

TECHNICAL BRIEF

Developing a Global Standard to Facilitate Traceability of Long-Lasting Insecticide-Treated Nets

Background and Problem Statement

Long-lasting insecticide-treated nets (LLINs) are exchanged among multiple entities (trade partners) as the LLINs travel through the supply chain from manufacturers to end users. Being able to track and trace LLINs is crucial for supply chain security, enabling the ability to verify that the chain-of-ownership of the item is intact, and to realize efficiencies through increased granularity, timeliness, and accuracy of data for decision making. However, the process of aggregating and using data to enable efficiency across trade partners can bring challenges, including:

- Different and proprietary item identifiers assigned at various points of the supply chain
- Inconsistent labelling of products across suppliers
- Inability to automatically capture identification data
- Incomplete or inaccurate product master data that define key attributes of the net, such as dimensions, insecticide type, and manufacturer

These challenges create a high-maintenance, error-prone environment that increases complexity, inaccuracy, and cost—and can be prohibitive to tracking where a net is going and tracing backwards to know where it has come from. Trade partners can uniformly identify nets with the same level of precision and consistent identifiers by adopting a common business language—a global standard—that can be used by all trading partners, from manufacturer to dispenser, to identify, capture, and share information about the LLIN and its movement in the supply chain. Using such standards enables interoperability across supply chain information systems, enhancing the quantity and quality of data available to support operational processes.



Photo credit: GHSC-PSM

Mulenga Silupya, a transporter in Zambia, offloads bales of LLINs in Mporokoso District.

Proposed Solutions and Activities

To address the issues identified above, GHSC-PSM supported the U.S. President’s Malaria Initiative (PMI) in establishing the TraceNet working group in 2019. This group was co-convened by PMI and the Global Fund to Fight Aids, Tuberculosis and Malaria (Global Fund). Working group members included representatives from manufacturers, procurement agents, donors, implementing partners, and select donor-funded country programs. The working group met bi-weekly to discuss the benefits, opportunities, and challenges of implementing standardized LLIN identifiers, data carriers (barcodes), and data-sharing mechanisms for the products.

GHSC-PSM, through a consultative process with TraceNet working group members, drafted and published a set of recommendations based on existing global standards to define a set of guidelines for LLIN identification, labelling, and master data information exchange. The working group determined that GSI standards—standards that establish a common language across business entities to identify, capture and share supply chain data—were best suited to accomplish these goals. In January 2020, the project and other TraceNet working group members published *Recommended Identification, Capture, and Master Data Sharing Specifications for Long-Lasting Insecticidal Nets*. The document included timelines by which LLIN suppliers for Global Fund and PMI procurement agents, IDA Foundation and GHSC-PSM, respectively, were expected to adhere to these requirements.

Using these new recommended requirements, GHSC-PSM:

- Established contractual requirements for supplier LLIN identification based on global standards (rather than proprietary, national, or regional standards) that mirror the identification implemented by Global Fund’s procurement agent, IDA Foundation.
- Created the requirement that a GTIN, the GSI standard for a globally unique trade item identifier that can be used across the supply chain network, be assigned to nets, bags, and bales.
- Created the requirement that a GLN, the GSI standard for a globally unique location identifier, be assigned to manufacturers’ business entity locations.

HELPFUL TERMS

Master Data

non-transactional data, or “attributes,” that identify products and locations such as name and address of buyer and seller.

Global Trade Item Number (GTIN)

the GSI key that uniquely identifies a product.

Global Location Number (GLN)

a universal number that uniquely identifies physical locations or parties. The key is comprised of a GSI Company Prefix, location reference, and check digit.

Human Readable Interpretation (HRI)

the readable characters that accompany a barcode. HRI is a one-to-one illustration of the encoded data.

GSI Global Data Synchronization Network™ (GDSN®)

a network of interoperable supply chain data pools governed by GSI standards and used to exchange standardized product master data.

- Implemented standards-based barcodes on labels affixed to all individual LLINs, the polybags that GHSC-PSM procures, and bales.¹
- Issued robust product master data exchange requirements.

The TraceNet working group decided that requirements would be implemented in phases. Phase 1 required LLIN suppliers to assign GTINs to their products and GLNs to their business entities. Phase 2 required LLIN suppliers to label their individual nets and polybags with the GTIN, production date, and batch/lot number encoded in a DataMatrix and included as human readable interpretation. Phase 2 also required LLIN suppliers to share master data through the GDSN for their products. In phase 3, suppliers will apply these requirements to LLIN bales and apply serial numbers to individual LLINs. These requirements were incorporated into GHSC-PSM supplier contracts in March–April 2020 (see Exhibit 1).



Before implementation of GS1, barcodes were used for some legs of the supply chain but were not required to align with a standard and could have been proprietary. These bales in Mozambique have a barcode from a 4th party logistics provider for tracking one in-country leg of their journey only. Photo credit: GHSC-PSM

This mock-up image shows how a GS1 barcode will appear on the care tag of an individual LLIN, allowing the net to be traced from the manufacturer all the way to the user. Image credit: GHSC-PSM




Exhibit 1. Summary of GS1 Requirements for LLINs

IDENTIFY

ENTITY	REQUIREMENT	PHASE
Trade items	Assign and provide GTINs for all levels of the trade item packaging hierarchy.	Phase I
Locations and/or legal entities	Assign and provide GLNs for sold-from, manufacture-from, and ship-from.	Phase I

¹ The deadline for barcodes to be included on bales is June 2022, which has not passed at the time of publication.

CAPTURE

PACKAGING LEVEL	DATA REQUIRED TO BE ENCODED IN BARCODE OR DATAMATRIX	PRINTED ON THE LABEL	PHASE
 Bale	GSI-128 barcode symbology encoded with: <ul style="list-style-type: none"> – (00) Shipping Container Code (SSCC) – (02) GTIN of contained items – (37) Count of contained items – (10) Batch/lot number – (11) Production date 	Information printed in human readable form: <ul style="list-style-type: none"> – (00) SSCC – (02) GTIN of contained items – (37) Count of contained items – (10) Batch/lot number – (11) Production date 	As soon as possible but no later than phase 3
 Bag with LLIN	GSI DataMatrix symbology encoded with: <ul style="list-style-type: none"> – (01) GTIN – (10) Batch/lot number – (11) Production date 	Information printed in human readable form: <ul style="list-style-type: none"> – (01) GTIN – (10) Batch/lot number – (11) Production date 	Phase 2
 Individual LLIN	GSI DataMatrix symbology encoded with: <ul style="list-style-type: none"> – (01) GTIN – (10) Batch/lot number – (11) Production date – (21) Serial number 	Information printed in human readable form: <ul style="list-style-type: none"> – (01) GTIN – (10) Batch/lot number – (11) Production date – (21) Serial number 	Phase 2 for GTIN, batch/lot number, and production date Phase 3 for serial number

SHARE

DATA TYPE	REQUIREMENT	PHASE
Master data	Provide mandatory and required trade item attribute data through the GDSN.	Phase 2

When the TraceNet working group was established, the project had already implemented requirements for standards-based identification, labelling, and master data exchange for other products, including pharmaceuticals. However, the same requirements were not always applicable to LLINs. For example, a standard requirement for pharmaceuticals is to print the expiration date and encode it in the barcode, but the working group agreed that this was not appropriate for LLINs. LLINs are durable goods that are used over time rather than consumed in one use or in doses like pharmaceuticals, so they do not have a set expiration date. However, the insecticide does lose potency over time and can be closely tied to storage conditions, which is why TraceNet working group members agreed that the production date was a better indicator of viability to print and embed in LLIN barcodes.

For suppliers to meet these requirements on time, the suppliers in the TraceNet working group requested that the project hold implementation webinars to guide them on the requirements. From February to September 2020, GHSC-PSM hosted three webinars that correlated with each deadline (see Exhibit 2) to ensure suppliers had the information they needed to implement the corresponding requirements.

Exhibit 2. Implementation Webinars for Suppliers

Date Held	Webinar Title	Number of Participants	Contributors
February 2020	Registering with GSI—Assigning GTINs and GLNs	50	GHSC-PSM, Global Fund, GSI Global
July 2020	Good Practices for Implementing Automatic Identification and Data Capture (AIDC)	30+	GHSC-PSM, Global Fund, GSI Global
September 2020	Introduction to GDSN and Best Practices for GDSN Implementation	30+	GHSC-PSM, Global Fund, GSI Global, IWorldSync

These webinars facilitated in-depth discussion on the requirements and how they applied to LLINs, enabling suppliers to be well-equipped for compliance ahead of the phased deadlines. The project recorded the webinars and continues to provide the recordings as a resource for LLIN suppliers.

The new requirements for LLINs also require suppliers to share master data through the GDSN. GHSC-PSM determined the information necessary for the LLIN product category through consultation across teams that use these data for business processes, including input from PMI and the Global Fund. The project then worked with its GDSN data pool provider to determine what existing GDSN attributes best represented the data that LLIN suppliers would need to provide. Where necessary, the data pool provider helped develop LLIN-specific attributes such as “thread denier,” a unit of measure for the linear mass density of fibers in an LLIN.

The project published the [GHSC-PSM Data Synchronization Attribute Guide](#) for LLINs in spring 2020, six months ahead of the first phase deadline, to give suppliers time to collect the necessary data for the requirement.

Results and Opportunities

As a result of the TraceNet working group’s efforts, LLINs procured by GHSC-PSM now have standards-based, globally unique trade item identifiers, batch/lot numbers, and production dates encoded in barcodes and printed on labels that appear on individual nets and polybags. This system provides a foundation for achieving end-to-end visibility in the LLIN supply chain.

Through the TraceNet working group’s collaborative process with donors, procurement agencies, and suppliers to develop the requirements, GHSC-PSM could see and record supplier compliance with the new requirements:



Photo credit: GHSC-PSM

Community members in Cambodia watch a demonstration of how to properly use an LLIN.

- The target for the end of phase 1 was a compliance rate of 50 percent of suppliers. When the June 30, 2020 deadline passed for phase 1, the supplier compliance rate was 100 percent—exceeding the target by 50 percentage points.
- When the December 30, 2020 deadline passed for phase 2, compliance, 85 percent of suppliers were compliant with the labelling requirements for individual nets and polybags, again exceeding the 50 percent target.

Phase 3, the final phase, requires LLIN manufacturers to include the defined identification data on bales and to add serial numbers to identification data on individual nets by June 30, 2022. GHSC-PSM will continue to monitor compliance with the requirements for all three phases for LLINs in its procurement portfolio.

Including standards-based identification data and data carriers encoded with the data on LLINs procured using Global Fund and PMI funding is an important foundational step for enabling the adoption of common, globally unique trade item identifiers across trade partners and for improving data timeliness and accuracy through scanning. Countries can use these advances to implement processes and adopt technologies that can, for example:

- Improve LLIN master data—a requirement for scanning—by allowing countries to collect GTINs and associated product attributes assigned by manufactures.
- Manage bale traceability within countries using shipping container codes (SSCCs) to trace which bales went to which in-country locations and to support investigation in cases of theft or diversion.
- Improve specificity of point-of-distribution data by allowing distribution teams to capture the serial numbers of nets distributed to houses through scanning into an application or manually recording serial numbers.
- Enhance research on LLIN durability and effectiveness—such as how long an individual net has been in a specific household—by leveraging the standard identification on the net’s labels and encoded in the data carriers when data from the same household is captured either manually or through scanning over multiple points in time.

Lessons Learned

While developing and implementing the TraceNet working group’s recommendations for LLINs, the project identified a number of key success drivers that other entities implementing standards-based product identification, data carriers, a master data exchange can learn from and adapt for their own implementation.

Challenge	Success Drivers
There was no standard for identification, labeling or master data exchange for LLINs	<ul style="list-style-type: none"> • Collaborating early and routinely with suppliers and with product and standards subject matter experts through the TraceNet working group to develop GSI requirements for LLINs.

	<ul style="list-style-type: none"> Engaging business process owners to define the product master data that would support their existing supply chain management processes to inform recommendations.
Generating stakeholder buy-in to operationalize TraceNet recommendations	<ul style="list-style-type: none"> Demonstrating value for suppliers engaging in the recommendation development process through— <ul style="list-style-type: none"> minimizing the time between the consultative recommendations development process and translating these into contractual requirements implementing common requirements and deadlines across multiple procurement agents.
Ensuring LLIN suppliers were equipped to implement requirements by the deadlines	<ul style="list-style-type: none"> Providing educational opportunities (in this case in the form of webinars) throughout the implementation phases to prepare suppliers and ensure they were well informed on the steps for successful and timely compliance Suppliers designating centralized and dedicated resources to operationalize requirements.

The combined forces of establishing a dedicated and inclusive working group and ensuring continued engagement from GHSC-PSM proved to be the recipe for success in establishing and implementing the TraceNet recommendations for LLIN products. If an organization is pursuing implementation of standards-based product identifiers, data carriers, and master data exchange, this process and the learnings can serve as a guide. If an organization is interested in adoption for LLIN products specifically, the TraceNet recommendations and subsequent GHSC-PSM requirements can be directly adopted to accomplish this.