences are not necessarily an indication that the Excel data was more accurate than the EpiSurveyor data. Four of the six discrepancies discovered came from data entered for the form used to assess whether or not a facility maintained proper storage conditions. This form consists of a series of questions that must be answered “yes or no,” as judged by the data collector (e.g. “*The current space and organization is sufficient for existing malaria medicines and supplies, including room for reasonable expansion in the event of receipt of expected product deliveries.*”) The data under comparison was gathered during the first three days of data collection, during which time there were several people on a team entering information using paper, and one person gathering data on the cell phone. As such, it is probable that the 4 discrepancies resulting in this form are merely a reflection of the fact that the somewhat subjective storage conditions form was completed in EpiSurveyor by a

different data collector than the one who recorded the answers on paper, resulting in different responses. It is also worth pointing out that, in any case, those discrepancies did not lead to a change in the overall calculation of the PMI End-Use indicators. In other words, the final results reported out of the two databases would have been the same.

### **Ease of Use**

In addition to evaluating EpiSurveyor using the concrete results previously discussed, each EpiSurveyor user was provided with a short questionnaire for making observations at health facilities about how to improve data collection using the cell phones. Made clear by their feedback was the fact that the ability to automatically perform analysis and eliminate the need to manually enter data after the data collection period made replacing paper-based data collection with EpiSurveyor desirable. In fact, across the board, when asked whether or not they would choose to replace paper-based data collection with EpiSurveyor, every respondent replied that they would.

### **Conclusions**

The findings of the Ghana pilot showed that, if managed appropriately, EpiSurveyor could be used to cut down on the time and cost of implementing the End-Use activity by enabling easier analysis of the data gathered, and eliminating much of the time needed for data entry. Based on these findings, PMI asked the USAID | DELIVER PROJECT and MSH/SPS to begin rolling out EpiSurveyor in their respective End-Use countries, beginning in quarter 1 of FY10. The first countries to receive training on mobile phone data collection were to be those countries that had already begun implementing the End-Use activity. Zambia was the first country selected.



# Rollout of EpiSurveyor in Zambia

A team of two technical assistance (TA) providers from the USAID | DELIVER PROJECT central offices in Arlington, VA traveled to Zambia in November of 2009 to implement the use of the EpiSurveyor software with the End-Use Verification activity. The purpose of the technical assistance was to train appropriate JSI staff and in-country partners on the use of the software and cell phones for data collection, and help plan and carry out that quarter's End-Use data collection activity, thus leaving behind the technical capacity for the office in Zambia to lead the activity using EpiSurveyor for future quarters.

## Prior to Traveling

In order to complement existing monitoring efforts and obtain the most programmatically useful information possible while visiting health facilities, the team first worked to incorporate the use of EpiSurveyor into the previously described routine monitoring and evaluation activity for the EDLS pilot, which covered multiple commodity categories, including essential medicines and family planning commodities. Prior to traveling to Zambia, the TA providers used the online EpiSurveyor interface to create mobile-phone versions of the existing EDLS tools. The tools remained essentially the same as the paper-versions, with some modifications made to:

- ensure the necessary data would be gathered to calculate the required End-Use indicators;
- for ease of use within EpiSurveyor; and
- to remove any redundancies.

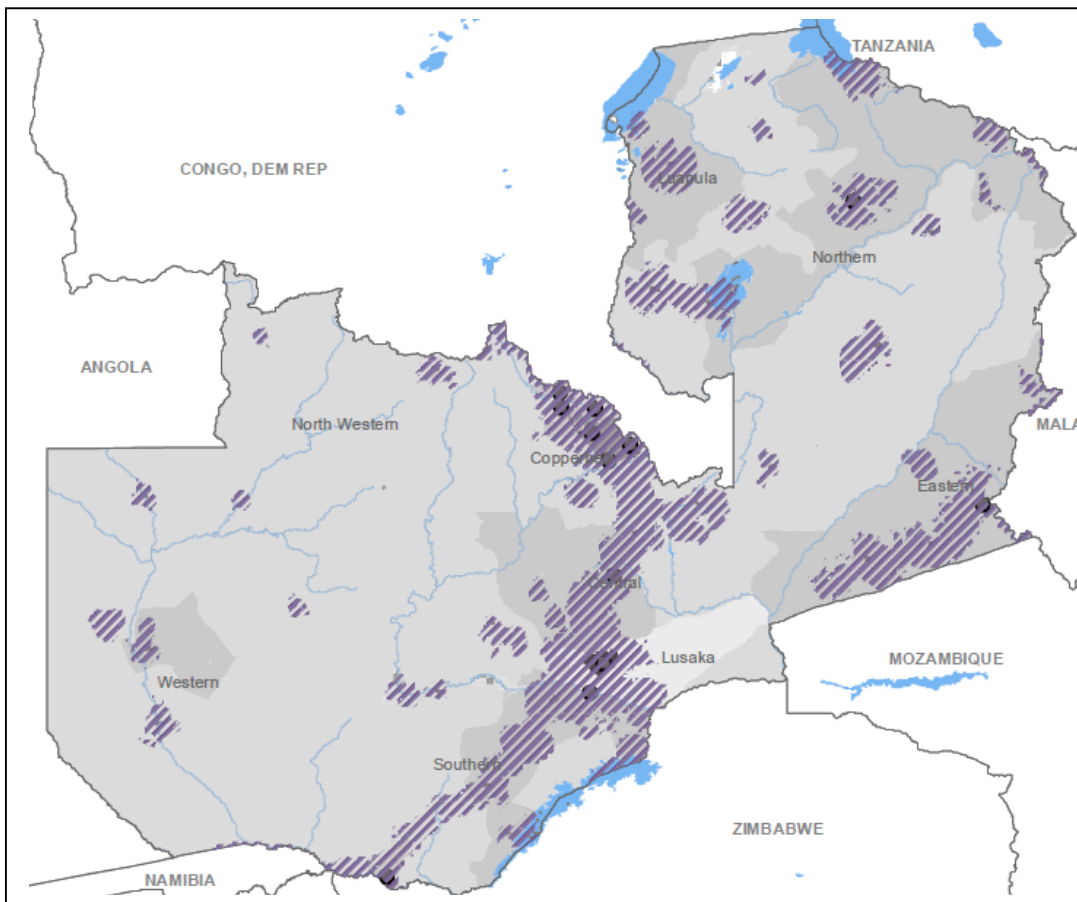
Before leaving to Zambia, the team also researched the appropriate phone to use in Zambia (the Nokia e71 or e63), purchased the phones and set them up for use with EpiSurveyor. Before the team's arrival in Zambia, the country office identified data collectors, prepared for workshops and trainings in the first week, and selected the health facilities that would be visited during data collection.

## Week 1

### Phones

Upon arriving in country, the first crucial component for implementing the use of EpiSurveyor was to identify an appropriate phone service provider and then activate the mobile phones for use with this provider's network.

**Figure 4: GSM Coverage in Zambia<sup>1</sup>**



Because EpiSurveyor only requires an internet connection when downloading forms to the phone or uploading data, it is not crucial to have access to the internet outside of the capital during a centrally-led survey. Forms can be installed on the phones prior to heading out for data collection, and the data can be backed up to a laptop while out in the field, and sent to the server upon returning to the capital. However, the more extensive the coverage the better, as data collectors with access to the internet can upload data from the field, providing nearly real-time results to those following the activity online.

For this survey, it was determined that Zain provided the best coverage. The TA providers worked with representatives at a Zain customer service center in Lusaka to install subscriber identity module (SIM) cards into the phones, and activate the SIM cards for use with Zain’s internet coverage.

### **Training**

A two-day training was conducted at the project offices in Lusaka, attended by all data collectors for the activity, as well as personnel that had previously been identified to potentially use EpiSurveyor in

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<sup>1</sup> Source: [http://www.infrastructureafrica.org/aicd/system/files/zmb\\_new\\_ALL.pdf](http://www.infrastructureafrica.org/aicd/system/files/zmb_new_ALL.pdf) accessed 26 Feb 2010. Information based on GSM Association, Oct 2006. GSM coverage is likely to have expanded greatly since this time.

the future and for other activities. The first day provided an overview of EpiSurveyor, and hands-on training with the phones that would be used the following week while visiting health facilities. Participants were trained to navigate the EpiSurveyor website, create and download forms, enter data into the phones, upload data to the server and manage data online. The second day focused specifically on the forms that would be used to gather data for the activity, and followed the traditional route of examining each question with the data collectors to determine whether any changes or corrections were needed, and to ensure that everyone would answer any given question in the same manner, making possible a proper analysis of the results.

One discussion point during the second day of training concerned the need to still have a standardized paper form to have at each facility to capture any qualitative information that would not be entered into the phones for later analysis (e.g. comments by health facility staff with suggestions for improving the supply chain). The group agreed on the layout of a paper form, and was also trained on its use.

### **Pilot in Kafue**

Following the training, the data collectors split into four teams to pilot the survey at nearby facilities in Kafue. The pilot had the purpose of further familiarizing data collectors with the survey and providing real experience with EpiSurveyor, and also to inspire more concrete input on whether any more refinements were needed on the survey itself. Following the morning's visit to health facilities, the teams met in the afternoon to discuss the experience and suggest improvements.

### **Administrative Preparations**

The final day of week 1 was used to assign phones to each individual data collector, create the pairings (two data collectors per team), and finalize the sample of health facilities to be visited.

### **Sharing Information**

During the first week, DELIVER staff also had multiple meetings with representative from USAID/PMI, NMCC, the Malaria Control and Evaluation Partnership in Africa (MACEPA), and the Massachusetts Institute of Technology (MIT) to provide an overview of EpiSurveyor and share the planned approach in Zambia.

## **Week 2**

### **Data Collection**

Including Kafue, data collection lasted 4 days, with each of the four teams visiting 7 or more health facilities for a total of 40 health facilities, located in five districts in Mwense, Kaoma, Choma, Kabompo and Kafue (see Appendix B for the full list of facilities.)

**Figure 5: Health Facilities Visited During End-Use Activity Nov 2009**



The speed with which the visits to the health facilities were conducted was faster than had been anticipated, adding to the evidence from Ghana that the use of mobile phones decreased the amount of time spent recording data at health facilities. The difference in the number of facilities that each team was able to visit (with the fastest team visiting 12, and the slowest team visiting 7) was attributed to the distance required to travel between facilities, rather than the length of time spent at facilities, as each team reported spending between 1 and 2 hours at a facility on average.

### **Data Management**

Each of the data collectors had received specific training on how to properly manage their data while in the field. Upon concluding data collection at each health facility, data collectors were to attempt to send their data to the server, and then back up the data to the phone's removable micro SD card. Following a full day of data collection, the data collectors were instructed to back up the data on the micro SD card to their laptops. Although, as expected, some teams had very few opportunities to upload directly to the server while out in the districts, every team was able to appropriately back up their data, and no data was lost.

### **Sharing Lessons Learned**

Each team met with district and provincial MOH staff upon arriving for the first day of data collection, and debriefed them about the purpose of the visit. A district pharmacist or other

personnel was then assigned to each team to accompany them during the visits to health facilities. On the last day of data collection, teams met back with MOH staff to share the general preliminary findings, highlighting any concerns or items needing immediate attention.

## Week 3

### Data Entry and Cleanup

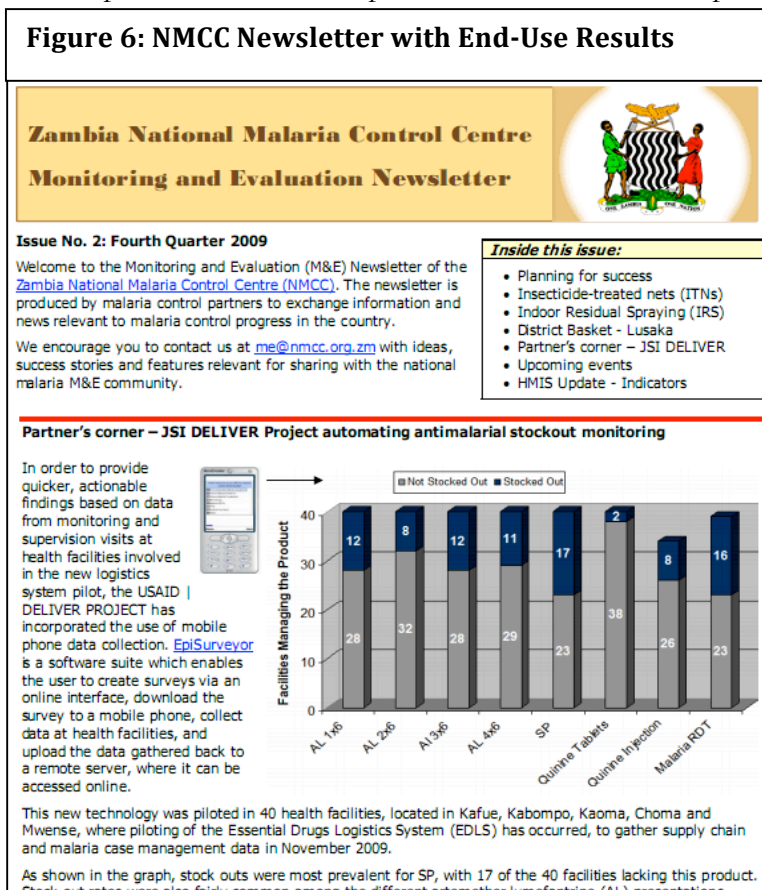
Once back in Lusaka, all of the data collectors turned in their phones to one of the TA providers, who downloaded the data to a computer as simple .txt files. The TA provider used Excel to compile into a large dataset, using sorting features to determine whether there was missing information or redundant entries. Where needed, follow-up was made with the individual data collectors to determine whether or not corrections were appropriate. The uncleaned data that had been uploaded to the server in the field was then deleted from the online database, and the newly cleaned, finalized dataset was uploaded.

### Data Analysis

Because the malaria case management component of the Zambia tool was identical to that previously used in Ghana, EpiSurveyor could be used to provide immediate analysis of this data, using the existing analysis template created for the earlier activity. This provided final analysis of 20 of the required 37 End-Use indicators one day after data collection was completed. Several of the remaining indicators (e.g. storage conditions assessment) were also easily analyzed using the basic frequency analysis included with EpiSurveyor. The remaining indicators would require a one-time creation of an analysis template by DataDyne, and thus preliminary analysis was conducted for these indicators (e.g. index of availability of ACTs) using Excel.

A scheduling conflict prevented NMCC and MOH from attending a debriefing with the preliminary findings, but they presented to USAID/PMI before leaving Lusaka (see Appendix C for the full PowerPoint presentation.) The findings were subsequently shared with NMCC and other in-country partners, and were used in the quarterly NMCC newsletter.

**Figure 6: NMCC Newsletter with End-Use Results**



## **Conclusion**

In November 2009, the use of mobile-phones enabled with the EpiSurveyor software to collect data at health facilities was rolled out in Zambia in association with the End-Use Verification Process. The implementation of EpiSurveyor went smoothly, and had the intended result of easing the data entry and analysis burden associated with the End-Use Verification Process. The local USAID | DELIVER PROJECT office was pleased enough with the approach that the decision was made to not only continue using EpiSurveyor to gather data for the End-Use activity, but also to use it during the EDLS evaluation taking place in January 2009.

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