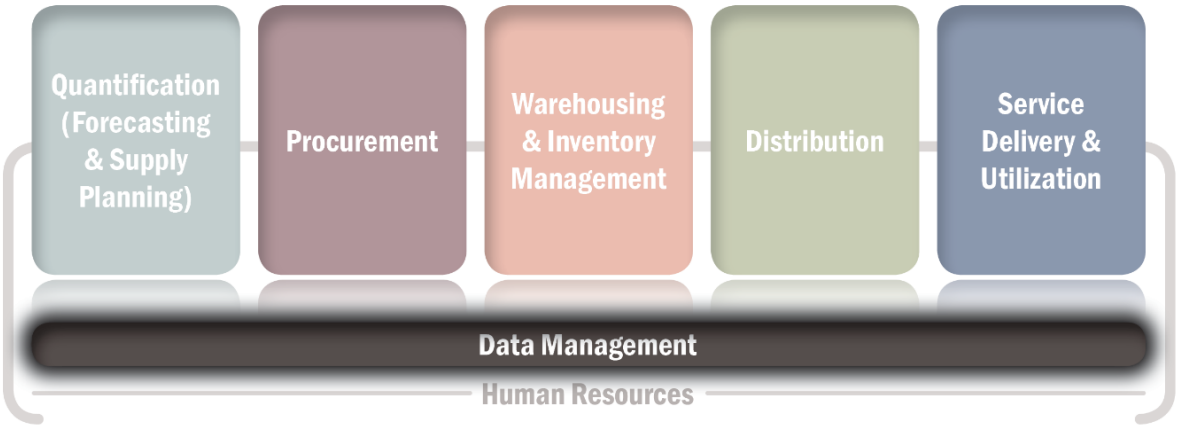
Promising Practices
Data Management

Brief #6 in the *Promising Practices in Supply Chain Management* Series



INSIDE

This brief is part of the *Promising Practices in Supply Chain Management* series, developed by the Supply and Awareness Technical Reference Team (TRT) of the UN Commission on Life-Saving Commodities for Women's and Children's Health (the Commission or UNCoLSC). As part of the Every Woman Every Child movement and efforts to meet the health-related Millennium Development Goals by 2015 and beyond, the Commission is leading activities to reduce barriers that block access to essential health commodities. The Supply and Awareness TRT developed this set of briefs on promising practices in supply chain management to guide countries in identifying and addressing key bottlenecks in the supply and distribution of the Commission's 13 life-saving commodities across the reproductive, maternal, neonatal, and child health continuum of care.

This series of briefs has been developed for use by in-country stakeholders. The briefs provide both *proven* and *promising* practices that may be used to address specific supply chain barriers faced by each country.

- *Proven practices* are defined as interventions with proven outcomes in improving health commodity supply chains in low- and middle-income countries tested using experimental or quasi-experimental evaluation designs. Examples of proven practices are identified by this symbol throughout these briefs.

- *Promising practices* are defined as interventions showing progress toward improving health commodity supply chains in low- and middle-income countries.

To view all the briefs in the Promising Practices in Supply Chain Management Series, visit http://siapsprogram.org/publication/promising-practices-in-supply-chain-management

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Abbreviations and Acronyms

AL	artemether/lumefantrine
DPAT	District Product Availability Teams
HSA	Health Surveillance Assistants
ICT	information and communications technology
ILS	Integrated Logistics System
JSI	John Snow, Inc.
LMIC	low- and middle-income countries
PRISM	Performance of Routine Information System Management
RHIS	routine health information systems
SC4CCM	Supply Chains for Community Case Management
SDP	service delivery point
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
SMS	Short Message Service
SOP	standard operating procedure
TRT	Technical Reference Team
USAID	US Agency for International Development

Background

Data management is intrinsic to all aspects of running the supply chain. It is essential for managing the ongoing operations of the supply chain, assessing performance over time, and identifying problems and opportunities for improvements.

Data management encompasses identifying, collecting, validating, storing, analyzing, and applying information to make decisions and, most importantly, to take action. Depending on the scope and sophistication of the supply chain operations, useful data may include:

- Detailed stock information, such as initial stock on hand, quantity received, consumption, remaining stock on hand, wastage/spoilage, transfers, stock-outs, etc.
- Lead times to replenish individual facilities
- Seasonal variations in consumption and accessibility of facilities
- Stock levels at warehouses that, at times, may indicate the need to ration available supplies
- Demographic data on the target population
- Disease prevalence, which will affect demand for medications and commodities used to treat the disease

Unfortunately, the supply chain often has to settle for imperfect data, or rather, data that are inaccurate, incomplete, delayed and/or not specific to the situation. Even when high quality and timely data are collected, many countries struggle to use data to inform supply chain decision making. The reasons for these data management challenges are widespread, including the lack of technical capacity of personnel and the lack of suitable data collection and management tools.

Human resource capacity is likewise a cross-cutting issue affecting all supply chain functions, including data management. Training may be used to successfully address capacity for data collection, however, the bigger challenge is to build capacity for data analysis and use in decision making. For additional information on improving human resource capacity for supply chain management outside of data management, please refer to the *Promising Practices in Human Resources* brief.

Designing effective data management solutions consists of three primary activities:

- An **assessment of supply chain information needs** should be conducted, including who needs the information, how it will be used, and the potential actions that may be taken in response to the data. Second, the platform best suited to supporting data collection should be selected. This may range from paper-based systems to mobile phones to sophisticated software programs.

- **Standard operating procedures** (SOPs) should be developed, with staff trained in how to adhere to the SOPs. Staff need to be trained on how to use the selected tool(s) and, equally importantly, on how to analyze and use the results.

- **The collected data should be made available in a format that enables decision making.** The format will depend on the resources available and the audience, but the data should be accessible and easy to use to answer key supply chain performance questions.

The table below presents the most common barriers to effective data management and lists the promising practices that address each barrier. The promising practices, when looked at holistically, encompass all three primary activities of effective data management solutions.

Barriers	Description	Promising Practice(s) that Address the Barriers:
Delayed, inaccurate, and incomplete data	Data that are not accessible for decision making within a reasonable timeframe after collection will not reflect current levels of need or supply. Inaccurate data may lead to under- or overestimating commodity needs. Incomplete data means that guesswork must be used to determine the current level of need or supply.	• Focused data collection • Use information and communications technology (ICT) tools for data collection and management • System design to improve data quality and use
Insufficient use of data for decision making	Data are often collected, but are rarely used to the fullest extent possible in decision making. Exacerbating the problem is the over-collection of unnecessary data. Not only does this use up valuable personnel time, it makes it difficult to see and understand the data that are actually important for decision making. Streamlining data collection activities to focus only on data that will be used helps address this barrier.	• Focused data collection • Create and use a logistics information portal • Use information and communications technology (ICT) tools for data collection and management
Insufficient human resource capacity for appropriate data collection and use	Human resource limitations at all levels of the system significantly impact data management. Inadequate training, incentives, and feedback result in poor data collection quality and inadequate use throughout the supply chain.	• System design to improve data quality • Incentivize data completeness and accuracy
Lack of easily accessible and shareable information	In many locations, there is a wealth of data collected. Too often, data are inaccessible because: they are paper-based; decision makers are located far away; the data are locked up in a secure setting; or the data are located on a computer to which few people have access.	• Use ICT tools for data collection and management • Create and use a logistics information portal

Focused Data Collection

To address barriers related to delayed, inaccurate, or incomplete data and the insufficient use of data for decision making

In most low- and middle-income countries (LMICs), significant amounts of data are collected at all levels of the health system, with the majority of data being created and compiled at the service delivery point (SDP). Countries should work to ensure that the amount and type of data collected are appropriate for the intended use. Regular review of data collection practices should occur to ensure that the right kind, amount, and frequency of data collection are performed. Because the supply chain is so heavily dependent on data at all levels, the temptation is often to place emphasis on collecting *more* data. This places an enormous burden on lower level health workers and supply chain personnel, and limits their ability to complete other aspects of their work. This burden also reduces employee motivation for the timely or accurate completion of the data collection requirements. Rarely are all the data collected used to make decisions for the improvement of the supply chain or commodity procurement. Ensuring that only the right data are collected helps reduce the amount of human and financial resources that are needed to complete these activities and improves motivation for the timely and accurate completion of data collection.

When should focused data collection be considered?

It is often best to err on the "less is more" side of data collection. One approach is to itemize the supply chain data elements that are available and *potentially* of interest and then, using supply chain analysts or knowledgeable personnel, determine which are truly necessary to drive decisions at each level of the supply chain. This approach resembles a "reverse engineering" process, where each data element is evaluated against answers to the questions: "What do we use this for?" and "What decision does it drive?" If there is no quick answer, the data element should be considered for removal from the data collection process. An alternative and more circumspect approach is to start with a list of the activities that must be supported and the decisions that need to be made, and then identify data elements that will truly inform these needs. This approach resembles a cost-benefit analysis, where the collection of each data element is justified based on its contribution to efficiently running the supply chain. Either approach should include: stock data necessary for the algorithm(s) used to calculate optimal replenishment amounts; triggers for identifying looming stock-outs; key indicators that may be used to identify performance problems (e.g., product shrinkage, recurring stock imbalances, repeated late reporting); statistics to support long-term forecasting for procurement; and more, as suits the specific supply chain.

Collecting minimal data creates a streamlined process that requires less training and less staff effort. In many cases, collecting a small amount of data may be surprisingly effective. In addition, the relative simplicity and expedience of this approach increases the frequency in which data are available. For example, requiring a facility to submit only stock-on-hand counts on a weekly basis increases visibility into consumption patterns, making it easier to identify impending stock-outs. At the same time, there are potential risks to this approach. Only submitting stock-on-hand data may mask details, such as spoilage and wastage or stock transfers between facilities, and limit the ability of the supply chain to respond to problems in these areas.

While there are times when collecting the least amount of data necessary is valuable, there are also times where a greater amount of data collection and reporting are necessary. This is particularly true

during the start-up phase of a program, to identify problems and inefficiencies and to fine tune processes, procedures, and supply chain infrastructure. This approach may also be useful in situations where an organization is evaluating new forecasting algorithms or during a detailed audit of ongoing supply chain operations. The challenge, therefore, is to be disciplined in identifying how each piece of data will be used in supporting or improving the supply chain, before designating it as a required indicator.

KENYA

Despite national recognition of their importance, antimalarial medications and diagnostic supplies are often stocked-out at health facilities in Kenya. To address this issue, Novartis Pharma AG, in partnership with the Government of Kenya, piloted a mobile application, called SMS for Life, in 87 public health facilities over a 26-week period from August 2011 to February 2012. The objective was to determine whether this application was effective at reducing stock-outs.

The application, which consists of a Short Message Service (SMS) management tool and a web-based reporting tool, had previously been successful at addressing commodity stock-outs in Tanzania and Ghana. SMS for Life allows health workers at rural health facilities to submit simple "stock-on-hand" counts at the end of each week via SMS messages. The application uses mobile phones already available at the health facility and focuses data collection and reporting activities on only the most important information. In this case, SMS for Life was responsible for tracking four dosages of artemether/lumefantrine (AL) and one type of rapid diagnostic test.

At a designated time each week, participating health facilities received a standardized SMS message requesting information on the current stock status of the five commodities. If health workers did not respond within 24 hours, a reminder SMS was sent the following day. District-based staff accessed the web-based interface to view the data, helping them determine which facilities were overstocked and which were understocked. They could then use this information to redistribute the commodities and avoid stock-outs.

Weekly participation by the health facilities averaged 97%, with the majority responding within the first 24 hours after the SMS was sent. By the end of the intervention period, stock-outs of one or more dosages of AL were reduced by 38%. District managers were able to redistribute commodities to facilities showing stock-outs 44% of the time.

To learn more:

- Reducing Stock-Outs of Life Saving Malaria Commodities Using Mobile Phone Text-Messaging: *SMS for Life* Study in Kenya

Use ICT Tools for Data Collection and Management

To address barriers related to delayed, inaccurate, or incomplete data, the insufficient use of data for decision making, and the lack of easily accessible and shareable information

Historically, paper-based data collection and reporting tools have been the main data collection and management tools used across the supply chain. Traditional paper-based methods cause long delays in getting data to decision makers (up to six months in some cases). Yet, in isolated or low-resource settings, paper-based tools may be the only option. Steady improvements in information and communications technology tools, such as computers, mobile devices, and the software that run on these devices, have dramatically expanded the options for collecting and managing supply chain data. In many cases it is now practical and cost effective to deploy an assortment of ICT tools for collecting data.

When should ICT tools be considered?

A number of issues need to be considered when deciding whether ICT tools are feasible and which are most appropriate. Some issues to consider include:

- Communications and power infrastructure: ICT tools are inherently dependent on access to communications infrastructure and the availability of electrical power. The data rate or "bandwidth" provided by the communications infrastructure will determine which software applications can be deployed in each community, and therefore the viable electronic devices that may be used. The rapid expansion of cellular networks is making SMS, general packet radio service, and even second-generation and third-generation mobile telecommunications services widely available. In some cases, ICT tools are designed to operate on battery power or to switch between "online" and "offline" modes of operation to be more compatible with environments where communications and/or power services are intermittent.

- Complexity of gathering and submitting data: ICT tools have significant impact in situations where the supply chain involves hundreds of commodities (e.g., a regional hospital) and therefore large amounts of data. In these situations, well-designed ICT tools provide structure to the user's workflow, validate certain data as the user enters it, and may dynamically adapt to ongoing changes in operations (e.g., the list of commodities to order is always up-to-date, based on current inventory status, as managed in the back end of a logistics system). In settings where the replenishment process entails very few commodities (e.g., a small community clinic) but geographic barriers or resources barriers limit communication between the SDP and the managers responsible for replenishing stock, ICT tools may still have equally significant impact by enabling rapid submission of data.

- Initial and recurring costs: Adoption of ICT tools involves upfront costs to purchase and install equipment, procure software licenses, as needed, migrate data from the current system, and provide user training. Ongoing operational costs should also be taken into account, including maintenance and repair of equipment, support for applications, user help desk, anti-malware software for computers, recurring charges for communications services (both wired and cellular), and refresher training. The effort and cost needed to define and apply an organizational policy regarding misuse or loss of equipment should also be considered.

- Staff skillsets: Staff familiarity with ICT and staff comfort levels with using new tools and technologies varies across any organization. ICT tools and staff training in how to use them needs to be tailored to the knowledge and experience of the various groups of users. Refresher training is also essential whenever new features, functionality, or systems are rolled out.

TANZANIA

Deployed in 2010, Integrated Logistics System (ILS) Gateway was designed to supplement the existing paper-based reporting and requisition process. ILS Gateway allows health center staff to report stock on hand for 20 commodities via text message. These data are automatically entered into a web-based dashboard that visually displays data for district, central, and national-level stakeholders. In reviews of the system's impact, over 90% of surveyed health center users reported that the tool improved their compliance with conducting stock counts on time and submitting their related report and requisition forms on time. In addition, 80% of district users felt that ILS Gateway improved their visibility into stock levels at the facilities. Overall, 45% of participating facilities indicated an increase in stock availability of the tracked commodities.

District medical officers also reported that use of the system improved the timeliness with which they received the regular report and requisition forms. Perhaps most important, a significant number of facilities reported an increase in the availability of tracer products through the use of ILS Gateway.

To learn more:

- The ILS gateway: mobile phones improve data visibility and lead to better commodity availability in Tanzania
- ILSGateway: A project in partnership with the Ministry of Health and Social Welfare and USAID | DELIVER Project

MALAWI

In Malawi, community health workers, known as Health Surveillance Assistants (HSA), provide health services at the community level. The HSAs provide community case management, preventative services, and manage up to 19 different commodities. In partnership with JSI and the Supply Chains for Community Case Management (SC4CCM) project, in 2010 Malawi identified problems in the HSA supply chain that led to the frequent unavailability of commodities at the community level. The baseline assessment identified two key bottlenecks: stock-outs at HSA resupply points and difficulty transporting commodities between the resupply point and HSA catchment areas. To address these bottlenecks, transportation and management interventions were introduced in parallel with a logistics information portal called cStock. cStock is a web-based reporting and resupply system that collects stock data from HSAs via SMS messages. This information is used to start a SMS-based workflow that calculates the quantity of stock needed, assesses availability at the resupply point, and notifies the HSA when his/her package of commodities is available for pick up. In addition, these data are made available on an interactive dashboard that presents real-time stock levels and other metrics to districts and partners. In many districts, the cStock dashboard has been paired with the Enhancement Management approach. This approach creates District Product Availability Teams (DPAT), composed of district management, health facility staff, and HSAs, who work together on identifying and solving problems. A 2013 midline evaluation showed that districts using cStock plus the Enhanced Management approach had higher reporting rates and had reduced lead times by half compared to districts using cStock alone. The evaluation also reported that DPAT meetings reduced tension, promoted trust, increased coordination among team members, encouraged problem solving, and improved performance.

To learn more:

- cStock: Using Data Visibility to Improve Community Supply Chain Performance in Malawi

System Design to Improve Data Quality

To address delayed, inaccurate, and incomplete data, and insufficient human resource capacity for appropriate data collection and use

Data quality is paramount to successfully managing the supply chain, yet assessing quality is a complex undertaking. Quality encompasses the timeliness, completeness, and accuracy of the data. Data are useless if they cannot be relied upon. High quality data improve visibility into the operating conditions at each health center. They also provide a better determination of optimal replenishment amounts, better allocation of commodities and related resources across the health system, improved long-term forecasting, and identification of opportunities for improvements.
Specific interventions to improve data quality may be categorized as technical, organizational, and behavioral:

- Technical interventions work to address the technical barriers that hinder the collection of high quality routine data and encourage the use of information at all levels of the supply chain. Technical interventions may also include streamlining the amount and types of data that get collected, integrating disparate or overlapping reporting systems into one system, standardizing data collection forms, or developing data entry and analysis software and databases. Examples of technical interventions include:

    - Defining expected values (or tolerance ranges) for data entries and asking the user to confirm suspect or unusual entries.
    - Enforcing (via software) a requirement that a form be completed before it can be submitted.
    - Checking for arithmetic consistency among values entered by a user.
    - Providing predefined lists for a user to pick from to reduce chances of entering incorrect information.
    - Having consistency in the layout of screens and functionality across screens.

- Organizational interventions encompass rules, processes, values, or systems that allow organizations to better use data. Examples of organizational interventions include:

    - Establishing review teams as a forum to discuss performance indicators.
    - Developing guidelines on how to use information, along with clear roles and responsibilities for individuals.
    - Creating an environment that specifically focuses on helping different levels of the supply chain collaborate, to improve sharing of information and raise the collective attention paid to the quality of data.
    - Performing periodic (and unannounced) audits of submitted data.

- Behavioral interventions focus on developing behaviors in individuals and groups that lead to better and more consistent use of information. These interventions include:

    - Training staff in skills and habits that encourage improved use of the data.
    - Feedback mechanisms, particularly from routine supportive supervision, to encourage use of information.
    - Making documentation readily available.
    - Providing periodic refresher training.

When should system design to improve data quality be considered?

Data quality should always be prioritized because the use of data for decision making and optimizing supply chain functions is only as good as the quality of the data captured. At the same time, data quality should be prioritized in tandem with efforts in the areas of data promotion and data visibility.

CÔTE D'IVOIRE

Although not directly designed for supply chains, the Performance of Routine Information System Management (PRISM) framework and tools focus on assessing the quality of data collected for routine health information systems (RHIS) and assessing the use of information for decision making. As a part of the PRISM framework, four assessment tools were created to assess RHIS performance, including data quality, information use, data collection and transmission, staff competence and motivation, training, and supervision. By the end of 2012, 23 countries had used the tools to assess their RHIS performance. In most of these countries, the assessment led to the adoption of RHIS interventions to strengthen the system and improve performance.

Between 2008 and 2012, the Côte D'Ivoire Ministry of Health implemented the PRISM framework and worked with the National School of Statistics and Applied Economics to evaluate the performance of HIV and AIDS information and the Health Management Information System. The government implemented several complementary interventions, including: combining parallel reporting systems into an integrated RHIS; reducing the amount of data collected; developing, testing, and distributing new data collection tools; developing RHIS courses for health workers as part of pre-service training; and training decision makers on data demand and information use. Following the intervention, data quality at health facilities increased from 43% in 2008 to 60% in 2012. At the district level, data quality doubled from 40% to 81%. However, the increase in the availability of quality data did not lead to an increase in data use. At the health facility level, data use rates remained at 38% between 2008 and 2012.

To learn more:

- Inventory of PRISM Framework and Tools: Application of PRISM Tool and Interventions for Strengthening Routine Health Information System Performance

Incentivize Data Completeness and Accuracy

To address insufficient human resource capacity for appropriate data collection and use

When designing data management systems, it is important to consider what incentives and disincentives (intentional and unintentional) the end user experiences. For example, a health worker may be incentivized to avoid criticism from her supervisor for a late requisition, but that same motivation also incentivizes her to hurry through the requisition without concern for accuracy. If the supply chain operates such that the delivered quantity has little relation to the requested quantity, there is no incentive for the requestor to report stock on hand or to request the quantity accurately.

Once the existing incentives and disincentives have been identified, the next step is to consider how to adjust the incentive structure to align with supply chain goals. Incentives may need to be introduced and disincentives decreased to achieve data completeness and accuracy targets. Many incentives may be modified via system adjustments, however, an additional strategy to consider is introducing performance-based financing. Refer to the Performance-Based Financing section of the *Promising Practices in Service Delivery and Utilization* brief for approaches to incentivizing the timely submission of accurate data.

Create and Use a Logistics Information Portal

To address insufficient use of data for decision making and the lack of accessible and shareable information

Logistics data are often siloed and difficult to access. Frequently, data exist in various paper and electronic forms in different locations. This problem is compounded when there are numerous vertical programs and supply chains. A logistics information portal addresses this problem by creating a centralized website that displays key logistics information (such as stock-outs on tracer commodities) to all stakeholders in a flexible, easy to read, and easy to update format. Portals increase transparency and ensure that data are available to all who need them. They may also be used to improve communication between various actors in the supply chain. For example, portals may include forecasting, procurement, and distribution data, creating one location for viewing the performance of the end-to-end supply chain.

Equally important to the portal itself is the development of continuous improvement teams responsible for reviewing the portal and taking corrective action. Portals provide a common data source that serves as a basis for issue identification/response and logistics system performance evaluation. For example, monthly supply chain performance teams may be created who are responsible for reviewing portal data and conducting root cause analysis on issues, such as stock-outs. The same portal data may be used by national stakeholders to view current stock levels throughout the country. Having a common system that all stakeholders at all levels use increases confidence in the data and builds a common base of data for decision making.

Logistics information portals may be part of a nationwide logistics system, or a stand-alone website that receives data from multiple systems. The portal should be easy to use, presenting key information in graphical format with the ability to drill-down to more details. Different stakeholders may be interested in different data. The portal may effectively target specific end user roles with the content and format that are most useful to them.

When should a logistic information portal be considered?

A logistic information portal should always be considered. Unfortunately, the same factors that drive the need for shared data are also those that make its implementation difficult. When particular interests have historically controlled specific supply chain information, it may be difficult to mount the political will to drive open information access. In this situation, international funding or a mandate for the portal, in concert with other data capacity building initiatives, may be required.

Often the implementation of a new information system is an opportunity to introduce a data portal. In this scenario, it is important to consider whether to implement a program-specific portal or attempt to create a national logistics portal. Program- or technology-specific portals may serve a short-term need, however over time, having multiple portals with different logistics data merely continues the practice of siloing data. When possible, a goal for logistic information portals should be to centralize information from multiple programs and information systems.

Portals should only be introduced with process changes and human resource capacity building that will support the portal's use. For example, national or sub-national teams responsible for specific aspects of supply chain performance may be established. These teams may be trained on using the portal as a daily, weekly, or monthly input into their supply chain management activities. Creation of

organizational processes for *use* of the portal is essential for achieving impact because without it, the data portal will languish unused.

BANGLADESH

In 2010, the SIAPS program worked in collaboration with the Ministry of Health and Family Welfare in Bangladesh to develop the Supply Chain Management Portal for family planning procurement and distribution. Prior to the project, electronic tools were deployed unevenly at the upazila (sub-district) level. Paper requisitions from 483 sub-districts had to be keyed in manually at the central level, and it took two months to produce a logistics report and supply chain plan. In addition, problems with procurement led to chronic stock-outs.

The goal of the project was to improve the monitoring, transparency, and efficiency of the family planning commodity tracking system. The centralized portal was implemented in parallel with an upazila-level system for electronic submission of stock on hand and consumption data. Central, regional, and upazila-level managers enter data into the system, which is then consolidated and uploaded into the portal.

The portal serves as an electronic dashboard for communicating real time supply chain and procurement data. A key feature of the portal is an interactive dashboard that presents easy-to-understand charts, maps, and tables on stock levels throughout the country to foster effective and efficient decision making. The portal is published on the Internet and anyone may request access to the system.

A 2013 evaluation of the project concluded that between 2009 and 2013, potential stock-outs (defined as less than 18 days of stock on hand) in districts and at SDPs were reduced by 85%. Actual stock-outs were also reduced. For example, there were no stock-outs of oral contraceptive pills since the project began in 2010. Procurement lead time was reduced by an average of 32.8 weeks. The portal has also enabled data-based decision making. At the national level, the portal enables regular interactive discussions among partners to prepare, review, revise, and update the national needs for contraceptives to revise forecasting, fund-gap analysis, and supply planning.

To learn more:

- DGFP Supply Chain Information Portal
- Innovation Supported by the Project in Bangladesh Receives Award

Conclusion

When reliable, timely and accurate data are a powerful tool to use for managing each of the supply chain functions. Streamlining data collection procedures to improve data quality is a vital part of the improvement process. However, enhancing the quality of data without making corresponding improvements in the existing capacity to analyze data or use them to drive decisions limits the effectiveness and reach of these activities. Systematic and appropriate attention to making improvements in these areas leads to increased efficiency and effectiveness in the whole supply chain, from quantification all the way to the SDP.

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