USAID GLOBAL HEALTH SUPPLY CHAIN PROGRAM

PROCUREMENT AND SUPPLY MANAGEMENT

GS1 STANDARDS IMPLEMENTATION

Guidance for USAID In-Country LMIS Projects

February 9, 2017

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ACRONYMS

ARTMIS	Automated Requisition Tracking Management Information System
ASN	advance ship notice
BI&A	Business Intelligence and Analytics
CMS	Central Medical Store
CTE	critical tracking event
eLMIS	electronic logistics management information system
EPCIS	Electronic Product Code Information Service
FMHACA	Food, Medicine and Health Care Administration and Control Authority of Ethiopia
GDSN	Global Data Synchronization Network
GHSC-PSM	Global Health Supply Chain-Procurement and Supply Management
GLN	Global Location Number
GTIN	Global Trade Item Number
HCCC	Health Commodity Classification Code
HCMIS	health commodity management information system
KDE	key data element
LMIS	logistics management information system
PFSA	Pharmaceuticals Fund and Supply Agency
MSD	Medical Stores Department
R&R	requests and requisition
SCM	supply chain management
SSCC	serial shipping container code
TZ	Tanzania
TZ E2E	Tanzania End-to-End
UOM	unit of measure

INTRODUCTION

The GS1 Standards Implementation Project developed strategic recommendations for implementing and supporting GS1 Standards across USAID's global health supply chain.The primary objectives included ensuring that the Automated Requisition Tracking Management Information System (ARTMIS) is designed properly to capture product information according to GS1 Standards, developing a strategy for implementing GS1 Standards with the USAID supplier base, and informing country-level logistics management information system (LMIS) tools on USAID/GHSC-PSM GS1 implementation to help ensure data can continue down the chain to truly create end-to-end visibility.

Five reports were produced for this project:

- Report 1, *Technical Review of the Ability of ARTMIS to Support GS1 Standards*
- Report 2, *Assessment of the USAID Supplier Base and the Ability of ARTMIS to Support GSI-compliant and Noncompliant Suppliers*
- Report 3, *Implementation Strategies for Engaging Suppliers and Capturing GS1 Data in ARTMIS*
- Report 4, *Guidance for USAID's In-country LMIS Projects*
- Report 5, *Summary of Key Findings and Additional Recommendations*

This document is Report 4, *Guidance for USAID's In-country LMIS Projects*. Based on a functional and technical review of LMIS systems in Ethiopia and Tanzania, this report provides:

- Guidance for USAID's country LMIS projects to follow to ensure country LMIS tools can exchange data with ARTMIS and other country and global supply systems
- Guidance for how LMIS tools can leverage best practices, common derivations, and lessons learned associated with exchanging Global Trade Item Numbers (GTINs), Global Location Numbers (GLNs), product hierarchies, attributes, application identifiers, and serialization/traceability information.

BACKGROUND

Deliverable 4 seeks to assess how to leverage GS1 Standards in LMIS systems. For this statement of work, we were asked to examine the questions in the context of two different in-country LMIS systems, the Ethiopia health-care management information system (HCMIS) and the Tanzania LMIS.

The focus of each effort was slightly different. In Ethiopia, the focus was on use of GS1 standards in pilots and in HCMIS functions. In Tanzania, the focus was on implementation of GS1 Standards as backbone foundational elements, plus use of standards around core LMIS functions related to inventory.

Although the focus of each half was different, all of the guidance provided here applies to both efforts and to the country LMIS systems in general. For example, Ethiopia's focus was on use; however, Ethiopia still needs to implement the foundational elements discussed for Tanzania. Likewise, Tanzania's focus was on foundational elements related to data issues, but the Tanzania team should still leverage the techniques presented to Ethiopia.

In other words, bringing all recommendations and guidance together provides the roadmap for recipient countries and LMIS systems in general to start leveraging GS1 Standards.

GLOSSARY OF KEY TERMS

Terminology currently used by GHSC-PSM, USAID, and other members of the global health community today does not align GS1 Standards concepts and terminology, or customary supply chain management (SCM) terminology. To properly apply the standards and clearly communicate them, it is essential that GHSC-PSM begin to align terminology with that used across the GS1 user community.

To that end, this document uses GS1 Standards and SCM terminology.The table below lists some of the key terms used with basic definitions and the GHSC-PSM terminology counterpart.

Term used in this deliverable	Definition	GHSC-PSM term
Commodity (type)	Generic type of product (e.g., aspirin 325 mg).	Product
Trade Items	Anything that may be priced, ordered, or invoiced anywhere in the supply chain. Can be an item, case, pallet, etc. — whatever packaging configurations that a manufacturer offers for sale. Often informally referred to in industry as "products."	Item
Product Master	Authoritative database of product information. Data source for any/all other systems across the enterprise that need product information.	Datamart, product catalog, data store, etc.
Transactions	Electronic data interchange or paper-based business documents/messages exchanged between trading partners, e.g., purchase order; invoice, advance ship notice (ASN), packing slip.	Transactions
Business process	An activity or set of activities to accomplish an organizational and/or operational goal, e.g., shipping, receiving.	Transactions
Business step	Individual steps/physical activities performed as part of a business process.	Transactions

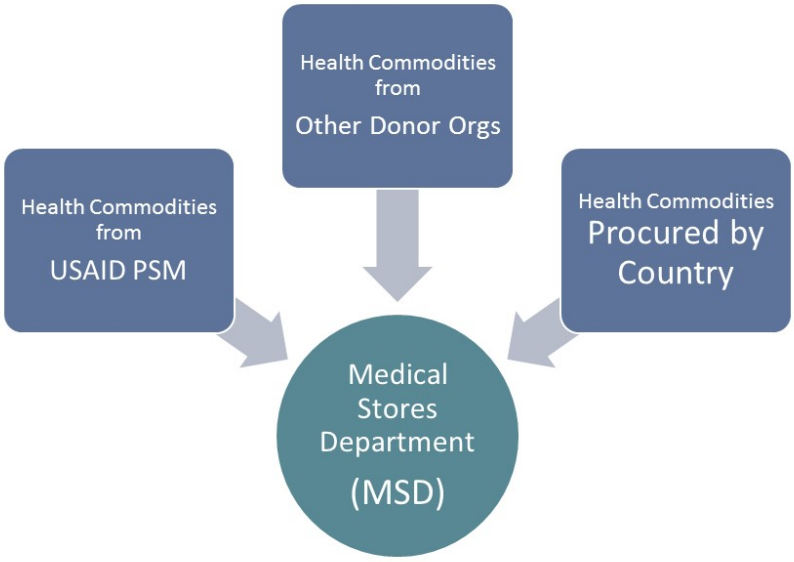
TANZANIA

SNAPSHOT OF INTERNAL SUPPLY CHAIN AND SYSTEMS

In-country, the Tanzania supply chain consists of movement of product through:

- Medical Stores Department (MSD) — moves product mainly at the case level
- Zonal warehouses — moves product mainly at the case level
- Facilities — receives mainly at the case level and breaks down to items

All commodities (whether procured by GHSC-PSM/USAID, another donor organization, or the government of Tanzania) are delivered to MSD.



Tanzania has two key health commodity supply chain systems: EPICOR 9 and Tanzania (TZ) electronic logistics management information system (eLMIS).

System	Users	Functional description
EPICOR 9	MSD and zonal warehouses	Primarily a financial enterprise resource planning system with significant customizations to track the MSD and zonal warehouse inventories. EPICOR 9 contains the inbound country shipments once they've been received into inventory, the stock on hand, and the distribution orders down to the zonal warehouses.
TZ eLMIS	Facilities	Provides inventory management reporting for the stock at the facility level only, for all products. In most hospitals and a few urban centers and dispensaries, staff will enter data directly into the eLMIS. For the rest of the facilities, eLMIS is updated quarterly by district pharmacists who manually enter the data they receive from each facility's requisition order (paper form).

BACKGROUND

Fortuitous timing of the USAID Business Intellligence and Analytics (BI&A) Tanzania End-to-End (TZ E2E) Data Visibility Project and the VillageReach project to update the in-country LMIS system (funded by the Gates Foundation) has provided the opportunity for GS1 Standards to be leveraged in country LMIS systems. The goal is to promote interoperability with the GHSC-PSM ARTMIS system as well as collaborative efforts across the larger global health supply chain community.

The USAID BI&A TZ E2E Data Visibility Project is building on BI&A and connecting information on the supply chain of commodities inbound to Tanzania using information from Tanzanian national supply chain systems. The goal is to provide a complete picture of the availability of commodities in the Tanzanian supply chain, combined with an overarching understanding of the commitments and budgets of the Tanzanian MSD and TZ development partners.[1] The project was given access to facility-level inventory data, providing a rare opportunity to gain real-time visibility into Tanzania's health commodity inventories down to the facility level. However, the facility-level data from Tanzania required significant data harmonization efforts that highlighted the need to seek solutions to the underlying issues.

With the VillageReach work on the Tanzanian LMIS underway, USAID brought together subject matter experts from BI&A (Intellicog), GHSC-PSM, VillageReach, Tanzania, Zambia, and RC Partners (on GS1 Standards) to examine the issues and identify areas where GS1 Standards could be leveraged in the update to Tanzania's LMIS to help address the data issues.

This collaborative effort and information exchange also has the potential to help improve supply chain operations and data quality across the larger global heath supply chain, as VillageReach can also leverage the standards insights in their work with other country LMIS systems.

TZ E2E: THE OPPORTUNITY

The global health supply chain consists of numerous donor organizations, numerous recipient countries, and numerous health initiatives providing numerous health commodities. Recipient countries go through "demand planning" once a year and then meet with aid agencies to quantify demand and create a "supply plan" (i.e., a monthly quantity of commodities to be supplied through the country's own procurement plus donor community contributions). This plan is done at the commodity level (e.g., aspirin 325 mg), not at the product level (e.g., not Bayer aspirin 325 mg; Excedrin aspirin 325 mg).

Recipient countries and the donor community meet quarterly to review, align, and adjust/revise the supply plan as needed. The primary need is to examine the supply plan against what actually occurred in country during the specific term. For most countries, this reconciliation effort can only occur quarterly because of paper processes and a lack of technology and visibility, especially at the facility level.

The opportunity to have access to facility-level data in Tanzania presented a significant opportunity: real time access to inventory down to the facility level without any reporting or re-

[1] *Tanzania End-to-End (TZ E2E) Data Visibility Project – Requirements Document* (Version 1.0), September 26, 2016. Prepared by Intellicog.

entry of data at the MSD. Such access would obviate the need to wait until quarterly meetings, providing more flexibility and agility in meeting needs.

However, in reaching through to pull the Tanzania data into the analytical system being developed by TZ E2E for dashboards and reporting, data issues abound and were of such a scale that they underscored the challenge facing the global health community when trying to access the information needed to optimize their efforts.

PROBLEM STATEMENT

Looking to the Tanzania example, the effort to harmonize data to effectively use it is complicated by many factors:

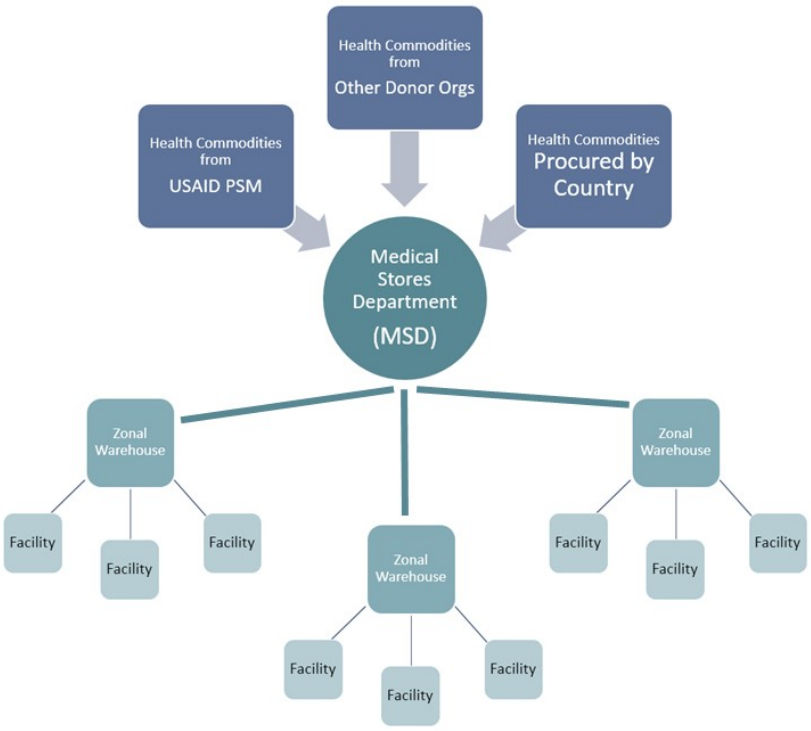
- Numerous data elements, e.g., commodity type, unit of measure, quantities
- Numerous locations/parties, e.g., regions, provinces, warehouses, regional distribution centers, local facilities, hospitals, pharmacies
- Numerous supply chains, e.g., pharmaceuticals, medical devices, testing kits, lab equipment
- Few if any data standards, e.g., naming conventions, abbreviations, field formats, definitions
- Various data capture mechanisms, e.g., barcodes, manual data entry of an identifier, manual data entry of a product name, manual data entry of a commodity description

All of these factors produced data that required significant data harmonization efforts before it could be meaningful — and of course introduced the risk of error. Despite Intellicog's (USAID BI&A) significant data warehouse capabilities and tools for data harmonization, the reality is that these challenges and the effort it takes to manage them threaten the feasibility of achieving the supply chain visibility USAID and Tanzania were seeking.

THE SCALE OF THE PROBLEM

As described above, the global health supply chain is extremely complex: numerous donor organizations, numerous recipient countries, and numerous health initiatives providing numerous health commodities. Moreover, recipient countries manage complex distribution channels to distribute health commodities throughout their country.

Donor organization procurement functions like USAID GHSC-PSM (and thus the data that can be provided by their supporting systems like ARTMIS) effectively "end" at a country's Central Medical Store (CMS) or MSD. From that point forward, the recipient country (and its systems, such as Tanzania's EPICOR 9 and LMIS) manage the distribution of the commodity — and any/all data collection related to that effort. Although a donor organization's data ends at the CMS/MSD, the work of the donor organization, the country, and the global system continues, as the quarterly supply plan reconciliation efforts demonstrate.



Although the TZ E2E Project highlighted the significant data issues challenging supply chain visibility between USAID and Tanzania, it became clear that the data issues are not unique to Tanzania or USAID. In fact, the same challenges and roadblocks would likely confront any member(s) of the global health community seeking supply chain visibility through to the facility level — suggesting the need for global health platform to address these issues.

WHERE DO WE START

The GS1 System is a comprehensive suite of supply chain information standards that address data issues like those experienced in the TZ E2E Project, and can provide a platform for aligning and harmonizing global health supply chain data. If everyone across the global health supply chain used GS1 Standards, data integration and harmonization for visibility efforts like TZ E2E would be easy. However, as it stands right now, some GHSC members use the standards, and some do not. Some members use the standards for some things but not others. And some in-country limitations inhibit the use of certain standards, e.g., electricity, internet.

So, where do we start? We start with Tanzania. USAID brought together subject matter experts from BI&A (Intellicog), GHSC-PSM, VillageReach, Tanzania, Zambia, and RC Partners (on GS1 Standards) to examine the issues and identify areas where GS1 Standards could be leveraged in the update to Tanzania's LMIS to help address the data issues. The focus was to leverage as much as possible right now to begin the process of addressing the data issues.

HOW DO WE DO IT

The analysis examined a variety of data types and a variety of data capture mechanisms, as listed in the table below

Types of data	Types of data capture
• Product attributes, e.g., brand name; manufacturer, quantity • Party/location data, e.g., name, address, role • Secondary item-specific data, e.g., batch/lot, expiration date, serial number • Transaction data, e.g., purchase order, invoice, ASN, packing slip • Event data, e.g., MSD and zonal warehouse shipping and receiving	• Supplier provides electronically • Supplier provides on paper — manually entered • Barcode — scanned • Barcode — manually entered • Product label — manually entered

Approaches for leveraging GS1 Standards in the Tanzania LMIS were discussed at length. Core concepts and recommendations are detailed in the remainder of this section.

Product Data

The Product Master should contain the core data about every product that the country purchases itself and/or receives through donor organizations. (Although it is likely this will be established and maintained in EPICOR 9, it will be used to feed the LMIS.) Maintaining data quality throughout Tanzania's systems was a primary concern raised during discussions. Key strategies recommended covered how to set up the Product Master, and how to maintain data quality throughout Tanzania's systems. Key recommendations include the following:

- During the transition to GS1 Standards, various product identifiers will be used. Create a field for GTIN and format per the standards (i.e., fixed 14 digits, alpha-numeric, right justified, zero-filled). If a GTIN is not available for a product, then use a combination of the supplier product number and an internally generated product key to avoid collision. (Do not use a supplier product number alone as a product identifier.)
- Use the same data set for every product regardless of what identifier is used. This data set should include:
    - Basic product information (based on standardized GTIN attributes).
    - Any internal attributes the country needs to support its business processes, e.g., lead times.
    - An attribute to designate the commodity category associated with the product. (Currently, no standardized commodity classification system is in place for the global health supply chain. Therefore, this value can be populated by Tanzania using the names used in its ordering systems to reference approved commodity types.)

      NOTE: *In an effort to coordinate and align, BI&A will provide VillageReach with the list of attributes developed for USAID GHSC-PSM.*
- Leverage GS1 Global Data Dictionary/Global Data Synchronization Network (GDSN) metadata standards for product/GTIN attributes (regardless of what identifier is used).
- Have suppliers define GTIN attributes for each product and share them with Tanzania.

- Establish the data-sharing mechanisms by which suppliers can provide attributes, e.g., spreadsheet, portal. Whatever mechanisms are offered should use the same GDSN metadata standards.

Party/Location Data

Discussion revealed universal concern about party and location identification, and the desire to move to GLN to standardize. Implementing GLNs in Tanzania would be a longer-range effort, and various implementation approaches were identified, e.g.,Tanzania assigning/managing on its own, versus either USAID or a consortium of aid organizations assigning and managing. In the interim, strategies for how to leverage GLN and GS1 location/party data standards were discussed. Key recommendations include the following:

- Create a field for GLN and format per the standards (i.e., fixed 13 digits, alpha-numeric).
- Use the same data set for every party/location regardless of what identifier is used. This data set should include:
  - Basic party/location information (based on standardized GLN attributes)
  - Any internal attributes the country needs to support its business processes, e.g., lead times.

    Note: See GS1 US Data Hub — Location for standardized GLN attributes and metadata standards.
- Leverage GLN attributes and metadata standards for every party/location (regardless of what identifier is used).
- GLN attributes for each supplier parties/locations should be defined by the supplier and shared with Tanzania.
- Establish the data-sharing mechanisms by which suppliers can provide attributes, e.g., spreadsheet, portal. Whatever mechanisms are offered should use the same GLN attributes and metadata standards.

LMIS Inventory

Background: When a user creates/assigns a GTIN or GLN, the last digit (called the "check digit") is automatically calculated based on the value and position of the preceding digits (using the GS1 standard algorithm). GTIN/GLN allocation systems integrate the check digit calculator logic to create the correct check digit for a GLN and GTIN. However, the logic can also be used in reverse: to verify that the check digit is correct based on the rest of the numbers in the identifier. This can be creatively used in a manual data entry environment, i.e., where GTINs/GLNs are being typed into systems, to alert users that they entered an "invalid GTIN/GLN," i.e., they typed it in wrong.

PRODUCT: As GS1 Standards become more widely implemented, facilities using LMIS to capture and manage inventories will be able to use barcodes to capture product information. Nonetheless, those facilities can have varying levels of technical capabilities depending on resources, electricity, and internet. As a result, they may enter the data by scanning the barcode or by manually entering/typing the GTIN and product information, e.g., batch/lot, expiration date, serial number. GS1 Standards can be used to promote data quality in these environments as well. Key recommendations include the following:

- Integrate GS1 "Check Digit" logic into GTIN fields in LMIS. This will alert users typing in GTINs if there is a problem with the GTIN they entered (i.e., "GTIN invalid") so they can check/fix it immediately.
- When a GTIN is scanned or entered for inventorying, LMIS should pull and return the commodity type associated with that GTIN in the Product Master so that the order can be generated correctly at the commodity level.

LOCATION: Using GLNs in LMIS will enable location/party data to be pulled from a database instead of manually entered everywhere. This is an important feature because it minimizes data entry errors and the creation of multiple versions of the same party/address in systems that need to be reconciled later, e.g., AVE versus Avenue; District A Clinic versus Dist A Clinic. This new approach is to only enter a GLN and then let the system pull the party/address data in from the database. This is the "vision" here — but you can also leverage the standards to creatively help with other challenges faced in the "real world," like manual data entry errors and situations where the database is inaccessible, e.g., due to issues with connectivity, internet, electricity.

When a system is connected to the database, the database will likely alert a user that there is something wrong with the GLN they typed in (e.g., at the very least — "GLN not found"). However, by integrating the check digit calculator into the LMIS, users typing in GLNs can still be alerted in real time that there is a problem with the GLN they entered, i.e., "GLN invalid" even when they are not connected so they can fix it right then and there — enabling the system to pull the correct party/location information from the database when its available (because the GLN will be correct). Key recommendation:

- Integrate GS1 "Check Digit" logic into GLN fields in LMIS. This will alert users typing in GLNs if there is a problem with the GTIN they entered (i.e., "GTIN invalid") so they can check/fix it immediately.

ETHIOPIA

SNAPSHOT OF INTERNAL SUPPLY CHAIN AND SYSTEMS

In-country, Ethiopia's supply chain consists of movement of product through:

- CMS — moves product mainly at the case level
- Hubs — moves product mainly at the case level
- Subhubs — moves product mainly at the case level
- Facilities — receives mainly at the case level and breaks down to items

All commodities (whether procured by GHSC-PSM/USAID, another donor organization, or the government of Ethiopia) are delivered to CMS.

Ethiopia uses a custom software solution known as the health commodity management information system (HCMIS). Two versions of HCMIS are deployed throughout the country:

- HCMIS warehouse: used for warehouse management and inventory control in CMS, hubs, and subhubs
- HCMIS facility: used to manage and account for all health commodities managed by facilities, including production of request and requisition (R&R) inventory report and replenishment request

PROBLEM STATEMENT

The key question being asked is, how can HCMIS leverage GS1 Standards to attain visibility of health-care commodities moving through Ethiopia?

ASSUMPTIONS

The recommendations and approaches provided in this section are based on the following assumptions. These assumptions underscore the need to begin by implementing the foundational GS1 Standards. The approach described below would need to be adjusted for any assumption that are not applicable.

1. A Product Master database stores the GTIN and a set of standardized GTIN attributes for each product received by Ethiopia.
2. The attributes include the hierarchy attributes,* quantity attributes, and any other Product Master data used by HCMIS screens and functions.
3. Pallets are identified and marked (barcodes) with GS1 serial shipping container codes (SSCCs).
4. Homogeneous cases are identified with GTINs and marked with barcodes encoding GTIN, batch/lot, and expiration date.
5. Heterogeneous cases (partial or mixed) are identified and marked with barcodes encoding SSCCs.
6. Suppliers provide Ethiopia with ASNs, including pallet SSCCs with aggregation information about the cases on board (i.e., GTINs, batch/lot, expiration date and quantity; or SSCC).

*GTINs are assigned to "trade items," which is anything that can be priced, ordered, or invoiced in the supply chain. They can include individual units ("eaches"), multipacks, cases, and even pallets, depending on what orderable units a manufacturer chooses to offer. Unique GTINs are assigned to each packaging level, e.g., item GTINs; multipack GTINs; case GTINs, and the relationships between the packaging levels (known as "hierarchy") are communicated in GTIN attributes.

Below is an example of how hierarchy information is communicated in the GTIN attributes for a **case** carrying four packs of 50 eaches:[2]

Attribute ▸ **Pack level ▼**	GTIN	Child	Quantity of next lower-trade item	Net content and unit of measure (UOM)	Quantity of children	Total quantity of next lower-level trade item
EACH	00614141123452	n/a	n/a	1 ONZ	n/a	n/a
PACK	10614141123459	00614141123452	50	n/a	1	50
CASE	20614141123456	10614141123459	4	n/a	1	4

RECOMMENDATIONS

Capture Visibility Information for Shipping and Receiving Events

The HCMIS warehouse could be enhanced to support visibility/traceability across Ethiopia's health commodity supply chain by developing the receiving, issuing, and transferring functions to capture event-based traceability information using GS1 Standards.

Traceability is enabled by collecting/storing visibility information during key business steps known as critical tracking events (CTEs). Generally, events are physical activities related to physical products. Examples of CTEs include packing, unpacking, shipping, and receiving. The visibility information to be collected/recorded for each CTE is known as key data elements (KDEs). Examples of KDEs include location, trading partner, GTIN, and quantity.[3] The GS1 Electronic Product Code Information Service (EPCIS) is the GS1 interface standard for sharing event-based visibility information. However, the general approach to capturing GS1 Standards-based visibility information for supply chain events can still be leveraged without specifically using EPCIS data interfaces.

Information related to two types of CTEs is already being captured in the HCMIS warehouse today — specifically, receiving and shipping events. However, the data being captured for these events would need to be supplemented to include the necessary KDE for case-level traceability.

[2] Foodservice GS1 US GDSN Attribute Guide R1.0 (GDSN v3.1.1).

[3] The terms "critical tracking events" and "key data elements" originate from the food industry in its evolution to implement track and trace. These terms provide a good mental framework for understanding track and trace concepts. We recommend that the global health supply chain use these terms as well.

In addition to those events, the HCMIS warehouse could be supplemented with functions to record unpacking and packing events.

The table below lists data elements that could be added in the HCMIS warehouse functions to create event records in HCMIS with the KDEs needed to support case-level visibility and traceability. These KDEs can be found in GS1 barcodes on cases, human-readable text on case labels, and in transactions, e.g., purchase orders, invoices, advance ship notices. The table below presents the recommended KDE and the various places where that information can be found (or pulled by the system) for data entry.

KDE	Values	Data sources
Business step	Receiving; unpacking; packing; shipping; etc. **	
Date/time of data capture	YYYYMMDD:MM:HH:SS	
Event location	GLN (recommended) or Internal ID no. (permissible) *	transaction documents
Trading partner	GLN (recommended) or Internal ID no. (permissible) *	transaction documents
Transaction/activity type	Purchase order, transfer order, R&R, ASN, etc.	transaction documents
Transaction/activity number	Purchase order no., transfer order no, R&R no., ASN no., etc.	transaction documents
Identifier	SSCC or GTIN	GS1 barcode*** or label text
UOM	Pallet, case, pack, each, etc.	
Lot/batch	Lot/batch number	GS1 barcode*** or label text
Expiration date	YYMMDD	GS1 barcode*** or label text
Quantity	Positive number	Physical count or transaction documents
*It is recommended that GLNs be adopted to improve data quality and accuracy. However, GLNs are not yet implemented by Ethiopia to identify locations and parties. Therefore, an internal ID number (i.e., a proprietary identification number assigned by Ethiopia to identify CMS, hub, sub-hub, facility locations, suppliers) can be used for this because the data is being used only for internal traceability.		
**Business steps are actions on physical product (like shipping, receiving, etc.), not systems activities (like generating a purchase order). This should be a pre-populated list users select from, or pre-populated by the system depending on system design. Avoid manual data entry.		
***Best practice is to scan the case GS1 barcode to capture the GTIN, lot/batch, serial number, and product date.		

- GTIN and GS1 barcode standards are integral to this effort. If suppliers use their own proprietary numbers and barcodes, barcode scanners at Pharmaceuticals Fund and Supply Agency (PFSA) locations will not be able to read them. For the barcodes to be interoperable, they must be based on standards.

- Beyond GTIN and barcodes, GS1 data standards are essential as well to promote data quality and support data exchange with partners in the global health supply chain. To that end, GS1 EPCIS Core Business Vocabulary should be used to select permissible values for transaction type and business step, and GDSN data standards should be followed for the remaining fields.

- To facilitate connection of transactions for traceability, transfer orders, R&Rs, issue orders, etc. in HCMIS will need identifiers. (Proprietary, system generated identifiers are acceptable.)

CMS Receiving Inbound Shipments

- Receiving functions serve to validate what was received against what was ordered/shipped and add the received goods into inventory. However, when large quantities are received, e.g., multiple pallets, some trading partners may prefer to record receipt of the pallet, and then confirm the contents and add the goods to inventory when the pallets are unpacked.

- Today, the receiving function in HCMIS occurs at the case level when the pallets are unpacked. (Event information to be collected for this approach is provided below as Option1.)

- If desired, receiving could be accomplished at the pallet level by simply scanning the SSCC on the pallet and connecting to the ASN. (Event information to be collected for this approach is provided below as Option 2A.)

- Then, if Food, Medicine and Health Care Administration and Control Authority of Ethiopia (FMHACA) customs documents included pallet SSCCs and/or ASN numbers, HCMIS would be able to connect legal entry documents to supply chain documents.

- Pallet contents could then be confirmed and added to inventory on hand during an unpacking event. (Event information to be collected is provided below as Option 2B.)

OPTION 1: CMS receiving at the case level

KDE	Values
Business step	Receiving
Date/time of data capture	YYYYMMDD:MM:HH:SS
Event location	GLN (recommended) or internal ID no.
Trading partner	GLN (recommended) or internal ID no.
Transaction/activity type	Purchase order, transfer order, R&R, etc.
Transaction/activity number	Purchase order no., transfer order no., R&R no., etc.
Contents of receipt:	*Capture data below for each case:*
Identifier	GTIN
UOM	Case
Lot/batch	Lot/batch number
Expiration date	YYMMDD
Quantity	Positive number

OPTION 2A: CMS receiving at the pallet level

KDE	Values
Business step	Receiving
Date/time of data capture	YYYYMMDD:MM:HH:SS
Event location	GLN (recommended) or Internal ID no.
Trading partner	GLN (recommended) or Internal ID no.
Transaction/activity type	ASN
Transaction/activity tumber	ASN #
Contents of receipt:	*capture data below for each pallet:*
Identifier	SSCC
UOM	Pallet
Lot/batch	Lot/Batch Number (if used)
Expiration date	YYMMDD (if used)
Quantity	1 (because SSCCs are serialized identifiers)

OPTION 2B: CMS unpacking pallets (to validate receipt and add into inventory)

KDE	Values
Business step	Unpacking
Date/time of data capture	YYYYMMDD:MM:HH:SS
Event location	GLN (recommended) or internal ID no.
Trading tartner	GLN (recommended) or internal ID no.
Transaction/activity type	Purchase order, transfer order, R&R, etc.
Transaction/activity number	Purchase order no., transfer order no., R&R no., etc.
Pallet ID	SSCC
Contents of receipt:	*Capture data below for each case:*
Identifier	GTIN
UOM	Case
Lot/Batch	Lot/batch number (if used)
Expiration Date	YYMMDD (if used)
Quantity	Positive number

CMS Unpacking

- Once pallets are broken down, an approach needs to be developed both operationally and in HCMIS to establish the linkage of cases to its inbound shipment and receiving information:
    - Cases marked with SSCCs can be tied back directly to the ASN of inbound shipment, thereby maintaining the history.
    - Cases marked with a GTIN plus serial number can be tied back directly to the ASN of inbound shipment, thereby maintaining the history.
    - Cases marked with GTIN plus batch/lot and expiration date cannot be tied back directly to a specific ASN. However, depending on the fulfillment scenarios in Ethiopia, the combination of batch/lot and expiration date with GTIN may be able to narrow the number of possible inbound shipment and receiving scenarios, e.g., how many sources supply that specific

product/GTIN to Ethiopia, how many different shipments/ASNs could carry cases of the same GTIN, batch/lot, and expiration date. In some cases, this level of visibility can be sufficient if it narrows the possible shipments to an acceptable number.

CMS Packing for Outbound Shipments to Hubs

- Currently, aggregations created for outbound shipments, e.g., pallets, shrink-wrapped case groupings, are not assigned an identifier. Documentation for outbound shipments includes a picklist and a voucher that includes an order number, date, and to and from locations along with the shipment product numbers, batches/lots, expiration dates, and quantities (among other information).

    - Question of whether to assign SSCCs to aggregations created for outbound shipments, e.g., pallets, shrink-wrapped case groupings: the value of the SSCC is that it provides identification of the aggregation in AIDC[4] format, e.g., barcode, to facilitate identification, e.g., on the truck or trailer for unloading,and expedited receiving (at the hub). SSCCs would be recommended for trucks/trailers containing aggregations for multiple orders/hubs (where SSCC could promote accuracy in unloading) and/or high-volume deliveries to hubs, e.g., where scanning pallet SSCCs would expedite receiving. Consulting with hubs and transport teams is advised to gain insight into value.

    - Question of whether to use ASNs for outbound shipments to hubs: The picklist and voucher currently contain the key pieces of data to pass about a shipment. Therefore, if SSCCs are implemented, these document could then be supplemented to include the SSCC and case aggregation information.

Note: These events are based on CMS receiving and shipping operations. Hub receiving and shipping operations are slightly different. They should be analyzed to determine if/how the sample event tables for CMS can be modified to support hub operations.

[4] automatic identification and data capture

HCMIS Product Master Design

In the *HCMIS Linkages* deck, the Directory Services slide listed some of the product attributes stored (shown at right).

Directory Services Fields:

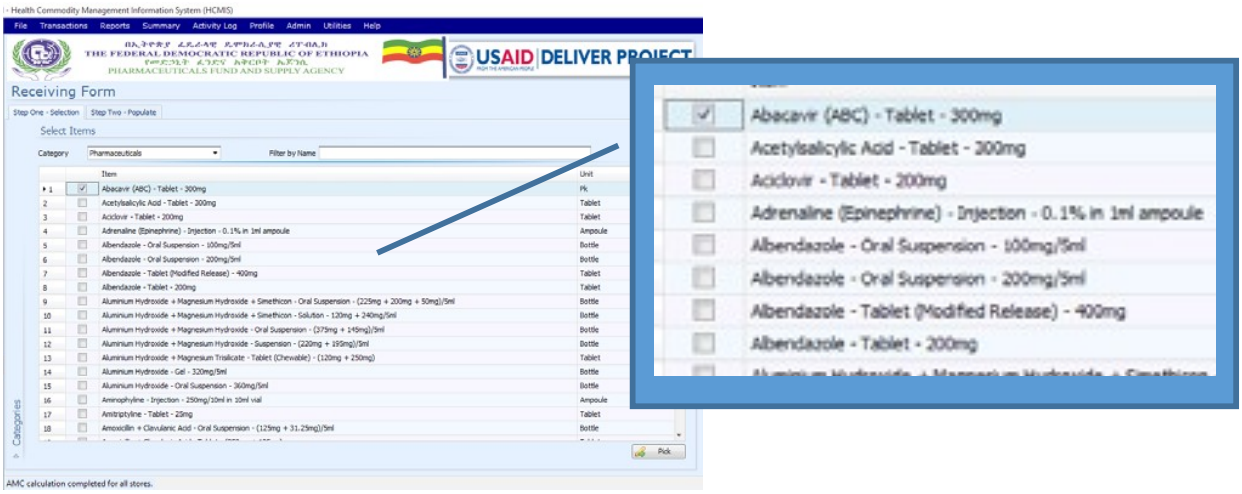
- Product
- Product Type
- Stock Code
- Product Code
- Storage Type
- Category
- Unit
- Program
- Manufacturer
- Suppliers
- Accounts
- Etc.

Recommendations:

- Add a field for GTIN. This field should be formatted as a fixed 14-digit field, alpha-numeric, right justified, left filled with leading zeros. (This format should also be used for GTINs any/all supporting systems and transaction messages.)
- Develop the list of fields/attributes to include standardized GDSN attributes and any additional internal data elements needed to support operations, e.g., lead times. (You can work with GHSC-PSM staff once they have finalized their attribute list to provide a jumpstart toward the standardized GDSN attributes.)
- Use GDSN metadata/format standards for all fields whenever they are defined, even if you do not use GDSN to exchange data. (Using the standardized format promotes data quality and alignment with partners.)
- Add a field for designating Ethiopia's approved commodity category (as shown in the Receiving screen). Manually populate this field for every product/GTIN to tie every product to its designated commodity category in the database.

Commodity Categories

As shown in the *Receiving Form Step 1 — Selection* screen, the list of approved commodities is well developed in HCMIS.



Within Ethiopia, PFSA has an opportunity to work with FMHACA to further align the commodity categories across PFSA and the regulatory environment to support further integration between supply chain and regulatory applications where beneficial. Beyond Ethiopia, these commodity categories/classifications need to be standardized across the global health supply chain so that all the donor organizations and recipient countries use the same commodity codes/values, i.e., establishing a standardized Health Commodity Classification Code (HCCC)

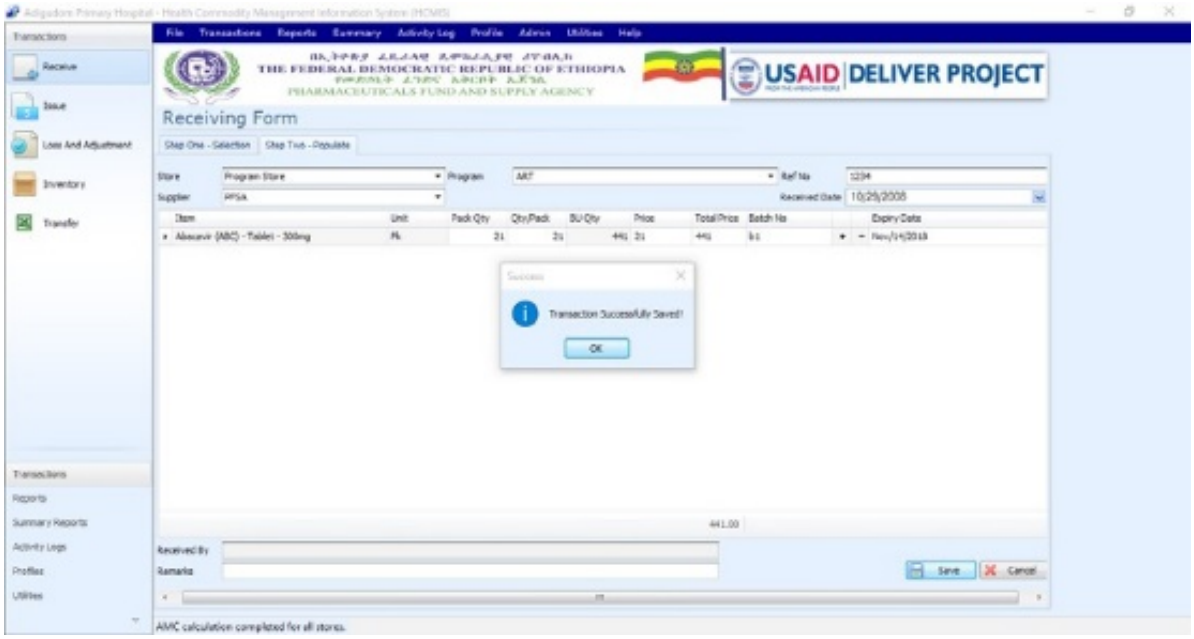
system. In the meantime, the commodity list shown on the HCMIS *Receiving* screen could be used as the "Ethiopian HCCC."

In the Product Master section above, we recommended that an attribute/field be added to designate Ethiopia's approved commodity category for every product. This will tie every GTIN/product in the database to its designated commodity category to facilitate automated processing and reporting as demonstrated in the following two examples:.

EXAMPLE 1: HCMIS WAREHOUSE — RECEIVING

As cases become marked with GS1 barcodes, the receiving process could be further automated so that users could simply scan the case barcode to capture the GTIN, and the system could retrieve the commodity category associated with that GTIN from the Product Master, thereby automating *Receiving Form Step 1 — Selection*.

Receiving Form Step 2 — Populate is where users enter certain data about the cases they received. Note that some of the information (such as pack quantity) should be stored as attributes in the Product Master and therefore able to be automatically populated based on the scanned GTIN barcode. Also, batch number and expiry may be encoded in GS1 barcodes (depending on Ethiopia's supplier requirements). If such a requirement is put in place, then this information could also be automatically populated when the barcode is scanned.



EXAMPLE 2: HCMIS FACILITY — INVENTORY AND R&R/ISSUE

Storing Ethiopia's approved commodity category as an attribute/field for every product in the Product Master was discussed above as a method for improving and automating the receiving process in the HCMIS warehouse. That same strategy will also help improve and automate the inventory and R&R/issue processes in the HCMIS facility.

With GS1 Standards adoption, products in the facility will be marked with a barcode encoding (at a minimum) their GTIN. Facility staff can scan the barcode of any commodity they are inventorying, and HCMIS can retrieve the commodity code associated with that GTIN from the Product Master to support the inventory and issue functions. (Helpful tip: If item-level GTIN barcodes are not available but case-level GTIN barcodes are: when cases are unpacked at the facility, cut the case panel where the barcode appears and put in in the bin with the items.

Because the system is using only the GTIN to pull the commodity category, the case GTIN can be used for that purpose.)

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