

SJMLS-2(2)-2017-001

Medical Laboratory Logistics Management Information System Practice for Some HIV/AIDS Laboratory Commodities in Selected Public Health Facilities in Sokoto State, Nigeria.

Daniel, Nanbol Listick^{1*}, Nanbol, Helen Daniel², Ibiang Livinus³, Iwe Eucharia³, Umoren Michael³, Magana Musa³, Tanko Haruna³, Abubakar Suleiman³, Daddah Abdul Wahab³, Ikhuenbor Dorcas⁴, Duru Nnamdi Boniface⁵, Iduh Unata Michael⁶ Solomon Mary⁷

Maternal New-born and Child Health Programme, (MNCH2-DFID) Nigeria ¹, School of Medical Laboratory Science, Plateau State College of Health Technology, Pankshin, Nigeria ², Management Sciences for Health, Nigeria ³, Department of Hematology, Usmanu Danfodiyo University Teaching Hospital Sokoto, Sokoto-Nigeria ⁴, Chemical Pathology Department, Federal College of Veterinary and Medical Laboratory Science, Vom, Nigeria ⁵, School of Medical Laboratory Science, Usmanu Danfodiyo University, Sokoto, Sokoto-Nigeria ⁶, Biochemistry Department, Faculty of Medical Sciences, University of Jos, Jos-Nigeria ⁷.

Correspondence: comradenanbol@gmail.com/Nanbol.Daniel@mnch2.com/ comrnanbol1@yahoo.com/
+234-803-350-4436

Abstract

Logistics management information system is the engine that drives the logistics vehicle geared towards effective and efficient coordination and analysing of data for decision making at all levels of services, projects and programmes. Majority of Medical Laboratory personnel are very poor in conducting daily documentation of HIV/AIDS laboratory commodities supplied by partners, government, philanthropists and Drug Revolving Fund/Sustainable Drug Supply System (DRF/SDSS) to public facilities. This has further affected services in these facilities, Sokoto State and Nigeria at large. The objective of this study was to assess the status of medical laboratory logistics management information system for HIV/AIDS laboratory commodities in public health facilities in Sokoto State. This cross-sectional descriptive study was conducted from February 2014 to July 2014 at selected public health facilities in Sokoto State. A stratified random sampling method was used to include a total of 28 facilities which, were investigated through quantitative methods using structured questionnaires interviews. Focus group discussion with the designated Supply Chain Managers and key informant interviews were also conducted for the qualitative method. Majority of the facilities 21(75.0%) have HIV LMIS tools (CRRIRF, ICC and store ledger) chosen for this study. Only 8(38.09%) out of the 21 facilities completed all the

three chosen tools for the past six months (June to December 2013), 6(28.57%) out of the 21 facilities completed only one tool (CRRIRF) out of the three chosen tools for the past six months and 7(33.33%) out of the 21 facilities completed the three chosen tools irregularly for the past six months. Most of the medical laboratory personnel were not trained in LMIS at the time of visits. Majority of the facilities 23(82.14%) had stock out issues for at least one HIV laboratory commodities and the highest stock out rate was for hematology reagents. Expired HIV laboratory commodities were found in 11(39.28%) of the facilities. Despite the availability of HIV LMIS tools, the practice of LMIS was poor among medical laboratory personnel. Finding in this study has provided the need to train medical laboratory personnel managing HIV laboratory commodities in order to enhance quality data reporting that will be used for decision making. Training and retraining should be conducted regularly for medical laboratory personnel to enable them handle LMIS tools properly to avoid stock out and outdate of reagents.

Keywords: Medical Laboratory, Logistics Management Information System, HIV/AIDS Commodities, Sokoto State, Nigeria.



Introduction

Logistics is a branch of management that studies the process of planning, implementing and controlling the efficient, cost effective flow and storage of goods, services from point of origin to point of consumption (Edward, 2002). Laboratory logistics management information system is the management of laboratory commodities in a systematic and standardized way by collecting, processing and utilizing timely logistics data to inform quantification, procurement, storage and distribution of laboratory commodities (USAID/DELIVER Project, 2009).

Logistics Management Information System (LMIS) is important for all public health commodity distribution systems. It is especially critical for *Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome* (HIV/AIDS) commodities that have high value and requires special handling procedures (JSI/DELIVER, 2004). Without LMIS implementation, programmes will inevitably waste valuable resources through prolonged and frequent stock outs, overstocks and losses (Owens and Warner, 2003). A well implemented LMIS reduces the likelihood of stock outs and overstocks that can waste scarce resources and lead to product expiration, especially given the short shelf life of HIV test kits (JSI/DELIVER, 2005).

Managing supply chains in support of laboratory services is a formidable challenge, especially in developing countries (USAID/DELIVER Project, 2009). Expanding programme for HIV/AIDS require strong and supportive laboratory services that depend on the availability of the required commodities to perform critical tests, with most tests requiring multiple commodities to be available simultaneously (USAID/DELIVER Project, 2008).

Sokoto State laboratory LMIS was weak, consistently being hampered by several systemic challenges that caused frequent stock outs of critical commodities, thus impeding continuous and quality testing for patients (Nigatu *et al.*, 2009).

Several studies have been conducted to see the status of logistics management information system and supply chain systems for HIV/AIDS laboratory commodities especially for HIV test kits elsewhere, however, there is limited information in Sokoto State. Therefore, this study is designed to assess the status of laboratory logistics management information system for HIV/AIDS laboratory commodities at selected public health facilities in Sokoto State and to identify the strengths and weaknesses of the LMIS in order to improve the design and operation of the logistics data collection, analysis and utilization of data for decision of key logistics functions.

Methods

Study area

The study was conducted in Sokoto State North West Nigeria. The study area was chosen because it is one of the areas where Management Sciences for Health (MSH) is providing support for HIV/AIDS intervention coupled with the fact that facilities in Sokoto are easily accessible.

Study design and period

This cross-sectional descriptive study was conducted from February 2014 to July 2014 at selected public health facilities in Sokoto State. A stratified random sampling method was used to include a total of 28 facilities which, were investigated through quantitative methods using structured questionnaires interviews. Focus group discussion with the designated Supply Chain Managers and key informant interviews were also conducted for the qualitative method.

Sample Size Estimation

Sample size was calculated using the minimum sample size calculation formula for cross-sectional study for estimating single proportion assuming 50% prevalence of poorly functioning laboratory LMIS, 5% margin of error and 95% CI due to lack of similar prevalence study in Sokoto. Finally, the

correction factor for finite population was applied to include a total of 28 facilities.

Sampling Methodology

To ensure that a state-wide representative sample was chosen for the laboratory LMIS study, a total of 30% facilities, including primary healthcare facilities, secondary and tertiary hospitals were randomly selected across all LGAs within the state. Data were collected from 30% of LGA, 1 tertiary hospital, 30% of General Hospitals and 30% of primary health centres/clinics.

Data collection techniques

A structured questionnaire which was originally developed by DELIVER (USAID/DELIVER Project, 2008) and locally adapted was used to collect quantitative information from the health facilities. On top of the information collected through interview using the structured questionnaire, physical counts of HIV/AIDS laboratory commodities were done in order to assess data quality by comparing the actual counts with the available records. The laboratory commodities covered in the assessment were ART monitoring chemistry, haematology, CD4 reagents and RTKs (STKs).

The instrument was used to provide information on the indicators like the availability of laboratory commodities for HIV/AIDS service on day of visit, stock out frequency and average duration of stock outs, percentage of facilities with personnel trained in logistics, percentage of facilities that had expired commodities, percentage of facilities with CRRF, ICC and ledger tools available and accuracy of stock keeping records.

Qualitative Method: The quantitative method has provided what information was available regarding the design and operation of the logistics management information system but does not provide how the logistics system functions (DELIVER, 2002). The Focus group guide originally developed by DELIVER (JSI/DELIVER, 2006) was locally adapted to be used for this study. Two Focus Group Discussions (FGD) with participants responsible for

logistics activities in all the facilities was conducted. The topics that were discussed aimed at identifying strengths and weaknesses in the system were flow of HIV/AIDS laboratory commodities in the supply chain, existence and functioning of laboratory LMIS, description of the information flow and how logistics information is used for decision making and capacity of logistics personnel, including training and supervision.

Statistical analysis

The quantitative data were entered using Magpi and analyzed using SPSS version 15 software (SPSS Inc, Chicago, IL, USA). Descriptive statistics were computed and result was presented using tables and graphs. The qualitative portions of the study (FGD) were analysed using qualitative analysis technique (relistening to the tape recorders several times, transcribing data, categorizing, reducing and finally writing the report by narrating the finding).

Results

Majority of the facilities 21(75.0%) have HIV LMIS tools (CRRIF, ICC and store ledger) chosen for this study. Table 1 and figure 1 shows the facilities with selected LMIS tools (CRRF, ICC and Store ledger). Only 8(38.09%) out of the 21 facilities completed all the three chosen tools for the past six months (June to December 2013), 6(28.57%) out of the 21 facilities completed only one tool (CRRIF) out of the three chosen tools for the past six months and 7(33.33%) out of the 21 facilities completed the three chosen tools irregularly for the past six months. Table 2 and figure 2 shows the facilities that completed selected LMIS tools (CRRF, ICC and Store ledger) in facilities. Most of the Medical Laboratory Personnel were not trained in LMIS at the time of visits. Table 3 and figure 3 shows the training status of Medical Laboratory Personnel in LMIS. Majority of the facilities 23(82.14%) had stock out issues for at least one HIV laboratory commodities and the highest stock out rate was for heamatology reagents. Table 4 and figure 4 shows the stock availability by commodity type. Expired HIV laboratory commodities were found in 11(39.28%) of the facilities. Table 5 and figure 5



show the Status of HIV/AIDS Reagents in the various facilities.

Table 1: Facilities with selected LMIS tools (CRRF, ICC and Store ledger)

N=28

Tool type	N (%)
No. of Facilities with 3 selected tools	21(75.0%)
No. of Facilities with 2 selected tools	4(14.3%)
No. of Facilities with 1 selected tool	3(10.7%)

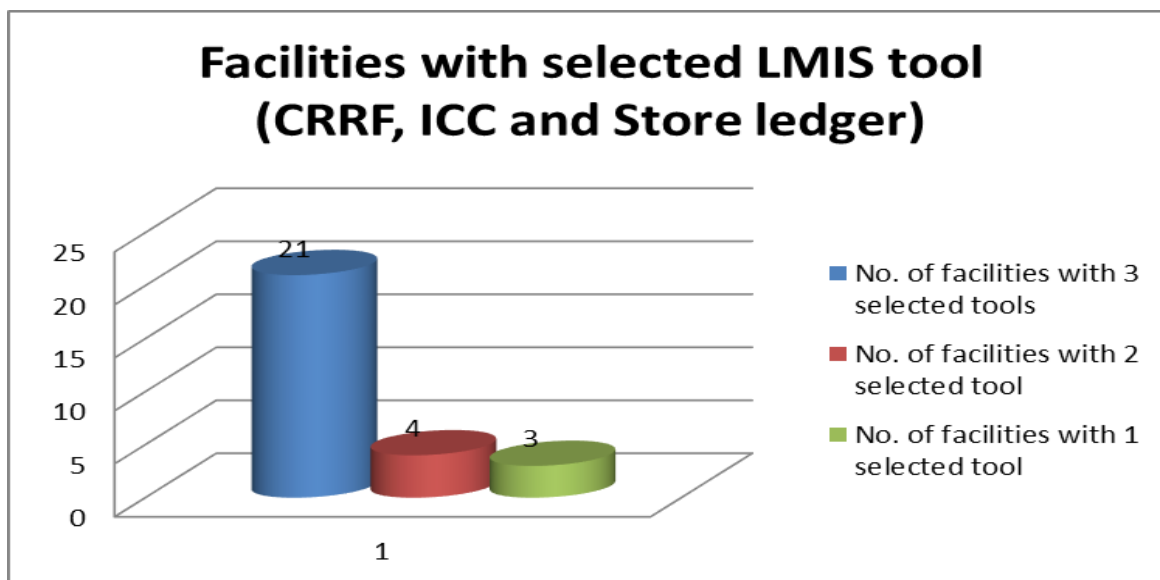


Figure 1: Facilities with selected LMIS tool (CRRF, ICC and Store Ledger)

Table 2: Completed selected LMIS tools (CRRF, ICC and Store ledger) in facilities

N=21

No. (%) of Facilities that completed all the selected tools for the past 6 months	8(38.1%)
No. (%) of Facilities that completed only CRRF for the past 6 months	18(52.4%)
No. (%) of Facilities that completed only ICC for the past 6 months	5(23.8%)
No. (%) of Facilities that completed the three tools irregularly for the past 6 months	9(42.8%)

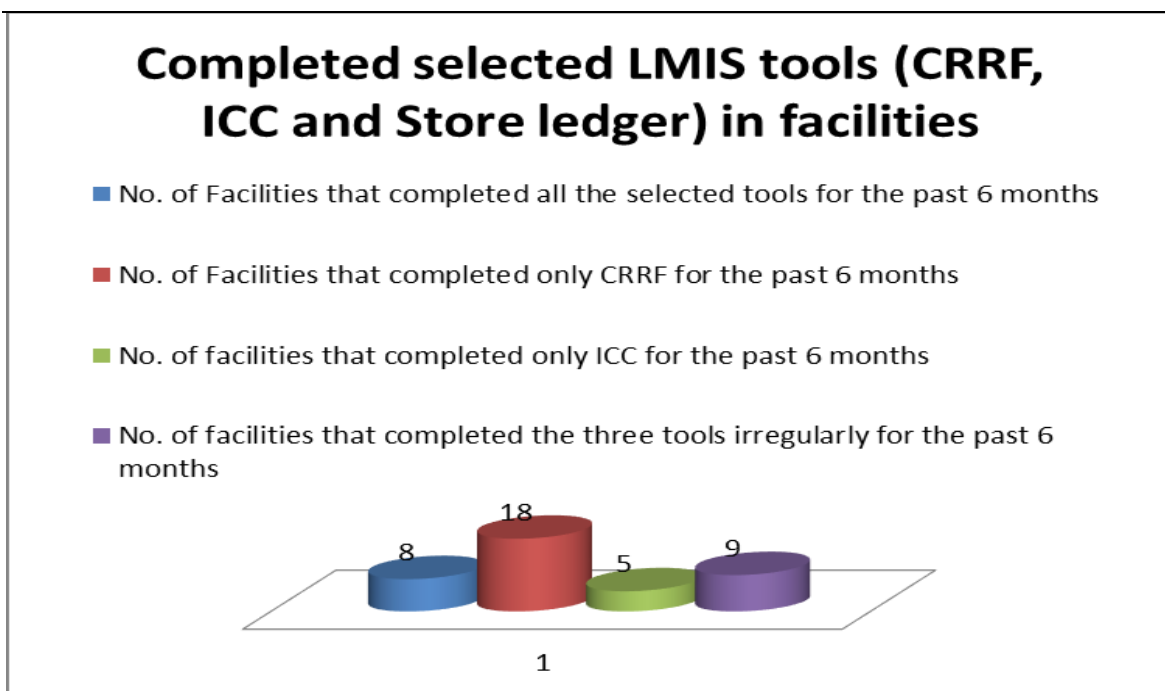


Figure 2: Completed selected LMIS tools (CRRF, ICC and Store Ledger) in Facilities



Table 3: Training of Medical Laboratory Personnel in LMIS

N=58

Training in LMIS	N (%)
No. of personnel trained in LMIS	18(31%)
No. of personnel not trained in LMIS	40(69%)

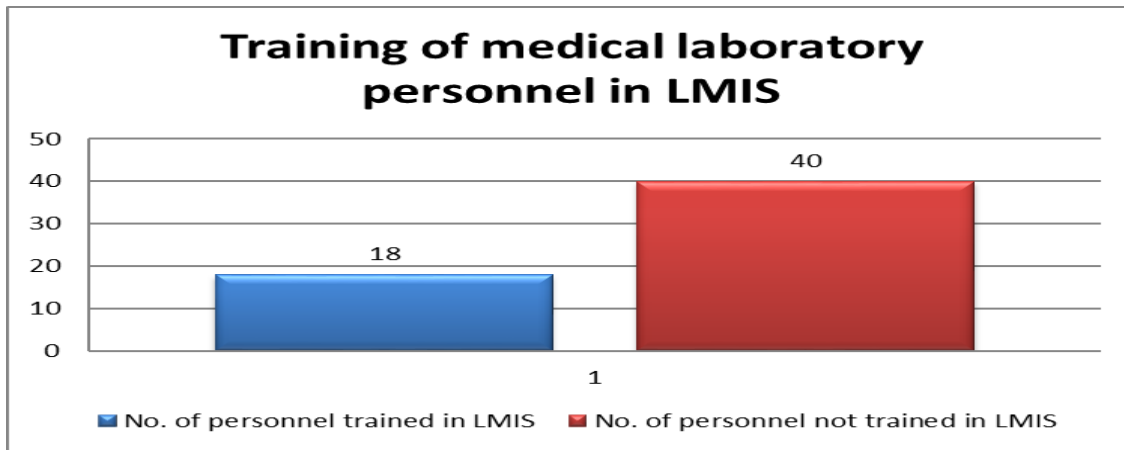


Table 4: Stock Availability by Commodity Type

N=28

Reagent	N (%)
Chemistry	12(42.9%)
Heamatology	18(64.3%)
CD4	7(25%)
RTKs	4(14.3%)

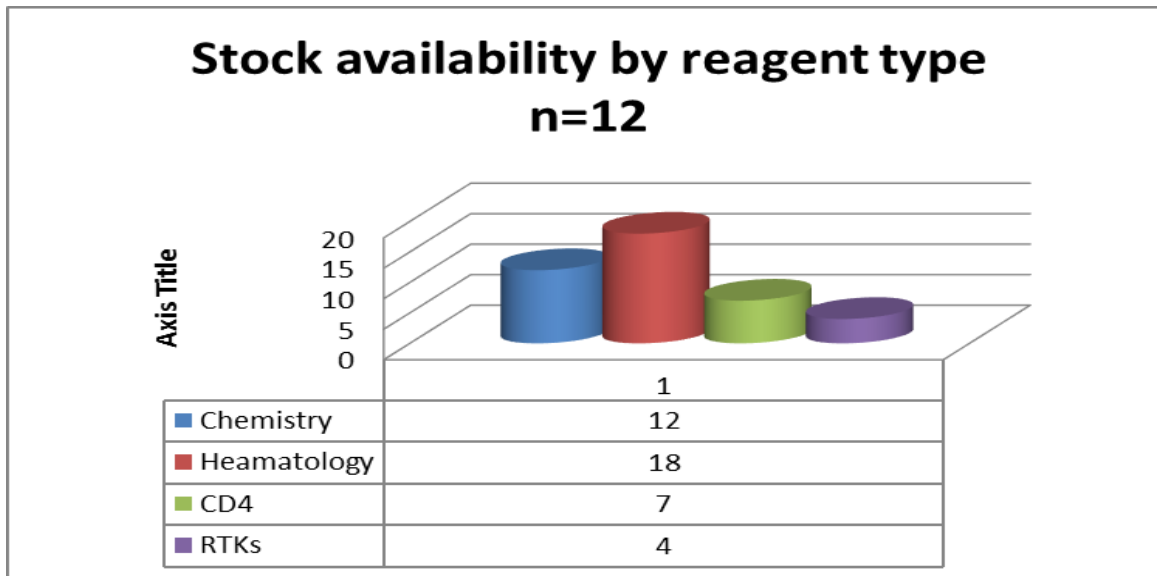


Figure 4: Stock Availability by Commodity Type



Table 5: Status of HIV/AIDS Reagents

N=28

Description of Facility	N (%)
Facilities with expired reagents	11(39%)
Facilities without expired reagents	17(61%)

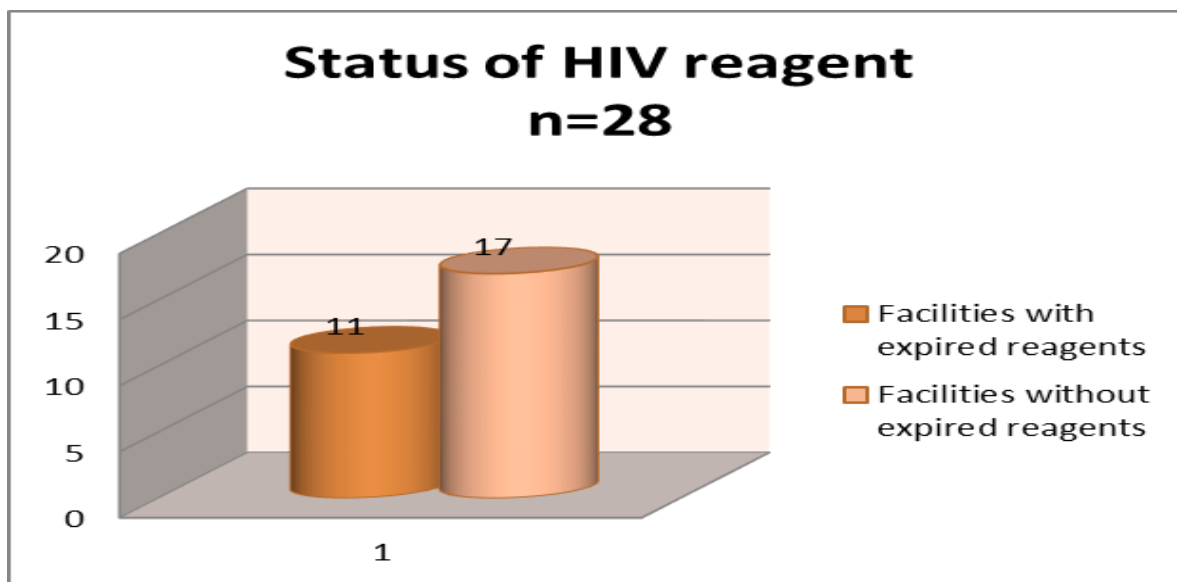


Figure 5: Status of HIV/AIDS Reagents

Discussion

The ultimate goal of the laboratory logistics system is to ensure laboratory commodity availability at the service delivery points so that clients will receive the necessary laboratory tests. Individuals responsible for managing laboratory commodities need to be

trained in timely keeping of records on essential logistics data, analyzing the collected information to make the right decisions and submission of reports to the next higher level.

In this study, it was found that 67 (58.8%) of pharmacy professionals and only 4 (3.5%) laboratory

professionals were trained in LMIS. Our finding is in agreement with a study done by Jabulani and Colleagues in Zimbabwe (Jabulani *et al.*, 2005) where few number of laboratory professionals were trained in LMIS.

The results of the present study showed that, majority of facilities were found under stocked for vacutainer tubes, CD4 and bilirubin reagents. Our finding is at variance with a previous report in Ghana (Akwei *et al.*, 2006) which revealed that facilities were adequately stocked for CD4 and chemistry reagents. The difference might be due to the fact that the assessment was done in Ghana at the start of ART programme where consumption of these reagents was lower. Our study also showed that, majority of facilities had adequate stock levels for creatinine, glucose, Cell Dyne diluent, Cell Dyne lyse and Cell Dyne detergent reagents. This finding is in agreement with a previous report in Ghana (Akwei *et al.*, 2006).

In the present study, it was found that majority of facilities 26 (60.5%) were stocked out at least one HIV/AIDS and TB laboratory commodities in the past six months. Our finding is in agreement with a previous in Tanzania (JSI/DELIVER, 2003).

Our result showed that, most frequent reagents associated with stock out were chemistry reagents (bilirubin and BUN), CD4 reagents in hospitals and vacutainer tubes in health centres. Our finding is consistent with a previous report in Rwanda (Lijdsman *et al.*, 2003). Moreover, our study showed that from eight facilities that manage haematology reagents, 3 (37.5%) of facilities had stock out for Cell Dyne reagents in the past 6 months. Our finding is in contrast to a previous report (Pharasi, 2007) in Lesotho. The difference might be due to the absence of functional procurement unit for ART monitoring laboratory commodities in Lesotho at that time and our assessment includes only Cell Dyne haematology reagents.

This study showed that, majority of stock/bin cards were not updated with accurate information matching with the physical count done at the time of visit. The overall accuracy (matching with physical

count) of stock/bin cards in all facilities was 38.9%. Similar study in Zimbabwe (Jabulani *et al.*, 2005) which indicated that out of 50 (80%) of facilities using stock/bin cards 40 (60%) were updated with accurate information which were much more better than our finding. This may be due to the presence of programmed supervision and trained staffs that improved stock/bin card accuracy in Zimbabwe. Absence of supportive, programme supervision and workload as confirmed in FGD were the reasons for low accuracy of stock/bin cards in our case.

Limitation of the study

Lack of similar studies especially in Ethiopia made it difficult for comparing results. The sample size was not large enough for some specific indicators

Conclusion

Majority of laboratory mini-store managers and laboratory managers didn't get LMIS training. A significant number of facilities experienced stock out for key ART monitoring and TB laboratory commodities on the day of the assessment and during six months before the assessment. Utilization of the logistics recording and stock/bin cards usage were limited to the higher-level facilities (Regional health bureaus and hospitals).

References

- Akwei, N., Adukpo, R., Bekoe, V., *et al.* (2006). Assessment of the Ghana Laboratory Logistics System and Services. USA. Arlington, Va.: DELIVER, for USAID.
- Central Statistical Agency-Ethiopia. Addis Ababa, Ethiopia (2008). Dec, Summary and statistical report of the 2007 Population and Housing Census.
- DELIVER (2002). USA. Arlington, Va.: John Snow, Inc. /DELIVER for the USAID; Logistics indicators and monitoring and evaluation tools.



- Edward, F. (2002). *Supply Chain Strategy: The Logistics of Supply Chain Management*. New York: McGraw-Hill.
- FMOH/PFSA (2010). Addis Ababa, Ethiopia. Mar, Standard operating procedure manual for the management of the national integrated pharmaceutical logistics system.
- Jabulani, N., Alt, D., Karim, A., et al. (2005). *Zimbabwe HIV and AIDS Logistics System Assessment*. USA. Arlington, Va.: JSI/DELIVER, for the USAID.
- JSI/DELIVER (2003). USA. Arlington, Va.: John Snow, Inc. /DELIVER, for the USAID. Tanzania: Commodity Availability for Selected Health Products Baseline Survey for Integrated Logistics System.
- JSI/DELIVER (2006). USA. Arlington, Va.: John Snow, Inc. /DELIVER for the USAID. Logistics Systems Assessment Tool (LSAT).
- JSI/DELIVER (2008). USA. Arlington, Va.: John Snow, Inc. /DELIVER for the USAID. Logistics Indicators Assessment Tool (LIAT)
- JSI/DELIVER. USA (2004). Arlington, Va.: JSI/DELIVER for the USAID. The Importance of Logistics in HIV/AIDS Programs: No product? No program (overview) Available from: www.deliver.jsi.com. Accessed on 15th April 2010.
- JSI/DELIVER. USA (2005). Arlington, Va.: John Snow, Inc. /DELIVER, for the USAID. HIV Test Kit Fact Sheets.
- Lijdsman, C., Onyango, C., Gatera, A., et al (2003). *Assessment of the Health Commodity Supply Sector in Rwanda*. USA. Arlington, Va.: Rational Pharmaceutical Management Plus Program, for USAID.
- MOH, Federal Democratic Republic of Ethiopia (2001). Addis Ababa Ethiopia: Policy plan and finance general directorate FMOH. Health and Health Related Indicators.
- Nigatu, A., Abdallah, H., Aboagye-Nyame, F., Messele, T., Kidane-Mariam, T., Ayana, A. (2009). *Impact of the Ethiopian National Laboratory Logistics System on the Harmonization of Laboratory Commodities*. Addis Ababa, Ethiopia. 7
- Owens, R.C., Warner, T. (2003). USA. Arlington, Va.: John Snow, Inc. /DELIVER, for the USAID. *Concepts of Logistics System Design*.
- Pharasi, B. (2007). *Assessment of the HIV/AIDS Medical Supplies and Laboratory Commodities Supply Chain in Lesotho*. USA. Arlington, Va.: USAID/RPM Plus, for management science for health.
- USAID/ DELIVER PROJECT, Task Order 1. (2008). USA. Arlington, Va.: John Snow, Inc. /DELIVER, for the USAID. *The Supply Chain Implications for Standardizing Laboratory Supplies: Lessons Learned and Practical Approaches*.
- USAID/DELIVER PROJECT Task Order 1 (2009). USA. Arlington, Va.: USAID/DELIVER PROJECT, Task Order 1; 2009. *Laboratory Logistics Handbook: A Guide to Designing and Managing Laboratory Logistics Systems*.