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Quarter 2, 2010

Supply Chain Management Newsletter

In Zimbabwe, staff persons unload boxes of health commodities from a truck.

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JULY 2010

This publication was produced for review by the U.S. Agency for International Development. It was prepared by the USAID | DELIVER PROJECT, Task Order 1.

U.S. Agency for International Development
www.usaid.gov

Welcome to the Quarter 2, 2010 installment of the quarterly USAID | DELIVER PROJECT Supply Chain Management E-Newsletter. The e-newsletter includes articles on supply chain best practices, public and private sector supply chain technology, project topics, and descriptions and evaluations of pilot programs. The e-newsletter is also available on the USAID | DELIVER PROJECT website at www.deliver.jsi.com under Resources>Publications>Logistics Briefs and Success Stories>Supply Chain Management E-Newsletter: Quarter 2, 2010.

The team welcomes your input! To submit an idea for a future newsletter, or to share information with our readers, please contact Kelly Hamblin, Program Officer, at khamblin@jsi.com.

Modeling Tools under Development

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Dominican Republic, May 2010: Working with the Community, a Strategy to Achieve Equity

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Transport Network Optimization: Features in Practice

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ArcMap and the Network Analyst extension—both are components of ArcGIS suite of tools from Environmental Systems Research Institute (ESRI). See the full article below.

Modeling Tools under Development

By Tessa Tan-Torres, WHO; Linda Allain, USAID | DELIVER PROJECT; Bruce Lee, University of Pittsburgh; and Carol Levin, PATH

If developing countries are to meet their populations' health needs, they must ensure that their supply chains are able to cope with the increased quantities, volumes, and cost of supplies. To help decision-makers understand the possible health and/or cost impacts of various supply chain design options, four different health commodity supply chain modeling initiatives are underway: (1) the logistics module of the Unified Health Model (UHM) sponsored by the United Nations (UN) Interagency Working Group on Costing, (2) the 2020 Supply Chain Model (USAID | DELIVER PROJECT), (3) the Vaccine Modeling Initiative (VMI) through the University of Pittsburgh, and (4) the vaccine logistics model at PATH-World Health Organization (WHO) with project Optimize. With the desire to demystify these four different yet complementary initiatives, this article explains the purpose, application, and expectations for each model.

The UHM is a tool for national planners to facilitate their strategic planning process. The model can be used to generate scenarios that display the financial requirements and expected mortality impact arising from alternative combinations of strategies. Its modules relate to key parts of the health system and major diseases and conditions, with particular focus on the health-related millennium development goals. The logistics module covers scenarios related to health logistics and supply chain. This module is being developed by LLamasoft using a simplified version of their "Supply Chain Guru" software package. The specific goal for this module is to take a forecast of commodity and logistic equipment requirements and basic product information and, taking into account the country context generate a supply chain network, logistics metrics, financial metrics, and measures of network service. Individual modules of the UHM will be piloted in third quarter 2010. The full model will be piloted in 2011 and then will be publicly available with full documentation and opportunities for training.

The 2020 Supply Chain Model is an activity undertaken by the USAID | DELIVER PROJECT in collaboration with other partners. The model will work from a "country view" in terms of morbidity patterns and the products required to meet treatment and prevention of prevailing diseases, as well as product needs for other public health initiatives such as family planning services, in the years 2020 to 2025. The 2020 model is designed to help policymakers accurately visualize and understand the most likely and possible situations facing them in ten years and make informed decisions about how to design their supply

chains to meet those needs. The model should be available in late June or early July 2010 with plans for dissemination in the fall of 2010.

The VMI, funded by the Bill & Melinda Gates Foundation and based at the University of Pittsburgh, aims to develop computer models and simulations to better understand vaccine development, distribution, and administration. The VMI is developing "HERMES," an interactive computer software tool that can rapidly create a simulation model of nearly any vaccine supply chain to the level of detail specified by the user (ranging from very simple representations to an extensively detailed representation of each vaccine unit, person, storage container, transport device, etc.). This software tool will be freely available and will include a graphical user interface which will allow users to input different characteristics of the supply chain and vaccines. Within minutes HERMES can construct a simulation model of the supply chain and the vaccines flowing through the chain. HERMES will be able to either stand alone or dock with other models such as disease models to simulate the resulting effects on on the items of interest to the end user (e.g., disease control, personnel allocation, inventory management, ordering policies, budgetary impact, etc.). The tool is currently in the verification and validation stage using data from Niger's Expanded Program on Immunization. VMI expects to release the software tool in 2011, along with documentation, training, and support to interested decision-makers.

Optimize is developing a vaccine supply chain logistic model in both Excel and ARENA®, a logistics simulation software. The model is designed to provide a visual presentation of the transport, cold chain, and warehouse components of the vaccines and injections supply chain and provide a platform for simulating changes and evaluating the associated costs. The model can be applied to any country setting, capturing the multiple functions and levels of the vaccine logistic supply chain. For example, in Vietnam, Optimize is piloting the introduction of small-volume passive cooling devices at the commune level. By modeling the costs and health impacts of this change and comparing it to baseline costs and impacts, government collaborators will be able to understand comparative costs and benefits of the proposed change, inform decisions and policies relating to the change, and engage in future vaccine supply chain system designs. Optimize is also supporting the other modeling initiatives through direct collaboration and participation on technical advisory groups.

How do the models compare?

Above all, each of these modeling tools is being created to help decision-makers make informed choices about supply chain design and management options. The models can answer difficult questions, such as: What are the trade-offs between storage and warehousing for health commodities? What is the cost impact of expanding the volume of drugs and vaccines in the supply chain? What is the cost impact of different supply chain design scenarios that will improve access to health commodities in remote areas? A summary of the models and their differentiating characteristics is provided in Table 1. Although there is considerable overlap among the models, they each serve a slightly different purpose, and their developers are working together to ensure that unnecessary repetition or reinvention is avoided.

Table 1: Summary of the Four Models

Model	Scope	Target countries	Procurement?	Measured outputs	Software	Developers
UHM	All health commodities, including vaccines	Will be made publicly available	Yes	Cost and health impact	Simplified "Supply Chain Guru" by LLamasoft	UN Interagency Working Group on Costing and LLamasoft
2020 Supply Chain Model	All health commodities, including vaccines	Developing countries	Yes	Cost, resource requirements and system performance	Modifed "Supply Chain Guru" by LLamasoft	USAID | DELIVER PROJECT
VMI's HERMES	Currently focused on vaccines and their accessories but can incorporate any product (e.g., medications)	Software tool that can be used to rapidly construct any supply chain in any country	Yes	Cost, health impact, and system performance (i.e., coverage, wastage, stock-outs, inventory levels, etc.,). Outputs are customizable by the end-user	Custom designed (developed in C++) with a customized graphical user interface	University of Pittsburgh and Pittsburgh Supercomputing Center
Optimize Supply Chain Model	Vaccines and temperature-sensitive drugs	Limited to project partners	No	Cost and system performance (i.e., coverage, wastage, stock-outs, etc.)	Microsoft Excel and ARENA®	Optimize, a WHO-PATH collaboration

Together, these four modeling initiatives provide countries systematic and complementary approaches to answer key questions about immunization and health systems for the future. To learn more about one of the modeling tools, please contact the organization directly:

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This article was previously published in the June 2010 *Optimize Newsletter*, a quarterly publication that highlights advances and innovations in health care logistics, technologies, and policy, with a focus on immunization.

Dominican Republic, May 2010: Working with the Community, a Strategy to Achieve Equity

As part of the effort to achieve contraceptive security (CS) for vulnerable groups, the USAID | DELIVER PROJECT works in the nine provinces of the Dominican Republic where unmet need for contraceptives is the highest.

Reducing unmet need means working to improve and to influence the demand for family planning services through community leaders and grassroots organizations. The CS committee envisions including community leaders as one of the steps to ensure that CS is more inclusive and to guarantee family planning equity by reaching vulnerable populations (rural communities, adolescents, migrants, gender-based violence survivors).

Within this process, the USAID | DELIVER PROJECT has forged a strategic alliance with the Peace Corps, an American institution that assigns young volunteers to hard-to-reach rural areas around the country. The objective of this initiative is to (1) increase access to and demand for reproductive health services at the service delivery points, (2) increase awareness of services at the community level by strengthening and training health committees, and (3) empowering communities to be key stakeholders in health promotion and oversight of services.

A family planning training in La Lima with community leaders, health promoters, and two Peace Corps volunteers.

With the strategy, I choose my life, which targets youth, the project and the Peach Corps train the volunteers in understanding life values, reducing teen pregnancy, delaying first sexual encounters, increasing self-esteem, setting life goals, preventing HIV, family planning, etc. Peace Corps volunteers and the USAID | DELIVER PROJECT, also provide assistance to health committees and conduct follow-up to trainings during their site visits.

A family planning training in El Jobo includes the local primary health unit physician, health committee members, and one Peace Corps volunteer.

The results from this training include an increase in the demand for services at the service delivery points, reactivation and/or creation of the six health committees, establishment of the family planning program logistics system in five primary care facilities, opening new programs (vaccination, family planning, prenatal care, tuberculosis care), and training new health promoters. The activities are being carried out at sites throughout the provinces of Montecristi, Santiago Rodríguez, Independencia, Pedernales, Bahoruco, and Hato Mayor. The participation of the service delivery points and the Sub-secretariat for Medical Assistance area coordinators, as well as the Directorate for Maternal and Child Health and Adolescents, have ensured the political will to achieve the proposed objectives.

Transport Network Optimization: Features in Practice

Technology advances over the past several years have enabled organizations to better plan and improve their distribution network. Commercial sector organizations ultimately seek to improve profit margin or market share; while agencies, such as city fire departments, security, water and electricity distribution, and public transportation, focus on improving services to the public. Network optimization software tools are still primarily applied in developed settings; however, as infrastructure improves, their use in developing countries to improve service delivery is increasing.

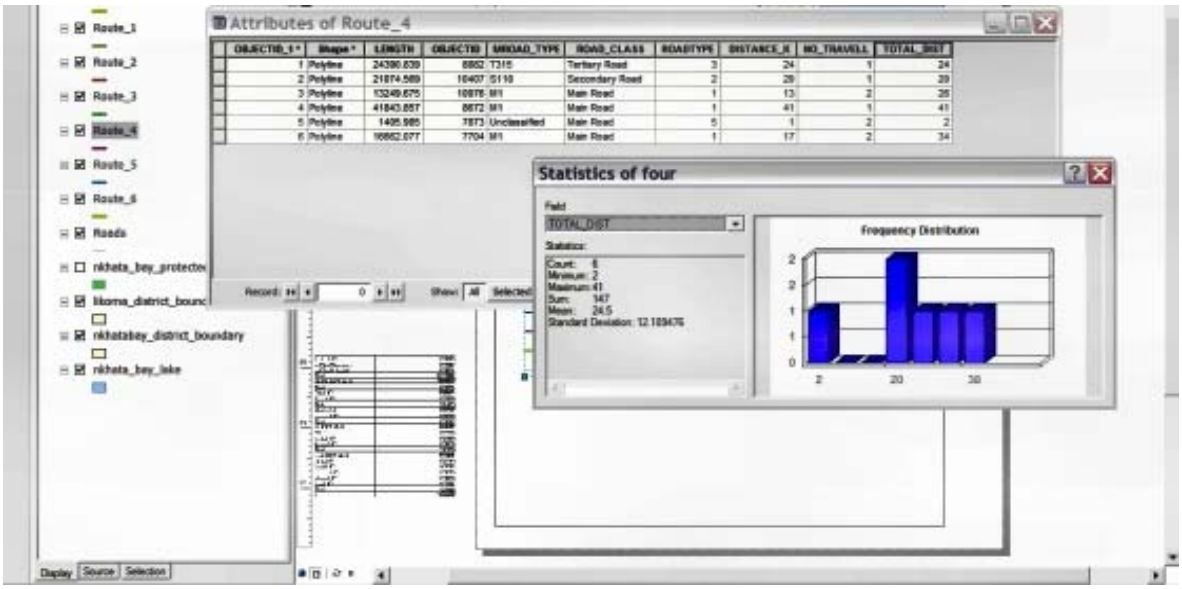
The USAID | DELIVER PROJECT recently explored some of the transport optimization features available in the ArcMap and the Network Analyst extension—both are components of ArcGIS suite of tools from Environmental Systems Research Institute (ESRI), one of the leading organizations that provide solutions for geographic information systems (GIS). The objective of the exercise in this article was to identify where improvements could be made in the existing distribution system of health products, e.g., from regional medical stores to health facilities. Compiling and analyzing data using transport optimization tools can be challenging if data is limited; however, the results can be very informative and useful.

Current Scenario Setup or Baseline Model

Similar to most network optimization tools, the first step was to replicate the existing scenario in the ArcMap tool. Before the current network was laid out, the data to be used had to be saved in GIS-specific file extensions. A GIS local agency usually does this. In this case, roads were ranked based on their conditions—from paved to dirt roads with driving restrictions; then the information was converted into projected centerline files, which allow distance measurements at the various segments (see figure 1). It was useful to measure each route's distance driven during the exercise. The list of the medical stores and the health facilities' geo-coordinated locations were entered and routes were converted into shape files. Additionally, information on fleet vehicle details—type or model, load capacity, and the volume of products supplied to each facility—was added. This information was entered into a GIS dataset called geodatabase.

Figure 1 shows road segment details—type of roads, one-way distance driven, or total distance driven — based on the frequency driven per segment for a specific route (NO_TRAVEL column). The Statistics chart shows the total distance driven for the route (see Sum field on Statistics column).

Figure 1. Attributes Table

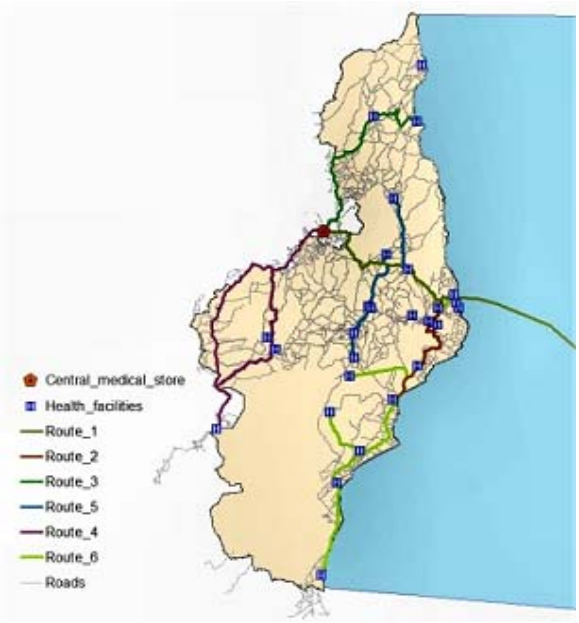


Analysis

Among some features explored in ArcMap, the ability to provide a graphic representation of a distribution network, although not unique to this tool, is helpful when analyzing different driven route patterns (see figure 2). It was possible to identify possible route consolidation by looking at the maps, without solving any simulation or automated problems. Some of the identified route changes were further validated using vehicle space utilization and road accessibility. Another important feature is the driven distance calculation, based on projected routes; this feature allowed a quick comparison between the actual and proposed routes, and the improved distances. Several other features available through ArcMap and Network Analyst are useful for transport network simulation and optimization, but they were not applied during this activity.

Figure 2 is an example of a projected distribution network using GIS. Color coded routes easily identify driving patterns within the region: location of facilities, roads/streets, boundaries, and lakes are also mapped.

Figure 2. Distribution Network Projected Using GIS



Some features found in the Network Analyst extension from ArcGIS could be useful for transport network analysis in developing country settings:

Vehicle Routing Problem (VRP): VRP will analyze the best routes, scheduling for drop offs/pick-ups, measure time restrictions, and transportation costs (including fuel cost, driver per diem, and vehicles amortization) for a fleet of vehicles. See figure 3 for a good example of VRP.

Routing: Models the best route from one location to another or analyzes the best route for multiple locations. The *best* route may mean the fastest or the shortest.

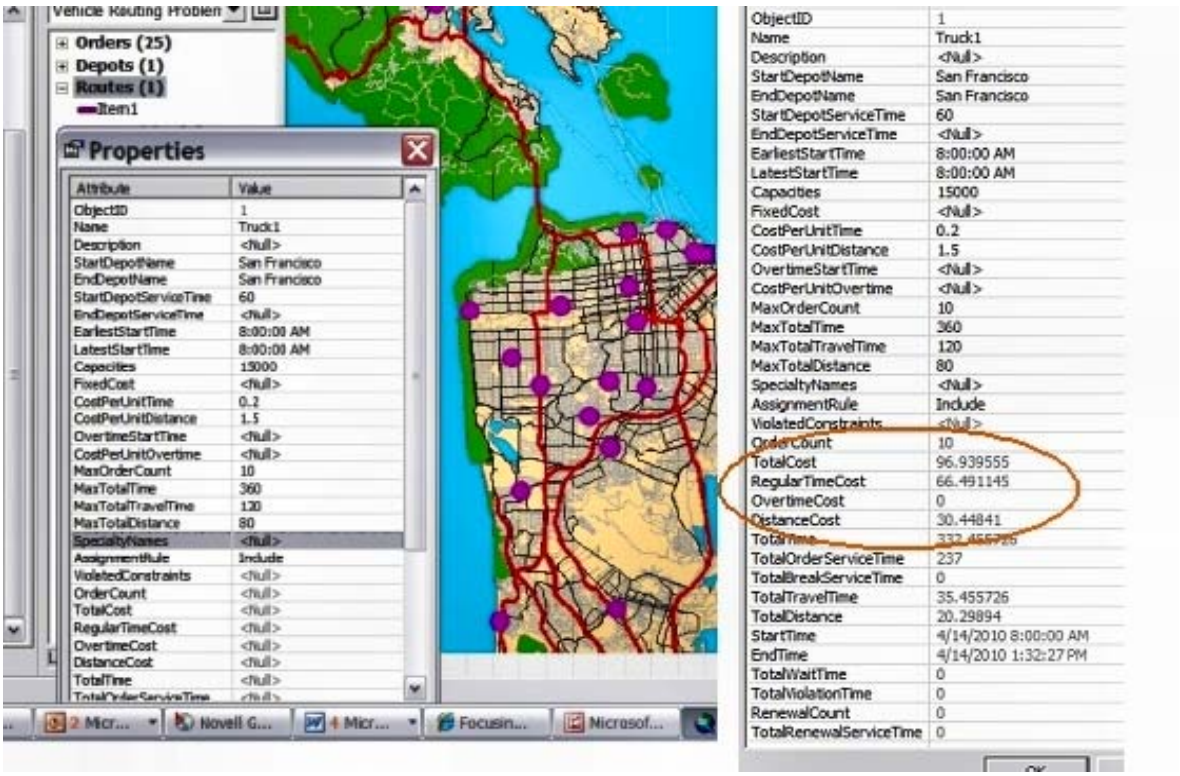
Service Area: Perform an analysis to determine areas within a specified driving time away from a facility of interest. Drive time may include one time (i.e., 30 minutes from a hospital) or multiple increments of time (i.e., 15 minute increments, up to three hours).

Driving Directions: This is calculated in both the route and vehicle routing problem tools. It includes the roads traveled, with turn-by-turn directions, time, and driving distance.

Multi-modal Network Support: For more complex environments, it can include multi-modal transportation networks (a combination of rail, road, sea, and air), or even public transportation and walking, in addition to modeling single-user drive times.

Figure 3 is a network analyst routing cost feature. The network analyst can calculate the total cost per route (see the TotalCost field). It also divides the labor cost (see RegularTimeCost) from other costs (Distance Cost). This information can also be applied to delimit facilities to be serviced within a certain driving range based on the cost of delivery (feature OD–Origin Destination–Cost Matrix in Network Analyst).

Figure 3. Network Analyst Routing Cost Feature



Opportunities and Challenges

GIS data and GIS-based tools are becoming more common in developing countries. For the tools to be useful, it is recommended to first identify what decision rules these solutions will support in a business or functional process. Network Analyst from ArcGIS can help decisionmakers determine the best national or regional transportation network based on available resources, and can compare it to the ideal network. This is an event-based tool; it is not designed for use in operations management. ArcGIS offers, however, a transportation management tool (TMS) solution, ArcLogistics.

The authors' views expressed in this publication do not necessarily reflect the views of the U.S. Agency for International Development or the United States Government.

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