Guatemala

Decentralization and Integration in the Health Logistics System

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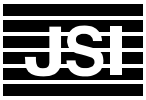

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Abstract
Decentralization has been one of the most far-reaching interventions in the health sector reform packages. Sectoral reform in Guatemala began in 1996 with the Health Services Improvement Program (HSIP), financed by ID and implemented by the Ministry of Health and Social Welfare (MSPAS). Among the goals of the reform were to expand health coverage with an emphasis on populations that lack access, increase the level of public expenditure, redirect resources based on efficiency and equity criteria, and generate an organized social response for mobilization and control of public resources.

Another key objective was the development of a new health care model based on decentralization, provision of a basic services package and community participation.

Using the decision space model, functions within the health logistics system were analyzed to measure the changes in performance indicators related to changes introduced by decentralization.

The study's indicators for high decision space were related to better performance indicators for budgeting, needs quantification, procurement, and assignment of personnel to logistics tasks. These are major functions in a logistics system and, for effectiveness, it is important to be able to make adjustments to local conditions. Conversely, the findings also suggest that some functions may perform better if they remain more centralized.

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Acronyms and Spanish Translations

BRES	*Balance, Requisicion y Envio de Suministros*
Centro de Salud	District Health Center
Compra Directa	direct purchase
Contracto Abierto	Open Contract
HEALTH AREA OFFICE	*Direccion de Áreas de Salud* (Health Area Office)
DS	decision space
EAS	*Equipo de Analisis de Suministros* (Supply Analysis Team)
EDL	essential drug list
GETSA	*Gestion y Technologia en Salud y Desarrollo* (Management and Technology in Health and Development)
HSPH	Harvard School of Public Health
IGSS	*Instituto Guatemalteco de Seguridad Social* (Guatemalan Social Security Institute)
JSI	John Snow, Inc.
LIAT	Logistics Indicators Assessment Tool
LMIS	logistics management information system
M&E	monitoring and evaluation
MSPAS	*Ministerio de Salud Publica y Asistencia Social* (Ministry of Heatlh)
NGO	nongovernmental organization
PNI	*Plan Nacional de Inmunizaciones* (National Immunization Program)
POA	*Plan Operativo Annual* (Annual Operational Plan)
PROAM	Drug Access Program
PS	*Puesto de Salud* (Health Post)
Tarjeta de Control de Inventarios	inventory control card
HEALTH FACILITY	service delivery point
USAID	U. S. Agency for International Development

Executive Summary

Decentralization and integration are often feared by logistics experts for their potentially disruptive effects to health logistics systems. John Snow, Inc. (JSI) DELIVER and the Harvard School of Public Health designed a series of studies to be implemented in six countries to assess the impact of decentralization on the performance of health logistics systems. This report presents the findings from the first country study in this series—Guatemala.

This study examined the impact of decentralization and integration of decision-making authority to district and locals levels on the logistics management and distribution of essential drugs, contraceptives, and vaccines. We used an approach and methodology to study the decentralization of health systems that we call the *decision space* approach. This approach empirically determines the range of choice for different functions of the logistics system that officials at different levels of the system report experiencing. It then evaluates how the reported range of choice relates to the performance of the logistics system.

The study was initiated in 2002 and implemented by a local consulting firm GETSA (*Gestion y Technologia en Salud y Desarrollo*—Management and Technology in Health and Development) in collaboration with JSI/DELIVER, Harvard School of Public Health, and officials from the Guatemalan Ministry of Health.

Guatemalan Health Logistics System

Guatemala initiated a series of health sector reforms in 1996 with the Health Services Improvement Program (HSIP), financed by IDB and implemented by the Ministry of Health and Social Welfare (MSPAS). These reforms sought to modernize the Guatemalan health system and included deconcentration of health care administration and services to the district health departments. The first phase of the Health Services Improvement Program was completed during the first half of 2001. These reforms included financial and procurement changes intended to induce more expeditious, transparent, and decentralized management of drug resources. One unusual and interesting part of the reform is the *Open Contract* (*Contracto Abierto*) under which MSPAS arranges for the purchase of drugs from pre-selected suppliers at relatively low, fixed prices. Although the Open Contract had been in place in some form for several years, the current mechanism has been in place since 1996. Formerly most decision making on procurement was made at the central level. Now, staff at lower levels have significant responsibilities for determining both the types and quantities of drugs to buy.

It should be noted that these reforms focused on the logistics of essential drugs. The logistic system for contraceptives and vaccines were not subject to the reforms and, as will be seen later in this report, these products remained relatively centralized compared to essential drugs.

Complementing this reform was a model for expanding health services by contracting nongovernmental organizations (NGOs). By early 2001, contracts had been signed with 89 NGOs, which covered 3.7 million people. The government established a different mechanism for supplying these NGOs—the Drug Access Program (PROAM), using central purchasing and economies of scale to give NGOs and community-led drug sales activities access to drugs at open market prices.

The Guatemalan system was also characterized by significant improvements in its needs quantification and reporting mechanism, and by major training programs in logistics management.

Using a methodology called "decision space" analysis, the study assessed the degree of decentralization and integration of the logistics system using two survey instruments in a sample of 281 facilities, representing all 22 departments (districts) in Guatemala. The instruments assessed the degree of decentralization and integration for seventeen specific logistics functions and evaluated the performance of the logistics system.

Findings

Although some functions still remain centralized, the decentralization process in Guatemala has resulted in a considerable degree of local control in the logistics system as perceived by informants in the system. As table 1 shows, the decision space for essential drugs varied considerably from function to function. *High* is defined as 75 percent of more facilities reporting that they had local authority over aspects of these functions.[1] (Only the decision space for drugs is shown here as the country's reforms focused on the logistics system for essential drugs; contraceptives and vaccines were not subject to the reforms and these products remain relatively centralized.)

Table 1. Degree of Decentralization and Logistics System Performance

Logistic Function	Degree of Decision Space for Drugs	Higher Logistics Performance	Lower Logistics Performance
Budgeting	High	X*	
Product Selection	Low	--	--
Needs quantification	High	X	
Procurement	High	X	
Inventory Control	Low	X [c]	X [m, v]
Transportation	High	X [m]	X [v]
LMIS	Low	X [v]	X [m, c]
Human Resources/Personnel	High	X	
Training	Low	--	--
Supervision	Medium	X**	X***
Monitoring and Evaluation	Low	--	--
Organizational Support	High	--	--
Treatment Protocols	Low	--	--

* Health Area Office and Hospitals only; **Health Area Office number of visits; *** quality of supervision visits; [m]=medicines, [c]=contraceptives, [v]=vaccines

Table 1 also includes the study findings about the relationship between decision space and logistic system performance. These findings suggest that decentralization may be advisable for some key functions. The study's indicators for high decision space were related to better performance on logistics system indicators for budgeting, needs quantification, procurement, and assignment of personnel to logistics tasks. These are major functions in a logistic system and the ability to make adjustments to local conditions is important for effectiveness. They also require that the personnel have significant skills. It is a testament to the effectiveness of the initiatives taken in Guatemala through the *Open Contract* and the use of NGOs that decentralization of these functions was related to better performance. It is also important to recognize that these functions are in themselves restricted centrally in some ways, e.g., limiting procurement mainly to the Open Contract[2] and

[1] Medium decision space = between 50% and 75% reporting high decision space low decision space = less than 50% reporting high decision space

[2] One part of the reform is the Contracto Abierto ("Open Contract") under which MPSP arranges purchases of drugs from pre-selected suppliers at relatively low, fixed prices.

central provision of LMIS forms and training. The survey could not assess whether these conditions were essential to the effectiveness of the performance of the functions.

Conversely, the findings also suggest that some functions might perform better if they remain more centralized. There were some negative or ambiguous findings for functions such as inventory control, transportation, logistics management information system (LMIS), and supervision. The lower/mixed performance in inventory control and LMIS for drugs suggests that these two functions are better maintained when they are centralized. Supervision may also require more centralized decisions. It may make sense to limit local choices over inventory control, LMIS, and supervision, because uniform and well-designed systems for these functions may not need to be adjusted to local conditions.

The study also found the same mixed results between integration and performance of the logistic system (see table 2).

Table 2. Degree of Integration and Logistics System Performance

Logistic Function	Degree of Integration for All Three Products (%)	Higher Logistics Performance	Lower Logistics Performance
Product Selection	25		X
Needs quantification	71	X	
Procurement	73		X@
Inventory Control	--		
Transportation	50	X@	
LMIS	30	X	
Human Resources/Personnel	64		
Supervision	64		

@ Related to facility type.

For integration of the three types of products, these results suggest posative results that needs quantification and the LMIS might be integrated with positive results. However, integrating product selection and procurement might produce poorer results. These findings are also logical. Needs quantification and LMIS are related functions that require similar skills for all three products. However, because selection and procurement of vaccines and contraceptives are vertically run activities, their integration may not be effective in the current system. It might require decentralization of these two functions for vaccines and contraceptives for integration to be more effective.

We are not able to draw conclusions about the other functions, either because they remain centralized or we were unable to find relationships between the decision space and performance indicators. Studies in other countries may find evidence for recommending these functions.

1. Introduction

Improved availability of affordable health commodities depends on effective logistics systems to move essential commodities down the supply chain to the service delivery point and, ultimately, to the end user. Initiatives of health reform, especially decentralizaiton of health systems, might possibly have an impact on logistics system performance. The United States Agency for International Development (USAID)-funded John Snow, Inc./DELIVER project seeks to determine how health system decentralization and integraton might affect the performance of logistics system functions. As management systems are decentralized and/or integrated, findings from these studies will be used to design interventions aimed at enhancing the performance of health logistics systems. The findings will increase the information available locally in the study countries and publicly to the international public health community.

This report presents the findings of the first country study—Guatemala**.** Guatemala was chosen based on a survey of DELIVER country representatives and advisors who reported on the levels of decentralization and the availability of performance data that could be evaluated. The study was initiated in 2002 and implemented by a local consulting firm GETSA (*Gestion y Technologia en Salud y Desarrollo*—Management and Technology in Health and Development) in collaboration with DELIVER, Harvard School of Public Health and officials from the Guatemalan Ministry of Health.

The report first presents a brief background of the Guatemalan health system, followed by a detailed section on the methodology of the study. The bulk of the report presents the findings of the levels of decision space and their relationship to the performance variables for each of the relevant seventeen functions of the logistics system. A short section follows with the findings of the degree of integration of the medicine, contraceptive, and vaccine logistics system and its relationship to performance for each major function. The report concludes with an overall assessment of how increased decentralization and integration are related to performance.

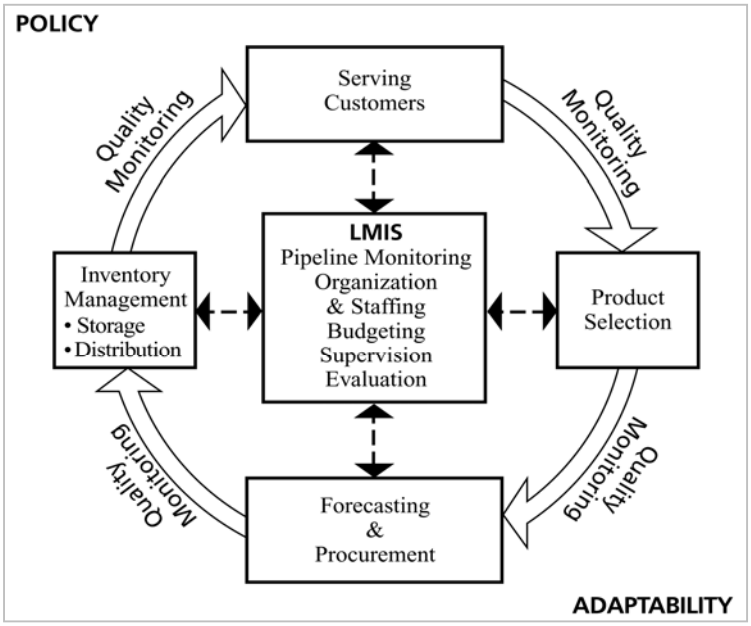
Conceptual Framework

This exploratory study attempts to measure the extent of decentralization and integration in the system by reviewing the actual local decision making at various levels of the health system, especially as one moves to the periphery or service delivery points. The health logistics system is analyzed by functions, and decision making in each of these functions are determined; while also analyzing selected indicators of performance that related to these functions.

The conceptual framework for this study is based on the *decision space* approach to decentralization, which was developed by T. J. Bossert (1998) of the Harvard School of Public Health. This approach is grounded in the principal-agent framework used by ecnomists and political scientists to study diverse institutional issues involving central and peripheral actors, and uses a comparative analytical tool that focuses on the range of choice allowed in the decentralization process. The conceptual base does not try to quantify formal decision space, but rather offers a preliminary characterization of its range as narrow, moderate, and wide, within the array of health logistics system functions.

The logistics functions under study are derived from the logistics cycle, which identifies some of the critical functions in the cycle as depicted in figure 1. From this cycle, and definition of additional discrete functions, a *decision space map* was developed to examine the effects of decision making on logistics.

Figure 1.
The Logistics Cycle



Objectives of the Study

The main objective of the study was to respond to the research questions posed by the concept paper for this study. (Bossert et al. 2002). The questions posed were—

- How does health reform that includes decentralization of health systems and management impact the performance of logistics systems?
- Are different types of decentralization (devolved versus deconcentrated) likely to have different effects on logistic system performance? How?
- Are different degrees of *decision space* likely to have different effects on logistics system performance? How?
- Are some elements of logistics functions—product selection, needs quantification, procurement, storage, distribution, use, and logistics information management—affected in diffferent ways by decentralization? If so, how?
- Are some elements of logistics system performance (e.g., availability versus efficiency versus affordability) more likely to be impacted by decentralization than other elements?
- Is integration of logistics systems a complicating factor that exaggerates or modifies the effects of decentralization on logistics system performance?

2. Background

Guatemalan Health Sector Reforms

In 2000, Guatemala's population was estimated at 12.6 million inhabitants living in the capital, Guatemala city, which is 40 percent in urban areas and 60 percent in rural areas. A 1998 survey estimated that 2.8 million were living in poverty, with per capita income of less than USD$1.00 per day. Poverty is concentrated in rural areas and indigenous populations.[3]

Life expectancy at birth for both sexes was estimated at 66 years for the five-year period ending in 2005. Through this period, overall birth and mortality rates steadily declined. Communicable diseases account for more than one quarter of deaths. Infant mortality is falling, with 47.0 deaths per 1,000 live births recorded in 1999. The leading causes are pneumonias and bronchopneumonias, diarrheal diseases, premature births, and non-specific septicemia. Among emerging and re-emerging diseases, there is an erratic downward trend in measles; cholera began to decline in 1993; and malaria, dengue, and HIV/AIDS are on the rise.

Sectoral reform, as such, began in 1996 with the Health Services Improvement Program (HSIP) financed by IDB and implemented by the Ministry of Health and Social Welfare (MSPAS). The top four objectives of the HSIP are to—

- Expand health coverage with emphasis on populations that lack access.
- Increase the level of public expenditure.
- Redirect resources based on efficiency and equity criteria.
- Generate an organized social response for mobilization and control of public resources.

Among the other objectives that the program pursues is—

- Development of a new health care model based on decentralization, provision of a basic services package, and community participation.

These reforms sought to modernize the Guatemalan health system, and included deconcentration of health care administration and services to the district health departments. The first phase of the Health Services Improvement Program was completed during the first half of 2001. These reforms included financial and procurement changes intended to induce more expeditious, transparent, and decentralized management of drug resources. One part of the reform is the *Contracto Abierto* (Open Contract) under which MSPAS arranges purchases of drugs from pre-selected suppliers at relatively low, fixed prices. Although the *Contracto Abierto* had been in place, in some form, for several years, the current mechanism has been in place since 1996. Formerly most decision making on procurement was made at the central level. Now staff at lower levels have significant responsibilities for determining both the types and quantities of drugs to buy. It should be noted that these reforms focused on the logistics of essential drugs. The logistic system for contraceptives and vaccines were not subject to the reforms and, as will be seen later in this report, these products remained relatively centralized compared to essential drugs.

[3] This paragraph and other data in this section is taken directly from the PAHO (see references).

Complementing this reform was a model for expanding health services by contracting NGOs. By early 2001, contracts had been signed with 89 NGOs, covering 3.7 million people. The government established a different mechanism for supplying these NGOs—the Drug Access Program (PROAM), using central purchasing and economies of scale to give NGOs and community-led drug sales activities access to drugs at open market prices. (Bossert 2002).

Health Services Delivery System

Guatemala's health sector has four major components. The public sector includes the Ministry of Health and Social Welfare and the Guatemalan Social Security Institute (IGSS). The private sector is divided into for-profit and non-profit segments. The for-profit segment includes physicians, hospitals, clinics, laboratories, and pharmacies. The non-profit sector includes the NGOs.

The relative sizes of these components can be discerned by comparing the total expenditures for each. For 1998, MSPAS expenditures were approximately $124 million, IGSS was $178 million, and private expenditure was $518 million. The historical trend has been toward segmenting the population according to its ability to pay or its level of activity in the formal economy. The poor and indigent tend to be served by MSPAS, wage earners by the IGSS, and wealthier populations by the private sector. The wealthiest decile of households accounts for 30 percent of total health expenditure.

Ministry of Health and Social Welfare: The MSPAS is divided into two parts—the central and local offices. The central level directs all central programs, regulates and controls human resources, and monitors district Health Area Office (*Direcciones de Áreas de Salud-Health* Area Offices) finances. The MSPAS system is based on 24 Health Area Offices, which administer a total of 278 Districts for an average 12 per Health Area Office. The Districts each have a District Health Center, Distict Office, and Health Posts. The District Offices are the managers and supervisors, while the District Health Centers (*Centros de Salud*) deliver health care services.[4] The Health Area Offices ordinarily do not provide health services, but instead, serve as the key intermediary between the Central Ministry and local facilities. The central level distributes funds to the Health Area Office three times a year and the Health Area Office coordinates distribution of drugs and other supplies to the district and sub-district levels. Based on the information given above, the typical Health Area Office is responsible for 12 District Health Centers and 42 health posts. In addition to these facilities, there are 43 hospitals. Nominally, the hospitals are under the authority of the Health Area Office in which they are located, but, in reality, they report to the national level.

Guatemala Institute of Social Security: Instituto Guatemalteco de Seguridad Social (IGSS) is an autonomous institution financed by mandatory contributions from worker and employers, based on wages. The IGSS network includes 24 hospitals, 30 primary care facilities, 18 first aid stations, and five wards in national hospitals. Of these, 6 hospitals and 10 primary care facilities are located in the capital, Guatemala City. To expand coverage, IGSS is contracting services from for-profit private providers, especially for elective procedures and outpatient consultations in medical specialties.

Non-profit Private Sector: The non-profit sector is made up of NGOs. There are approximately 1,100 NGOS in Guatemala. Nine hundred of these are country-based and of these, about 200 engage in health activities. The activities of health NGOs are mainly preventive in nature; only about 40 of them provide clinical services. NGOs are important partners in the effort to expand coverage of primary care services, using public financing from the MSPAS. In early 2000, MSPAS had agreements with 89 NGOs, valued at $12.5 million, and provided services in 21 of 27 health areas to an estimated 3.7 million beneficiaries through 2,500

[4] Because District Health Centers and District Offices are considered the same level, for the purposes of this study one interview was conducted for both locations. The District Office answered the managerial questions while the health centers and health center warehouses were the source for counts of essential drugs, vaccines, and contraceptives.

community centers. The contracts require the NGOs to provide specific services from the Basic Services Package based on adjusted per capita registered beneficiaries. The adjustments are based on negotiations and input costs, such as transport (LaForgia 2000). Initially, all functions related to contracting the NGOs took place at the central level; however, currently, most proposals originate at the Area and District levels**.** In a few cases, municipalities have sent proposals. The central ministry's approval rate for these proposals is relatively high.

Commodity Distribution Systems

The study focused on distribution systems for essential drugs, contraceptives, and vaccines in the public sector. Four systems currently operate for these commodities. For essential drugs, there are the Open Contract and the Extension of Access to Drugs Program (PROAM). The Open Contract provides drugs for MSPAS facilities, and PROAM for NGOs and community-based activities. The Reproductive Health Program distributes contraceptives and the National Immunization Program distributes vaccines. The distribution systems are usually separately managed; though during the past two years there have been efforts to integrate some logistics functions at lower levels (GETSA 2003).

The Open Contract: Originally set up in 1996, this mechanism was intended to allow MSPAS service providers access to drugs from an approved list of commercial suppliers at pre-negotiated, competitive prices. As the Open Contract currently functions, the Ministry of Finance—Contracts and State Purchasing Regulatory Directorate pre-qualifies the suppliers and negotiates the unit prices. The Treasurer's Office, under the Budget Department of the General administrative-financial Directorate, manages the money, and provides the Health Area Office and hospitals with funds every quarter. Using these funds, the Health Area Offices and hospitals place orders directly from the suppliers, who deliver to the area warehouses. The Health Area Offices manage redistribution from the area warehouse on down.

Extension of Access to Drugs Program: The NGOs receive essential drugs through the Extension of Access to Drugs Program. The NGO agreements include basic drug lists. PROAM purchases the drugs at low prices and sells them to the NGOS for free dispensing to patients. Another PROAM activity provides seed money to NGOs for revolving drug funds that sell their products through small retail outlets. Hospitals and Health Area Office sometimes purchase drugs from PROAM when Open Contract suppliers cannot provide certain products. One important difference between the Open Contract and PROAM is that Open Contract suppliers ship their products directly to Health Area Office and hospitals, and there is no central storage within MSPAS. PROAM, however, does have a central storage facility operated MSPAS.

The Ministry of Health also implemented a new logistics management information system in 1997. Under this system, each district utilizes information from the health information system to assess its pharmaceutical needs, and is responsible for procurement and distribution of essential medicines. Since 1998, the government of Guatemala has collaborated with local NGOs and private sector groups to facilitate health service and pharmaceutical deliveries to rural Guatemalan communities.

Each facility is supposed to use the Supply Balance, Need and Delivery Worksheet (*Balance*, *Requisicion y Envio de Suministros*-BRES) to calculate their needs for drugs, contraceptives, and vaccines. The BRES is regulated and compulsory. This worksheet is meant to assist each facility in ordering the correct quantity of supplies.

3. Study Methodology

The Guatemala study consisted of a two-part survey. One part of the survey assessed the degree of decentralization and integration of the current system using the Decision Space Assessment questionnaire. Data collection on decision space involved semi-structured interviews with key participants in the logistics system at the central and local levels. The *decision space* approach was adapted by HSPH and DELIVER for this particular study to assess the degree of decision space granted in the logistic system. A pre-established set of possible responses define whether a facility has a high- or low-degree of choice in executing/managing each of the logistics system functions.

The second part of survey assessed the current performance of the logistic system using DELIVER's Logistics Indicators Assessment Tool (LIAT). The study team modified an existing LIAT assessment tool that had been used in a logistics system assessment in Guatemala in 2001. The information collected included data from the reporting form *Balance, Registro e Envio de Suministro (BRES)*, direct observation of warehouse conditions, and physical count of the health commodities in facility stores and clinics. Table 3 outlines the types of key informants interviewed and documents reviewed at each level.

Table 3. Summary of Survey Information Sources

Data Collection Method	Source of Information
Interviews	**Health Area Office**: Director, Head Nurse, Manager **Hospitals**: Director, Head Nurse, Manager, Pharmacist, those in charge of pharmacy/*bodega*. **Health Center**: Director of the Health Center, Head Nurse, Pharmacist, those in charge of pharmacy/*bodega*, Auxiliary Nurse. **Health Posts**: Auxiliary Nurses NGOs: Director, Manager, those in charge of bodega.
Observations	Storage sites for health commodities
Document Review	• Product Stock Cards • Daily Activity Register • Requisition orders • BRES and shipping vouchers • Programmatic Information Forms for Reproductive Health Program • Vaccine records • Summary consumption chart and PNI (National Immunization Program).

The local firm, GETSA, was responsible for hiring and training the data collectors; organizing and supervising data collection, and data entry; and preparing a preliminary report. Eight experienced professionals conducted the interviews in two-person teams. The supervisor of each interviewing team was responsible for verifying data quality, editing the interviews at the end of each day, and ensuring that all tasks were carried out at the interview. The one-week training course included an overview of the methodology and study purpose, detailed review and practice of the instruments, and how to conduct interviews. Following the

training, the instruments were pilot-tested in nine facilities (two at each level and one NGO). Personnel from GETSA, Harvard, JSI/DELIVER, and MSPAS made final revisions to the instruments.

Data collection was completed between July 23 to September 5, 2002. All data were coded and initially entered into EpiInfo 2000. A double-entry technique was used to ensure data quality. After data entry and verification, the data were transferred to SAS and Stata for further analysis in the United States.

The study sample covered all 22 departments in the country.[5] A total of 281 facilities were surveyed, with the number of each type of facility proportional to the total number of facilities at that level. Health Centers and Health Posts were randomly selected based on the population size of each department. Hospitals were selected if they offered outpatient reproductive services. GETSA and Ministry officials selected the largest NGOs with programs in the country. and overall information was collected on 23 percent of the country's health facilities. Other statistics of the study sampling technique are detailed later.[6] Table 4 shows the final sample selected.

Table 4. Decentralization Study Sample—Guatemala, 2002

Facility Type	Country Total	Survey Sample Size	Percentage (%) of Total Facilities
Health Area Office	22	22	100
Hospitals*	10	10	100
Health Centers	278	57	12
Health Posts	924	150	8
NGOs	95	42	7
TOTAL	1,236	281	23

* The total amount of hospitals in the country includes only those hospitals that offer reproductive health services.

[5] One Health Area Office was randomly selected for those areas (*Petén y Quiché*) that had more than one.
[6] Confidence level: 95%; Variance: .5 (50% proportion rate); Margin of Loss: 10%.

4. Findings

Analysis and Presentation

Each logistics function is examined separately in the order shown in the logistics cycle:

1. Budgeting
2. Product selection
3. Needs quantification
4. Procurement
5. Logistics Management Information System (LMIS)
6. Inventory management: Warehousing and Distribution
7. Personnel, Supervision, Staffing, Organization

The analysis within each function begins with a list of the decision space and logistic system performance indicators that were examined for that function. The first variables presented are the decision space variables for that function. Decision space is a proxy measure for the degree of decentralization and is dichotomized into *high* decision space and *low* decision space. The relationship between decision space for each function and each of the performance indicators is analyzed using a paired T-test on the equality of means (see description). The number of facilities (N) included in the decision space analysis is shown for each function. Any N less than the total 281 means either that there were missing values (some facilities did not answer) or decision space in this function was not applicable to an entire level of facilities. For example, health posts were not included in the budgeting analysis because they have no control over this function, and training decision space questions were only asked to Health Area Office and hospitals.

Using a T-test for statistical significance, the difference between means of two groups (different decision space categories) are compared. The null hypothesis for each test is that the mean of the outcome variable is equal for both groups. A value called a T-test and a p-value helps us determine if this null hypothesis is statistically significant. If the T-test is large enough and the p-value is small enough, we can reject the null hypothesis and conclude that the means for the groups are statistically different. We will reject the null *with certainty* for any p-value of less than 0.10.

Although we have tested all possible relationships between degrees of decentralization or integration and performance variables, we report only those relationships that are shown to be statistically significant. For the performance variables that were not significantly related to the decentralization or integration variables, we present a description of the variable and the frequencies found in the survey to provide information on the current performance of the system and for comparisons with other studies.

Decentralization

The full Decision Space Map for decentralization is summarized in annex A. The map includes all decision space and logistic performance indicators for every function in the logistics cycle. Also shown in the map is the percentage of facilities that reported a high or low decision space for that function. When there was more than one indicator of decision space, the percentages reported for each function represent the average of all

indicators. All percentages are for essential drugs, as they were the subject of most decentralization reforms: decision space for contraceptives and vaccines was measured for fewer functions. Appendix B contains most of the results for contraceptives and vaccines.

The following section describes the degrees of decision space for each of the 17 functions reported by the decentralization survey and the relationship of decision space to performance indicators for those functions.

Finance, Cost Recovery, and Budgeting

In Guatemala, financing of the drugs, contraceptives, and vaccines moving through MSPAS supply chains is highly centralized. All funding originates with the government or with donors who work through the government. Under this system, there is little choice in terms of finance for local levels. For instance, the fiscal year is from September to August and the Central Ministry distributes funds to the Health Area Office and hospitals on a trimester basis. These funds are distributed to local districts, which have moderate discretion over their use. Health Area Offices, hospitals, and District clinics are permitted to purchase drugs and supplies with these funds, but those decisions are supposed to be reviewed by MSPAS. MSPAS maintains the Open Contract with an approved list of suppliers and Health Area Office, and hospitals may use the funds in budget line 263 to purchase drugs from these suppliers. The Health Centers and the Health Posts do not oversee any health funds.

Prior to 1999, all decisions about drug purchases through the Open Contract were made at the central level. Beginning in that year, however, the Health Area Office hospitals gained the right to determine types and quantities of drugs to purchase. These decisions must, however, be based on the planning and budgeting process, Annual Operating Plans (POA); and these plans and budgets are subject to review and approval by the Central Ministry. However, the Health Area Office do, in practice, have considerable discretion in determining program content. The planning and budgeting process is intended to be participatory. District level decision makers begin meeting with Health Facility staff in March and by May prepare a draft plan and budget. In June and July all districts are represented at meetings at the Health Area Office, and the participants prepare the plan for the entire Health Area Office. The Health Area Office submits the plan to the central level for approval near August. From there, the central MSPAS distributes the first trimester's funds. And, from that point, Health Area Office and hospitals are free to purchase drugs from the assigned funds using the Open Contract.[7]

There is no cost recovery within the MSPAS system. In 1998, MSPAS adopted a policy allowing user fees for *those who can pay for services*. However, this act was not followed by systematic development of systems for charging user fees and managing the revenues. In fact, several hospitals attempted user fees for laboratory and radiological services and, because of complaints, they were obliged to eliminate those fees. At present, there are no charges for drugs, contraceptives or vaccines at MSPAS clinical facilities. NGOs receiving drugs from PROAM based on their per capita payments from MSPAS may not charge for the products that they dispense. However, community-managed drug sale operations do charge for the drugs that they purchase from PROAM.

From this description, we concluded that the sources of financing and decisions about cost recovery were fully centralized, with no decision space allowed at lower levels. We, therefore, examined only budgeting. Two decision space indicators were examined:

1. Make budgetary decisions on their own: *High* decision space was if they make decisions on their own, *low* if a higher authority makes these decisions for them.

[7] Note that actual month of trimester fund distribution is not known.

2. What actions are taken if budgets are reduced*: High* decision space was defined as facilities that modify their Annual Operational Plan (POA) and make budget transfers if budgets are cut. *Low* decision space was defined as facilities that prioritize their tracer drugs, reduce all medicines to equal amounts, and give favor priority facilities with higher demand.

The logistics system performance variable was the percentage of their planned budget that was approved. Facilities provided information to allow us to calculate what percentage of their planned budgets were approved.

Table 5 shows that budgetary decision making for drugs was high at all levels (except for health posts because they do not participate in budgeting). NGOs had less budgetary decision space, but it still was significant at three out of four facilities. There was a high approval rate (88 percent) for planned budgets.

Table 5. Decision Space for Budgeting (Drugs) and Related Performance Indicators

	Decision Space Indicators (high DS facilities only)		Performance Indicator (all facilities)
Facility Type	**Make their own budgetary decisions (%)**	**Modify POA & make transfers if budgets are cut (%)**	**Percentage (%) of planned budget that was approved**
Health Area Office	100 (22)	41 (9)	81 (18)
Hospitals	100 (10)	30 (3)	77 (7)
NGO	73 (24)	24 (6)	96 (24)
Health Centers	90 (51)	Not applicable	Not applicable
Health Posts	Not applicable	Not applicable	Not applicable
Total	88 (107/122)	32 (18/57)	88 (49)

We found a positive relationship between the percentage of planned budget that was approved and whether a facility had a high decision space for what they do if budgets are cut (see table 6). This relationship was only for hospitals and Health Area Offices, because they were the only levels that reported on this indicator.

Table 6. Relationship between Decision Space for Budgeting and Performance Indicator

Decision Space Indicator	Percentage (%) of Planned Budget That Is Approved (N)
Modify POA and make transfers if budgets are cut (High DS)	91 (9)
Rationalize Drug stocks (Low DS)	74 (16)
Ttest	t=-1.80 p=0.07 N=25

Product Selection

Most drugs entering the MSPAS services delivery system originate in purchases through the CA. The specific list of drug products that hospitals, Health Area Offices and districts may purchase is based, for the most part, on the IGSS basic drug list (essential drug list) (PAHO). MSPAS, IGSS, and the Ministry of Finance (as the regulatory entity for State-financed procurements) all require that drug products be limited to products on this list. Ideally, to promote rational product selection and subsequent prescribing, the contents of essential drug lists should be based on standard treatment guidelines. In Guatemala, the only standard treatment guidelines with widespread application are those that cover the health problems and conditions included in the basic services package provided by the NGOs.

The IGSS essential drug list is structured by *level of use*; that is, separate and progressively longer lists at each successive higher level of the system. Thus, community health posts with their preventive orientations and minimally trained staffs have the shortest lists; while hospitals, with their extensive capacities for diagnoses and treatment, have the longest lists. Health posts and health centers fall between, in accordance with their missions. Within the context of the HSR program, this concept has been further ramified. Since 1997, hospitals have had *pharmaceutical committees* and Health Area Offices and district Health Centers have had *supply analysis teams*, which are to assist with the management of drugs, contraceptives, and vaccines. One of the major functions granted to these groups has been the responsibility for defining each establishment's own basic list of medicines, according to the missions of the health facilities concerned and the needs of geographic areas covered.

For health posts and health centers, staff must stay entirely within the limits of the levels of use specified by the IGSS drug list. Hospitals and Health Area Office may request products not on the official lists, but, for this, they must request waivers from the Health Area Office financial officers. Waivers are also required for purchases from suppliers not pre-approved by the Open Contract. One reason for granting permission to use a non-Open Contract supplier would be if the Open Contract suppliers for certain products cannot supply them.

There is a general assumption that the different basic drug lists will generally conform to the levels of use specified by the IGSS drug list, and deviations will be the exception and not the rule. However, while the IGSS is an important determinant of the boundaries of product selection, it is not the only one. The actual list of products to be made available through the Open Contract is also very important. Over time, some not on the IGSS list have been added to the Open Contract. This is done at the central level year-by-year, based on what is listed on the IGSS list and what additional drugs are requested by hospitals, Health Area Offices, and districts. While this may not translate directly to decision space for these establishments, the post-reform process does appear to take into account their stated preferences.

To measure decision space for product selection, we examined two variables:

1. *Make their own decisions about product selection*: Decision space is defined as *high* if key personnel in that facility selected medicines for their essential drug list. *Low* decision space is defined as someone from a higher level selects medicines for the essential drug list of that facility.

2. Have their own essential drug list.

The logistics system performance indicator was the *number of products on the essential drug list.*

We found a fairly high level of selection decision space for all administrative levels in the public service (table 7). All hospitals and Health Area Offices (except one) selected their own medicines for their essential drug lists. Ninety percent of health centers made their own selection decisions. Only 39 percent of NGOs were able to choose their own drugs. These responses correspond with another question about whether there had been any change in decision authority since the 1997 changes: 72 percent of respondents reported they could make more of their own decisions now.

We did not find a statistical relationship between decision space and the number of products on the essential drug list.

Table 7. Decision Space for Product Selection (Drugs) and Related Performance Indicators

Facility Type	Decision Space Indicators (high DS facilities only)		Performance Indicator (all facilities)
	Select their own products (%)	Have their own EDL (%)	Average number of products on own EDL
Health Area Office	95 (21)	82 (18)	110 (18)
Hospitals	100 (10)	100 (10)	173 (10)
NGO	39 (12)	44 (18)	31 (19)
Health Centers	90 (43)	53 (30)	73 (30)
Health Posts	88 (15)	0 (13)	49 (14)
Total	79 (101/128)	32 (89/279)	78 (91)

Needs Quantification

For essential drugs, needs quantification is done once a year and updated each trimester. As described in the section on Finance and Cost Recovery, since 1999 hospitals and Health Area Offices have had the right to plan their own drug needs. The Finance and Budgeting section summarizes a schedule of *annual operational plan events*. District staff meet with Health Facility staff in March and prepare draft plans by May. In June and July, Health Area Office and District decision makers meet and finalize the plan for the entire Health Area Office. Based on the plan, staff at the Health Area Office (or hospital) level use the standard manual for needs quantification to quantify their drug needs, which takes into account both the operational plan itself and the amount of funds allocated from central level. The primary sources of information for quantification are the *Balance, Requisition and Issue of Supplies* (BRES) form prepared by facility staff.

Needs quantification for contraceptives is separate and centralized. Needs quantification of vaccines is only a formula exercise—different levels provide the center with data for estimating their needs based on estimated population age groups and estimated population that was not vaccinated in the previous year.

For needs quantification, the decision space indicator was—

Participate in needs quantification of essential drugs needs: High decision space was defined as personnel participating in quantifying their essential drug needs, *low* if a higher authority did the needs quantification for them.

Needs quantification performance indicators:

1. Needs quantification accuracy: This is the percentage a facility estimated as required and what was actually consumed/dispensed to clients. For example, if the forecast accuracy is 50 percent, they consumed only half the amount they forecasted as needed. A negative percentage means that a facility consumed more than their forecast.

2. Use logistics data to forecast requirements:

   - mean percentage of tracer products stocked out on the day of the visit
   - mean percentage of tracer products stocked out in the last six months
   - average number of days per stockout (of products stocked out in last six months).

Table 8 presents the results for drugs; annex B contains the results for contraceptives and vaccines. Most facilities did their own needs quantification, therefore, there was insufficient variation to examine if needs quantification decision space was related to needs quantification accuracy; use of logistics data to forecast; and stockouts during the last six months, of both medicines and contraceptives.

Table 8. Decision Space for Needs Quantification (Drugs) and Related Performance Indicators

	Decision Space Indicator (high DS facilities only)	Logistic Performance Indicators (all facilities)			
Facility type	**Participate in needs quantification of drugs needs (%)**	**Needs quantification accuracy (drugs) (%)**	**Used logistics data for needs quantification (%)**	**Mean percent of tracer products stocked out on day of visit (%)**	**Mean percent of tracer products stocked out in last 6 months (%)**
Health Area Office	100 (22)	24 (11)	60 (12)	14 (21)	26 (21)
Hospitals	100 (10)	46% (4)	33 (2)	5 (10)	11 (10)
NGO	78 (33)	Not applicable	44 (7)	27 (33)	24 (31)
Health Centers	95 (54)	-23(43)	72 (39)	18 (54)	34 (57)
Health Posts	90 (135)	-27 (100)	60 (82)	18 (142)	37 (146)
Total	91 (254/280)	-20 (158)	61 (142)	18 (260)	33 (265)

Needs quantification decision space was statistically related to stockouts at the time of the visit and over the last six months. No other performance variables were statistically significant. Table 9 shows the results for stockouts. Those with higher decision space in needs quantification had fewer drug products stocked out at the time of the visit and during the last six months. NGOs were not included in this analysis. We did not find a similar relationship for contraceptives or vaccines.

Table 9. Relationship between Decision Space in Needs Quantification and Product Availability (Drugs)

Decision Space Indicator	**Mean Percentage (%) of Tracer Products Stocked Out on Day of Visit (N)**
Participate in needs quantification of essential drugs needs (High DS)	18 (254)
Do not participate in needs quantification of essential drugs needs (Low DS)	26 (26)
T test	t=1.6 p=0.09 N=259

The relationship between participation in needs quantification and stockouts of drugs during the last six months was not statistically significant (p value=0.15). However, facilities that had high decision space in needs quantification did have fewer stockouts of medicine in the last six months: 33 percent (N=242) compared to 41percent (N=22) in the facilities with low decision space.

Procurement

The Open Contract has been in use since 1996 but, prior to 1999, most decisions about the quantities of drugs to procure were made by the Central Ministry. Since that year, the right to determine the types and quantities of drugs to buy through the Open Contract has been delegated to the hospitals and Health Area Offices. These sites then obligate funds to the Health Area Office suppliers every three months, based on the drugs they need. There are anecdotal reports that sometimes the central disbursements are late and that, consequently, the orders to suppliers and subsequent deliveries of stock are also late.

Suppliers on the Open Contract ship directly to the purchasers or the purchaser's designated recipients. The Health Area Offices have warehouses and about 90 percent of all deliveries go to this level for subsequent redistribution to districts and health facilities. In some cases, however, the suppliers do ship directly to the districts and even to health facilities.

There are situations in which hospitals and Health Area Office have the prerogative purchase drugs outside the Open Contract. One such situation would be when designated suppliers are unable to supply the drugs requested. Another would be when the purchaser wants a product not on the Open Contract. In these cases, the purchasing office must request waivers from the Area Financial Office.

Contraceptives and vaccines are supplied centrally and are not subject to the Open Contract. Local authorities have no real role in the procurement of these products. The supply of contraceptives depends largely on donors.

The decision space indicators examined were—

1. make own procurement decisions for medicines
2. made purchases off the EDL within the Open Contract
3. made purchases off the Open Contract.

The performance indicators for procurement were—

1. *Percent Order Fill Rate:* Order fill rate is defined as the percentage of products that the facility receives above or below the quantity that they ordered. A percentage greater than zero indicates that the facility received more of a product than they ordered.
   - order lead time
   - percentage of last four orders/procurements received according to schedule.

Only results for drugs are shown in table 10. Contraceptives and vaccines are included in annex B.

We found a higher than expected level of decision space for procurement. Health centers and health posts also reported high levels of procurement decision space, although, theoretically, the procurement decisions for health centers should be made by the Health Area Office. *Low* decision space for health centers means that Health Area Offices are either making these decisions for the health centers or coordinate with health centers, as is the national policy.

Table 10. Decision Space for Procurement (Drugs) and Related Performance Indicators

Facility Type	Decision Space Indicators (high DS facilities only)			Performance Indicators (all facilities)		
	Make their own procurement decisions (%)	Made purchases off EDL but within Open Contract (%)	Made purchases off Open Contract (%)	Order fill rate (%)	Order lead time (%)	Percentage (%) last 4 orders received on time
Health Area Office	100 (22)	100 (22)	100 (11)	167 (5)	13 (11)	100 (11)
Hospitals	100 (10)	75 (3)	100 (4)	39 (7)	3 (6)	71 (7)
NGO	86 (36)	36 (5)	61 (11)	---	---	--
Health Centers	91 (51)	Not applicable	Not applicable	75 (44)	3 (45)	90 (41)
Health Posts	87 (129)	Not applicable	Not applicable	23 (105)	10 (99)	84 (98)
Total	89 (247/277)	57 (13/23)	81 (30/37)	47 (168)	8 (161)	86 (158)

To analyze the order fill rate, we defined a *good* order fill rate as any value between –5 percent and 5 percent. As shown in table 10, we found that those facilities with high decision space in making their own procurement decisions are more likely to be in the *good* order fill rate range for medicines. NGOs were not included in this analysis. There are not enough facilities to test the relationship between the other decision space indicators and theorder fill rate (see table 11).

Table 11. Relationship between Decision Space in Procurement and Order Fill Rate (Drugs)

Decision Space Indicator	Percentage (%) in "Good" Order Fill Rate Range
Make their own procurement decisions (High DS)	21 (131)
Do not Make their own procurement decisions (Low DS)	0 (11)
Ttest	t=-1.7 p=0.08 N=152

Logistics Management Information System

In 2000, MSPAS introduced the basic source document for an logistics management information system (LMIS), that is, the Balance, Requisition and Issue form (BRES). Almost 90 percent of facilities reported that they used this form. If filled out correctly, BRES provides the basic information required for good logistics management, that is, stock on hand, losses/adjustments, and consumption. At present, storage facilities and health facilities use this form mostly for essential drugs and contraceptives and less often for vaccines. The data are aggregated at the district and regional levels. It appears, however, that the form is used primarily as a reporting document, and most of the time it is not used for requisitioning and issuing supplies. There is a separate form for vaccines.

The decision space indicator chosen for the LMIS was *Percentage of facilities that created their own (different) BRES form.* Two logistics performance indicators were examined. (See table 12.)

1. percentage of facilities using the BRES
2. submitting the BRES on time.

Table 12. Decision Space for LMIS (Drugs) and Related Performance Indicator

Facility Type	Decision Space Indicator (high DS facilities only)	Logistics Performance Indicator (all facilities)
	Create on BRES form (%)	Percentage (%) using BRES for reporting
Health Area Office	18 (4)	86 (18)
Hospitals	24 (3)	40 (4)
NGO	24 (9)	19 (8)
Health Centers	11 (6)	94 (53)
Health Posts	5 (8)	88 (132)
Total	11 (30/276)	77 (215)

Table 13 shows the percentage of facilities that are using the BRES for medicines, contraceptives, and vaccinations. We did not find any significant relationship between creating a different BRES and use of the BRES. (NGOs were excluded from this analysis).

Results showed a statistically significant relationship between decision space in using the BRES and whether or not facilities report sending the BRES in on time. Facilities that created their own reporting form for drugs and contraceptives are less likely to report on time.

Table 13. Relationship between Decision Space for LMIS and Reporting on Time

Decision Space Indicator	Percentage (%) of Facilities Reporting They Send the BRES in on Time (drugs)	Percentage (%) of Facilities Reporting They Send the BRES in on Time (contraceptives)	Percentage (%) of Facilities Reporting They Send the BRES in on Time (vaccines)
Create new BRES form (High DS)	33 (18)	35 (17)	60 (103)
Did not create new BRES form (Low DS)	67 (177)	65 (161)	0 (10)
Ttest	t=2.9 p=0.003 N=195	t=2.5 p=0.01 N=178	t=3.7 p=0.0003 N=113

Inventory Control

In 1997, MSPAS introduced new inventory control procedures. The two principal innovations were (1) new stock record keeping cards for tracking goods in storage and (2) imposition of standard system-wide stock levels and norms for calculating them. MSPAS initially set the levels at six months for maximum and three months for minimum. In 2000, however, MSPAS changed the norms: for Health Area offices the minimum stock level is two months and the maximum is four months, for the districts and lower-level health facilities, it is minimum of one month and a maximum of three months.

As in many countries, the stock level norms for vaccines are different than those applied for other products.

We examined the following inventory control decision space variables:

1. *Calculate needs using a system other than standard max-min levels: High* decision space is when a facility calculates their needs based on any other inventory control system different than the max-min system. *Low* is if the central level make these calculation for them or they calculate their needs based on the max-min system only.

2. *Use data other than logistics data to estimate needs:* For this indicator, *high* decision space was defined as a facility that uses population-based projections, estimation, historical calculation, no calculation, or *other* calculation. *Low* decision space is if they only use the standard max-min levels based on the BRES.

The logistics performance indicators for inventory control were—

1. *Percentage discrepancy between stock cards and physical inventory*: Percentage discrepancy between stock cards and physical inventory is defined as the percentage increase or decrease between the amount of stock on the stock card and the amount in the physical inventory. A figure of 0 is perfect because the facility has the exact same amount on the stock cards as in the physical inventory. An acceptable range of agreement is any figure between –5 percent and 5 percent.
2. Percentage of facilities with stock between max-min levels.
3. Stock cards not used to monitor inventory.
4. Mean percentage of products stocked out at the time of the visit.
5. Mean percentage of products stocked out in the last six months.
6. Average number of days per stockout (in last six months).
7. Facility reports problems with product quality.
8. Facility reports receiving a product with less than 18 months of shelf life.

Table 14 presents the frequencies for the decision space indicators and three of the performance indicators and table 14 presents the product quality indicators. Frequencies for the two stockout indicators are the same as presented in table 8.

Table 14 shows that NGOs have the highest decision space for inventory control, i.e., the majority do not follow the norms on how to calculate their stock levels, NGOs also had the highest rate of stock card inaccuracy and the lowest use of stock cards. On average, only one out of four facilities had drug stocks between the max-min levels and 80 percentage of facilities did not use stock cards to track their inventory of drugs. Results for contraceptives and vaccines are in annex B.

Table 14. Decision Space for Inventory Control (Drugs) and Related Performance Indicators

Facility type	Decision Space Indicators (high DS facilities only)		Logistics Performance Indicators (all facilities)		
	Calculate needs using a system other than max-min (%)	Use data other than logistics data to calculate needs (%)	Percentage stock card discrepancy (%)	Percentage within max-min stock level (%)	Percentage not using stock cards (%)
Health Area Office	24 (5)	33 (7)	181 (20)	14 (21)	33(7)
Hospitals	40 (4)	56 (5)	30 (10)	---	80 (8)
NGO	78 (29)	84 (31)	5763 (17)	---	94 (33)
Health Centers	11 (6)	25 (13)	237 (51)	31 (52)	77 (43)
Health Posts	28 (38)	Not applicable	133 (115)	27 (117)	85 (124)
Total	32 (256)	47 (120)	617 (213)	27 (190)	80 (215)

Table 15 shows that more than a third of facilities had received one or more products with less than 18 months of shelf life and one-fifth had received a product with quality problems. Health Area Offices reported the most problems. These indicators were not significantly related to the decision space indicators for inventory control.

Table 15. Facilities Reporting Product Quality Problems (Drugs)

Facility Type	Logistics Performance Indicators	
	Percentage of facilities reported problems with product quality (%)	Percentage of facilities reported they received product with less than 18 months shelf life months (%)
Health Area Office	48 (10)	50 (11)
Hospitals	30 (3)	40 (4)
NGO	10 (4)	10 (4)
Health Centers	18 (10)	38 (21)
Health Posts	16 (24)	42 (62)
Total	18 (51/280)	37 (102/279)

Statistically significant relationships were found for two performance indicators: stockouts at the time of visit and duration of stockout. Table 16 shows that those facilities with a *high* decision space for inventory control (calculating their needs based on an inventory control system different than the max-min system) had a higher percentage of drugs stocked out on the day of the visit and a higher percentage of their facilities were not using stock cards for these products. Facilities with high decision space for this indicator also had longer stockout periods for vaccines. No other relationships were found for the other indicators. Summary frequencies for these variables are reported in annex B.

Table 16. Relationship between Decision Space in Inventory Control and Product Availability

Decision Space Indicator	Mean Percentage of Tracer Products Stocked Out at the Time of Visit (drugs)	Mean Number of Days Product Stocked Out (vaccines)	Percentage of Facilities Not Using Stock Card (drugs)
Calculate needs based on system other than max/min (High DS)	22 (70)	30 (6)`	88 (75)
Do not calculate own needs—use max/min only (Low DS)	16 (168)	12 (9)	78 (169)
Ttest	t=-1.8 p=0.06 N=242	t=-1.9 p=0.07 N=15	t=-1.7 p=0.08 N=244

Facilities that used other types of estimates (population- based, historical, or no estimation) had fewer days that they were stocked out of contraceptives than did those facilities who used the max-min system (see table 17). This analysis does not include NGOs.

Table 17. Relationship between Decision Space in Inventory Control and Duration of Stockout (Contraceptives)

Decision Space Indicator	Average Number of Days per Stockout
Use data other than max-min to estimate needs (High DS)	11 (14)
Use max-min only (low DS)	28 (20)
Ttest	t=1.6 p=0.09 N=34

Facilities with higher decision space are more likely not to use stock cards for contraceptives. This relationship includes NGOs in the analysis. When NGOs are removed from this analysis, the relationship is no longer significant.

Table 18. Relationship between Inventory Control Decision Space and Use of Stock Cards (Contraceptives)

Decision Space Indicator	Percentage of Facilities Not Using Stock Cards (%)
Use data other than max-min to estimate needs (high DS)	82 (73)
Use max-min only (low DS)	78 (84)
Ttest	t=-2.3 p=0.02 N=241

Storage

For most essential drug supplies, there is no central storage. They are delivered directly by Open Contract suppliers to Health Area Office warehouses or, in most cases, hospital store rooms. In other cases, they are delivered to district or health facility storage facilities. For PROAM drugs, there is an MSPAS central storage facility, and, also, separate central storage facilities for contraceptives and vaccines.

In 1997 MSPAS published norms of *Good Storage Practices*. The practices include 16 norms for central-level storage facilities, hospital storerooms, and Health Area Office warehouses; and twelve norms for health facilities. The norms cover such topics as sanitation, organization, security, and expiration.

Because central norms are very clear about warehousing requirements, in this section, we examine the compliance of facilities with these norms. The lack of compliance might be considered *informal* decision space, because it reflects the lack of ability of the center to enforce their norms; however, it does not necessarily imply that the local authorities consciously make decisions to use their own norms—it may reflect a lack of resources and/or lack of knowledge of the norms.

We did not have a decision space variable for storage, because the norms were centrally determined.

Two logistic performance indicators were used:

1. *Mean Percentage of Storage Standards Met:* These are the twelve basic storage conditions deemed necessary to maintain the quality and preserve the condition of products for users.
2. *Percentage of Cold Chain Compliance:* This is primarily for vaccines, but can apply to other products that require refrigeration. The standards for cold chain were (1) refrigerators and thermo flasks available to protect the vaccinations during transport; (2) the appropriate temperature (between 0–8 centigrade) for all refrigerators; (3) appropriately graphed/recorded temperature on the day of the visit; and (4) if they had a guide for the vaccination scheme on hand.

Table 19 shows that compliance with the basic storage standards were much higher than compliance with the standards for cold chain maintenance. The low quality of the latter is of concern.

Table 19. Compliance with Storage Conditions (All Products)

Facility Type	Logistics Performance Indicators	
	Mean Percentage of Storage Standards Met (%)	75% or More Cold Chain Standards Met (%)
Health Area Office	65 (21)	32 (7)
Hospitals	80 (10)	60 (6)
NGO	50 (32)	10 (4)
Health Centers	71 (54)	35 (20)
Health Posts	63 (148)	30 (44)
Total	64 (265)	74 (81)

Distribution/Transportation

Under the Open Contract, hospitals and Health Area Offices order drugs every three months and the suppliers deliver directly to the Health Area Office. Hospital storage sites for subsequent redistribution to districts and health facilities. Usually, to redistribute the drugs, the districts pick up drugs from the provider's warehouse and the health facilities pick up the drugsfrom the districts. In some cases, the health facilities go directly to the Health Area Office.

Within the context of this study, there are four scenarios for transporting stock from storage facilities to health facilities. They include essential drugs provided through the Open Contract; essential drugs provided through PROAM; and contraceptives and vaccines. Some of these are more affected by Health Area Office, District, and health facility decision making than others.

The Transportation Decision Space indicator was "W*hat facilities do if their normal transportation does not arrive." High* decision space is if they contract private transportation or they use public transportation. *Low* decision space is if they wait until the regular transport arrives.

There were two performance indicators for transportation:

1. *Percentage that report no transport problems*: Any facility reporting that they had transportation, hire private transport, use public transport, or their transportation always arrives is considered to have no transportation problems.

2. Percentage of stockouts due to late delivery.

Table 20. Decision Space for Transportation (Drugs) and Related Performance Indicators

	Decision Space Indicator (high DS facilities only)	Logistics Performance Indicators (all facilities)	
Facility Type	**Use alternate transport if normal transport does not arrive (%)**	**Report no transport problems (%)**	**Mean percentage of products stocked reported due to late delivery (%)**
Health Area Office	25 (1)	85 (17)	--
Hospitals	100 (1)	83 (5)	--
NGO	95 (21)	81 (30)	--
Health Centers	61 (11	70 (28)	--
Health Posts	79 (58)	50 (64)	--
Total	77 (118)	63 (144)	25 (220)

Not surprising, facilities that could use private or public transport if normal transport did not arrive had a higher percentage of facilities that reported no problems with transportation (see table 21). All facilities that waited for the regular transport (low decision space) reported having transportation problems. No relationship was found between the transport decision space indicator and the percentage of stockouts due to late delivery.

Table 21. Relationship between Transport Decision Space and Frequency of Transportation Problems (All Products)

Decision Space Indicator	**Percentage of Facilities Reporting No Transport Problems (%)**
Hire alternate transport (high DS)	30 (62)
Wait for regular transport (low DS)	0 (24)
Ttest	t=-3.1 p=0.003 N=86

Transport decision space was also found to be significantly related to vaccine stockouts at the time of the visit. Facilities that waited for regular transport instead of hiring private transport or using public transport had zero stockouts, whereas facilities that waited for the regular transport had, on average, 21 percent of their vaccines stocked out on the day of the visit.

Table 22. Relationship between Transport Decision Space and Vaccine Stockouts

Decision Space Indicator	Percentage of Facilities Stocked Out of One or More Vaccines at the Time of the Visit (%)
Hire alternate transport (high DS)	21 (57)
Wait for regular transport (low DS)	0 (19)
Ttest	t=-2.4 p=0.017 N=76

Personnel

With the exception of pharmacists, the personnel assigned to the logistics system are not specialized professionals. The personnel who participate in decisions on budgeting, product selection, needs quantification, procurement, and other functions are the nurses and doctors who are also the health providers. The decisions to assign personnel to these tasks can be made at the facility or by higher authorities.

The decision space indicator for personnel was "*Facility decides how many personnel to assign to logistics functions.*" Personnel decision space was defined as high if the facility was able to decide how many personnel could be assigned to logistic functions. There are no personnel assignment decisions to make at health post level, because there is only the auxiliary nurse, who does not supervise others on logistics functions.

The performance indicator chosen was "*Percentage of staff trained in different logistics areas.*" Each facility was asked about the number of staff they had trained in three different areas over the last two years. Some facilities reported that they had more than 100 percent of their staff trained in each area (perhaps some that worked in other areas had been trained). Therefore, we assumed that any facility reporting more than 100 percent trained in an area had at least 100 percent trained in that area.

Table 23. Decision Space for Personnel Decisions

Facility Type	Decision Space Indicator (high DS facilities only)
	Assign personnel to logistics (%)
Health Area Office	91 (20)
Hospitals	90 (9)
NGO	76 (32)
Health Centers	84 (48)
Health Posts	Not applicable
Total	83 (131)

Table 24. Personnel Trained in Each Logistics Area: Logistics Performance Indicator (Drugs)

Logistics Area	Percentage of Total Staff Trained (%)
Budgeting (POA)	55 (139)
Logistics	98 (232)
Rational Use	98 (178)

Table 25 shows a significant relationship between personnel decision space and the percentage of staff trained in budgeting and logistics. (NGOs were not included in this analysis.)

Table 25. Relationship between Decision Space in Personnel and Training Status

Decision Space indicator	Percentage of Staff Trained in Budgeting (%)	Percent of Staff Trained in Logistics (%)
Assign personnel to logistics (high DS)	60 (63)	97 (70)
Do not assign personnel on own (low DS)	35 (10)	88 (12)
Ttest	t=-1.8 p=0.07 N=73	t=-2.1 p=0.04 N=82

Supervision and Staff Development

In Guatemala, supervision is done in a cascade—centralized from the central level to the Health Area Office. It was not clear how much decision space is exercised at lower levels. There was also a change in supervision strategy; an earlier separate supervision system for logistics is now integrated into the overall supervision system for all functions.

Supervision decision space is categorized into six different areas, and indicators were selected for each area. In each area, *high* decision space refers to decisions made by that level and only that level. *Low* decision space refers to decisions made by a higher level or coordinated with a higher level.

1. Design Own Supervision Guides.
2. Apply Own Supervision Guides.
3. Assign Human Resources for Supervision.
4. Assign Financial Resources for Supervision.
5. Schedule Supervision.
6. Schedule Frequency of Supervision.

The supervision performance indicator was "*Tasks carried out during the supervisory visit*."

Facilities were asked what was done during the last supervisory visit that they carried out/or received, looking specifically as to whether supply forms were revised, on-the-job training was conducted, and/or written recommendations were left at the facility.

The highest decision space was reported for scheduling and supervision frequency. The lowest decision space was reported for designing supervisory guides, which makes sense, because guides are designed at the central level.

Table 26. Facilities with High Decision Space for Supervision

Facility Type	Decision Space Indicators (high DS facilities only)					
	Design own supervison guide (%)	Apply own supervision guide (%)	Decide supervision staff (%)	Allocate financial resources to supervision (%)	Schedule supervision visits (%)	Decide frequency of visits (%)
Health Area Office	20 (4)	80 (16)	81 (17)	79 (15)	20 (19)	90 (19)
Hospitals	Not Applicable	--	--	--	--	--
NGO	31 (8)	76 (19)	69 (36)	61 (17)	74 (20)	67 (19)
Health Centers	31 (915)	61 (30)	31 (16)	24 (10)	82 (40)	84 (81)
Health Posts	Not applicable	--	--	--	--	--
Total	29 (28/96)	69 (65/94)	71 (72/101)	48 (42/101)	81 (79/97)	81 (81/100)

As seen in table 27, overall, less than half of the facilities received a supervisory visit in the past year, and very few facilities reported that they carried out or received the three *requirements* of a supervision visit.

Table 27. Supervision Visits—Frequency and Content of Visit

Facility Type	Received Supervisory Visits in the Past Year (%)	Percentage of Facilities that Met Three Supervision Visit Requirements (%)
Health Area Office	67 (14)	10 (1)
Hospitals	40 (4)	0 (3)
NGO	29 (12)	50 (1)
Health Centers	48 (27)	26 (5)
Health Posts	39 (58)	11 (5)
Total	41 (115)	15 (12)

Higher decision space in developing supervisory guides was not related to better supervisory visits (meeting the three requirements during a visit). However, we found that those that make their own decisions in applying the guides and scheduling the visits were less likely to have had their supply forms revised, had on-the-job training, and/or been left written recommendations. (NGOS were not included in this analysis.)

Table 28. Relationship between Decision Space in Supervision and Content and Scheduling of Supervisory Visits

Decision Space Indicators	Percentage of Facilities that Met Supervision Visit Requirements (%)
Apply own supervision guides (high DS	7 (15)
Do not apply own supervision guides (low DS)	40 (10)
Ttest	t=2.1 p=0.04 N=25
Make their own decisions in scheduling supervision (high DS)	17 (23)
Do not make their own decisions in scheduling supervision low DS	66 (3)
Ttest	t=1.9 p=0.06 N=26

Table 29 shows that Health Area Offices with higher decision space in supervising human resource assignments made significantly more visits to their respective health posts for medicines in the last year.

Table 29. Relationship between Personnel Decision Space and Supervisory Visits (Drugs)

Decision Space Indicator	Percentage of Facilities That Received a Supervisory Visit in Past Year (%)
Make decisions on their own staff assignments (high DS)	86 (16)
Do not make decisions on their own staff assignments (low DS)	50 (4)
Ttest	t= -1.7 p=0.10 N=20

Training

The central level provides the bulk of training in logistics but local units also provide training through a cascade system or their own initiative. We collected data on whether health facilities select the personal to be trained or whether higher authorities make these decisions for them. We also collected data on how many people have been trained in different areas. Only three types of training were known to have been implemented by the central level and given in cascade form by lower levels: (1) logistics (covering the functions of logistics information system, acquisition/distribution, warehousing, and inventory control); (2) planning and budgeting (for POA—including needs quantification); and (3) rational use of drugs (protocols).

The decision space indicator for training was: *Who selects participants for courses designed by the central level?* Decision space is defined as *high* if the facility selects its own participants for courses. *Low* decision space is if the central level makes these decisions or the facility coordinates these decisions with the central level.

The performance indicators were—

1. percentage of staff trained in rational use
2. percentage of staff trained in logistics
3. stockouts over the last six months.

In general, we found a *low* decision space for training. Only 27 percent of Health Area Offices reported that they made their own selections. All hospitals reported that the central level made training selection decisions

for them, or these decisions were coordinated with the central level. No other type of facility was included in this analysis (table not shown).

No relationships were found between decision space and the performance indicators for training.

Organizational Support

Prior to this study, little was known about how local offices solved their problems and how well their decision making mechanisms worked. This section focuses on whether the local offices were able to solve their problems at their level or had to move to higher levels for solution.

We selected one decision space indicator for organizational support: *Whether the facility solved their own problems or sought help from a higher level authority,* and/or they did not resolve the problem. The logistics performance indicators were—

1. Solve Stockout problems.
2. Solve warehousing problems.
3. Solve transport problems.

Table 30 shows the percentage of facilities that were able to solve their stockout problems, warehousing problems, and transport problems on their own. We did not find a relationship between solving conflicts on their own and solving problems in stockouts, warehousing, and/or transport.

Table 30. Decision Space for Organizational Support and Related Performance Indicators

	Decision Space Indicator (high DS facilities only) (%)	Logistics Performance Indicator (all facilities)		
Facility Type	**Solve organizational problems on their own (%)**	**Solve stockout problems on their own (%)**	**Solve warehousing problems on their own (%)**	**Solve transport problems on their own (%)**
Health Area Office	89 (17)	45 (5)	22 (2)	13 (1)
Hospitals	100 (7)	33 (2)	0 (3)	50 (1)
NGO	97 (30)	29 (6)	38 (3)	47 (8)
Health Centers	87 (39)	40 (14)	56 (9)	46 (12)
Health Posts	91 (78)	28 (25)	23 (7)	17 (12)
Total	91 (171)	32 (52)	31 (21)	27 (34)

Quality Assurance

The Ministry of Health and the Ministry of Finance utilize contracts for providers that require a minimum standard of quality for both prescription drugs, as well as health care delivery. The National Health Laboratories test the quality of pharmaceutical products and report findings to the National Pharmaceutical Regulatory Board, the regulatory arm of the government responsible for quality assurance. We were not able to measure a level of decision space for quality assurance.

Data were collected on two performance outcomes:

1. Problems detected with quality/efficacy of medicines in last year.
2. Percentage who received a product with less than 18 months of shelf life.

Table 31. Percentage Reporting Problems Detected with the Quality/Efficacy of Drugs in the Past Year

Facility Type	Logistic Performance Indicators	
	Percentage reporting problems with quality of drugs in the last year (%)	Percentage who received a product with less than 18 months of shelf life (%)
Health Area Office	48 (10)	50 (11)
Hospitals	30 (3)	40 (4)
NGO	10 (4)	10 (4)
Health Centers	18 (10)	38 (21)
Health Posts	16 (24)	42 (62)
Total	18 (280)	37 (279)

More Health Area Offices and hospitals identified quality problems, but the problems of short shelf life were relatively consistent in public facilities. NGOs reported fewer problems in efficacy and short shelf life.

Integration

We reviewed the logistics functions for which integration is possible for the three types of products.

Needs Quantification

Needs quantification integration was defined as who made the most decisions for needs quantification. For all three products, the facility nurse made most needs quantification decisions. We then defined needs quantification integration as integrated if the nurse forecasts medicines, contraceptives, and vaccinations together, but mixed and vertical if the nurse forecasts any combination of these products together or if the nurse forecasts each product separately.[8] The majority (71 percent) had an integrated needs quantification processing, mostly due to health posts where 95 percent had the nurse do needs quantification.

[8] This analysis does eliminate any facilities where the nurse does not make the needs quantification decisions.

Table 32. Percentage of Facilities with Integrated Needs Quantification

Facility Type	Integration Indicator Needs quantification integrated (nurse made most needs quantification decisions) (%)
Health Area Office	5 (1)
Hospitals	--
NGO	25 (1)
Health Centers	19 (5)
Health Posts	95 (130)
Total	71 (137)

There was a significant relationship between our definition for needs quantification integration and needs quantification accuracy for drugs (table 33). Facilities that integrated needs quantification (had the same person or type of staff) do the needs quantification resulted in more accurate forecasts compared to what they consumed. Facilities with a mixed and/or vertical process tended to forecast much higher than they consumed for medicines. There was no relationship between these variables for contraceptives or vaccinations.

Table 33. Relationship between Degree of Integration for Needs Quantification and Needs Quantification Accuracy

Integration Indicator	Needs Quantification Accuracy (%)
Nurse made most needs quantification decisions (integrated)	129 (98)
Staff other than nurse made most needs quantification decisions (mixed/vertica)l	1153 (28)
Ttest	t=1.9 p=0.05 N=126

Product Selection

Product selection was defined as integrated if the facility includes drugs, contraceptives, and vaccines on their essential drug list, and *vertical/mixed* if they include any combination of the three products on their essential drug list, or if they have a separate essential drug list for medicines, contraceptives, and vaccines. See table 34.

Table 34. Percentage of Facilities with Integrated Product Selection

Facility Type	Integration Indicator Their EDL includes drugs, contraceptives, and vaccines (%)
Health Area Office	38 (6)
Hospitals	--
NGO	--
Health Centers	43 (12)
Health Posts	23 (3)
Total	25 (21)

When we examined the effect of having an integrated selection system on stockouts of drugs over the last six months, we found that those with a more integrated system, as opposed to a vertical or mixed system, are more likely to have greater than 50 percent of their drugs stocked out during the last six months.

Table 35. Relationship between Degree of Integration for Product Selection and Stockouts of Medicines in Last Six Months

Integration Indicator	Percentage of Facilities with Stockouts > 50% of Drugs (%)
Their EDL includes medicines, contraceptives, and vaccines	40 (20)
Products combined or on separate EDLs (mixed/vertica)l	20 (61)
Ttest	T=-1.85 p=0.067 N=81

We also examined whether having an integrated system for product selection is related to having an essential drug list or number of products on the essential drug list, but we found no significant results with these variables.

Procurement

Procurement decision space is defined similarly to needs quantification decision space: We first defined who made the most decisions for procurement. Similar to needs quantification, we found for all three products, the nurse made most procurement decisions. Procurement was defined as *integrated* if the nurse procures medicines, contraceptives, and vaccinations together, and as *mixed and/or vertical* if the nurse procures any combination of these products together or separately.[9] Procurement was integrated in 73 percent of facilities, again mostly due to heath posts with the highest level of integration.

Table 36. Percentage of Facilities with Integrated Procurement

Facility Type	Integration Indicator Nurse procures drugs, contraceptives, and vaccines together (%)
Health Area Office	0
Hospitals	0
NGO	0
Health Centers	30 (7)
Health Posts	93 (125)
Total	73 (132)

Procurement integration was found to be related to stockouts of medicines over the last six months (see table 37). Facilities with integrated procurement were more likely to have had more medicines stocked out in the last six months.

Procurement integration was not found to be significantly related to the other performance indicators for procurement: percent order fill rate, percent of last four order received according to schedule, and requests made to buy off their open contracts.

[9] This analysis does eliminate any facilities where the nurse does not make the procurement decisions.

Table 37. Relationship between Degree of Integration for Procurement and Stockouts of Drugs in Last Six Months

Integration Indicator	Percentage of Facilities with Stockouts > 50% of Drugs (%)
Nurse procures medicines, contraceptives, and vaccines together (integrated)	39 (129)
Nurse procures any combination of these products together or separately (vertical/mixed)	20 (46)
Ttest	T=-2.40 p=0.018 N=175

Logistics Management Information System

LMIS integration was defined as *integrated* if the facility fills out the BRES for drugs, contraceptives, and vaccines and *vertical/mixed* if they only fill out the BRES for some combination of these products or separately for each product. We found a 30 percent level of integration for the LMIS. See table 38.

Table 38. Percentage of Facilities with Integrated LMIS

Facility Type	Integration Indicator BRES filled out for medicines, contraceptives and vaccines (%)
Health Area Office	12 (92)
Hospitals	40 (2)
NGO	22 (2)
Health Centers	42 (21)
Health Posts	28 (32)
Total	30 (59)

Facilities with an integrated LMIS were more likely to always submit the BRES.

Table 39. Relationship between LMIS Integration and Frequency of Submitting BRES

Integration Indicator	Percentage of Facilities that Report Always Submitting the BRES (%)
BRES filled for medicines, contraceptives, and vaccines (integrated)	68 (59)
BRES filled for some combination of these products or separately for each product (vertical/mixed)	42 (52)
Ttest	T=-2.77 p=0.007 N=111

Supervision

Supervision was defined as *integrated* if in the last supervision visit the facility received, the supervision was given for all three products at the same time; and as mixed/vertical if supervision was given for only one or two out of the three products. Two-thirds of the facilities had integrated supervision.

Table 40. Percentage of Facilities with Integrated Supervision

Facility Type	Integration Indicator Supervision given at same time for medicines, contraceptives, and vaccines (%)
Health Area Office	55 (6)
Hospitals	67 (2)
NGO	33 (1)
Health Centers	45 (9)
Health Posts	80 (31)
Total	64 (49)

No relationship was found between Health Area Offices with integrated supervision and the performance indicator or the number of supervisory visits they make to their respective health posts.

Personnel

For personnel integration, we first defined who made most of the personnel decisions for the facility. We determined that the director of the facility made most personnel decisions. Based on this information, we defined personnel as *integrated* if the director made all personnel decisions for staff related to medicines, contraceptives, and vaccines and *vertical/mixed* if the Director made personnel decisions for staff related to one or two out of the three products. Fifty percent of facilities had an integrated personnel decision-making process. See table 41.

Table 41. Percentage of Facilities with Integrated Personnel Decision Making

Facility Type	Integration Indicator Director made all personnel decisions for staff related to the three product groups (%)
Health Area Office	50 (2)
Hospitals	0
NGO	17 (1)
Health Centers	59 (20)
Health Posts	--
Total	50 (23)

Personnel integration was not found to be related to any of the performance indicators: personnel trained in estimation and budgeting, personnel trained in logistics, or personnel trained in rational use of pharmaceuticals.

Transportation

We defined transportation as *integrated* if the facility had transportation for all three products and vertical/mixed if they had transportation for only one or two out of the three products. Less than half the facilities had integrated transport systems (see table 42).

Table 42. Percentage of Facilities with Integrated Transportation

Facility Type	Integration Indicator Facility had transport for all three product groups (%)
Health Area Office	71 (15)
Hospitals	50 (40)
NGO	57 (8)
Health Centers	74 (34)
Health Posts	19 (15)
Total	45 (76)

Facilities with an integrated transportation system were more likely to have a facility managed vehicle for contraceptives and vaccinations (but not for medicines). This statistical relationship is most probably related to the type of facility not the degree of integration (see table 43).

Table 43. Relationship between Transportation Integration and Facility-managed Vehicle

Integration Indicator	Percentage of Facilities with Facility-managed Vehicle (contraceptives) (%)	Percentage of Facilities with Facility-managed Vehicle (vaccines) (%)
Facility had transport for all three product groups (integrated)	100 (76)	100 (76)
Facility had transport for one or two product groups (vertical/mixed)	27 (93)	6 (93)
Ttest	T=-14.29 p<0.001 N=169	T=-32.99 p<0.001 N=169
Chi-square test	χ =92.98 p<0.001	χ =146.53 p<0.001

Warehousing

We defined warehousing as *integrated* if the facility stores medicines (see table 44), contraceptives, and vaccines together in the same warehouse and *vertical/mixed* if the facility stores any combination of these products together or separately. Most facilities (94 percent) have a mixed or vertical storage.

Table 44. Percentage of Facilities with Integrated Storage

Facility Type	Integration Indicator
	Facility stored all three product groups together (%)
Health Area Office	14 (3)
Hospitals	0
NGO	0
Health Centers	2 (1)
Health Posts	8 (11)
Total	6 (15)

There were no relationships between storage integration and the performance indicators of compliance with storage standards, cold chain compliance, or stockouts over the last six months.

Summary and Conclusions

Although some functions still remain centralized, the decentralization process in Guatemala has resulted in a considerable degree of local control in the logistics system, as perceived by informants in the system. Overall, the *decision space* measured in this survey showed that logistics management of contraceptives was the most decentralized (78 percent of facilities had high decision space), followed by vaccines (68 percent had high decision space), and then drugs (55 percent had high decision space).

For those functions that reported some degree of local control, the *decision space* for essential drugs varied considerably from function to function. The degree of decision space for each logistic function is shown in table 45. *High* is defined as 75 percent or more facilities reporting that they had local authority over aspects of these functions.[10]

Table 45. Degrees of Decentralization and Integration of Health Logistics Functions

Logistics Function	Degree of Decision Space for Drugs	Degree of Integration for All Three Products (%)
Budgeting	High	--
Product Selection	Low	25
Needs Quantification	High	71
Procurement	High	73
Inventory Control	Low	--
Transportation	High	50
LMIS	Low	30
Human Resources/Personnel	High	64
Training	Low	--
Supervision	Medium	64
Monitoring and Evaluation	Low	--
Organizational Support	High	--
Treatment Protocols	Low	--

Findings

The study found statistically significant relationships between high decision space in several functional areas and the indicators of *better* logistics system performance; there were also some functions with high decision space that had negative implications in system performance. The same mixed picture was found for integration. The key findings related to decentralization and integration were as follows:

[10] Medium decision space = between 50% and 75% reporting high decision space, low decision space = less than 50% reporting high decision space.

Decentralization

- Facilities with high decision space about what they can do if budgets are cut had a higher percentage of their planned budgets approved. (This relationship was only for hospitals and Health Area Offices because they were the only levels that reported on this indicator.)
- Needs quantification decision space was statistically related to stockouts at the time of the visit and stockouts over the last six months. Those with higher decision space in needs quantification had fewer drug products stocked out at the time of the visit and over the last six months. We did not find a similar relationship for contraceptives or vaccines. (NGOs were not included in this analysis.)
- Facilities with high decision space in making their own procurement decisions are more likely to have most of the orders filled for drugs. (NGOs were not included in this analysis.)
- There was a significant relationship between decision space in using the BRES and whether or not facilities report sending the BRES in on time. Facilities that created their own reporting form for drugs and contraceptives are less likely to report on time.
- Facilities with a high decision space for inventory control (calculating their needs based on an inventory control system other than the max-min system) had a higher percentage of products stocked out on the day of the visit. Facilities with a higher decision space are more likely to have a higher percentage of their facilities not using stock cards for medicines (88 percent).
- Facilities with higher decision space for inventory control are more likely not to use stock cards for contraceptives. When NGOs are removed from this analysis, the relationship is no longer significant.
- Facilities that were able to make use of private or public transport if normal transport did not arrive had a higher percentage of facilities that reported no problems with transportation. All facilities that waited for the regular transport (low decision space) reported having transportation problems.
- Facilities that had high decision space in personnel assignments were more likely to train staff in logistics and budgeting. (NGOs were not included in this analysis.)
- Higher decision space in developing supervisory guides was negatively associated with doing more complete supervisory visits (revise supply forms, do training, and leave written on-the-job recommendations).

Integration

- Facilities that integrated needs quantification (had the same person or type of staff do the needs quantification) had more accurate forecasts in relation to what they consumed. Facilities with a mixed and/or vertical process tended to forecast for drugs much higher than they consumed. No relationship was found between these variables and contraceptives or vaccines.
- Facilities with a more integrated system were more likely to have greater than 50 percent of their drugs stocked out over the last six months.
- Facilities with an integrated LMIS were more likely to always submit the BRES.

A summary of the overall relationships with logistic system performance is shown in table 46.

Table 46. Decentralization and Integration: Findings on Relationships with Performance by Function

Function	Decentralization		Integration	
	Higher performance	Lower performance	Higher performance	Lower performance
Budgeting	X*			
Needs quantification	X		X	
Product selection				X
Procurement	X			X@
Inventory control	X^{c}	$X^{m,v}$		
Transportation	X^{m}	X^{v}	X@	
LMIS	X^{v}	$X^{m,c}$	X	
HR/Personnel	X			
Supervision	X**	X***		

*Health Area Office and Hospitals only; **Health Area Office number of visits; *** quality of supervision visits; ^{m}=medicines, ^{c}=contraceptives, ^{v}=vaccines; @ related to facility type.

For selection and organizational support, there was such uniform high level of decision space that there was insufficient variation to evaluate performance. No relationship was found for any performance indicator for the training function. Although respondents found different levels of decision space for the *Treatment Protocol* function, we were unable to find an indicator to evaluate the performance of that function.

For the logistics functions of financing, cost recovery, storage, monitoring and evaluation, and quality control, the amount of local decision space was formally centralized.

Integration was related to poorer performance of the logistic system for the functions of selection and procurement. For the functions of personnel, the findings were ambiguous, with higher integration related to more training in logistics but less training in budgeting and rational use of drugs. While we found lower performance related to integration of procurement, this relationship was due to facility type. Similarly the relationship for transportation (which was positive) was also accounted for by facility type. We found no relationship with warehousing and supervision.

Limitations of the Study

One limitation is the standard limitation of surveys of opinions and attitudes. The reported decision space is based on perceptions of officials involved in the logistic system as reported to interviewers. and it is not verified by review of documents or other sources. While the questions have been designed to ask for specific concrete and factual responses, perceptions often change and, in some cases, are open to different interpretations. A second limitation is that the relationships we found for the performance of functions were limited to the statistical significance of a small number of indicators for each function. While this is the most complete assessment of a logistic system that has been implemented, it is still limited because we are not sure that the lack of significance is due to small numbers or lack of a relationship.

Conclusions and Lessons Learned

This initial study of Guatemala suggests that decentralization may be advisable for some key functions. The study's indicators for high decision space were related to better performance indicators for budgeting, needs quantification, procurement, and assignment of personnel to logistics tasks. These are major functions in a

logistic system and the ability to make adjustments to local conditions is important for effectiveness. They also require the personnel to have significant skills. It is a testament to the effectiveness of the initiatives taken in Guatemala through the *Open Contract* and the use of NGOs that decentralization of these functions was related to better performance. It is also important to recognize that these functions are restricted, in some ways, centrally, e.g., limiting procurement mainly to the *Open Contract* and central provision of LMIS forms and training. The survey could not assess whether these conditions were essential to the effectiveness of the functions.

On the other hand, the findings also suggest that some functions might perform better if they remain more centralized. There were some negative or ambiguous findings for functions such as inventory control, transportation, LMIS, and supervision. The mixed/lower performance in inventory control and LMIS for drugs suggests that these two functions would be better maintained if they were centralized. Supervision may also require more centralized decisions. It may make sense to limit local choices over inventory control, LMIS, and supervision, because uniform and well-designed systems for these functions may not need to be adjusted to local conditions.

For integration of the three types of products, the study suggests that needs quantification and LMIS might be integrated with positive results. However, integrating product selection and procurement might lead to poorer results. These findings are also logical. Needs quantification and LMIS are related functions that require similar skills for all three products. However, because selection and procurement of vaccines and contraceptives are vertically run activities, their integration may not be effective in the current system. For integration to be more effective, it might require decentralization of these two functions for vaccines and contraceptives.

We are not able to draw conclusions about the other functions, either because they remain centralized or we were unable to find relationships between the decision space and performance indicators. Studies in other countries may find evidence for recommendations for these functions.

Annex A

Guatemala: Decentralization Decision Space Table

Guatemala: Decentralization Decision Space Table

Functions (N)	Decision Space	Performance Indicators
Financing	No indicator	No performance indicators
Budgeting	• Make budgetary decisions on their own. • What is done if budgets are cut. high: 75% low: 25% N=125	• Percentage of planned budget that was approved
Cost recovery	No Indicator	No performance indicators
Product selection	• Make their own Selection Decisions. • Have their own essential drug list. high: 35% low: 65% N=280	• Average # of products on the basic list
Needs quantification	• Make needs quantification decisions on their own. high: 91% low: 9% N=280	• Percentage of facilities using logistics data to forecast requirements • Stockouts at the time of the visit • Stockout over the last six months • Average number of days per stockout • Role of nurses in needs quantification (descriptive only)
Procurement	• Make procurement decisions on their own. • Made purchases off EDL (but within *contrato abierto*). • Made purchases off contrato abierto. high: 87% low: 13 % N=277	• Order fill rate • Order lead time • Percentage of last 4 orders/procurements received according to schedule
Storage	No indicator.	• Percentage of warehouse conditions met • Percentage of cold chain conditions met • Decision space analysis

Functions (N)	Decision Space	Performance Indicators
Inventory control	• Calculate their needs based on any other inventory control system different than maximum-minimum. • Calculate inventory control with other method other than maximum-minimum. high: 35% low: 65% N=265	• Discrepancy between stock cards and physical inventory • Stockouts at the time of the visit • Stockout over the last six months • Avgerage number of days per stockout • Stock status: percentage of facilities maintaining stock according to established levels • Percentage of facility reporting problems with the quality of product • Percentage of facility reporting receiving a product with less than 18 months of shelf life
Transportation	• Hire private transport or utilize public transport when normal transport provider does not arrive. high: 77% low: 23% N=118	• Percentage that report no transportation problems • Percentage of stockouts due to late delivery • Stockouts at the time of the visit • Stockout over the last six months
Logistics management and information systems	• Create a different BRES form. high: 11% low: 89% N=276	• Percentage of facilities using the BRES • Frequency of sending the BRES
Human resources/ personnel	• Make decisions on own regarding number of their personnel assigned to logistic functions. high: 83% low: 17% N=131	• Percentage staff trained in different areas (budget estimation, logistics, rational use)

Functions (N)	Decision Space	Performance Indicators
Supervision and staff development	• Make decision on their own in designing supervision guides. • Make decision on their own in applying supervision guides. • Make decision on their own in assigning human resources for supervision. • Make decision on their own in decision space in assigning financial resources for supervision. • Make decision on their own in the scheduling supervision. • Make decision on their own in decision space in the frequency of supervision. high: 63% low: 37% N=105	• What was done during the supervisory visit • Percentage facilities with supervisory visits in the last year.
Training	• Select participants for training courses on their own. high: 19% low: 81% N=32	• Percentage of staff trained in different areas
Organizational support	• Facilities resolve difficulties on their own. high: 91% low: 9% N=242	• Solving problems in stockouts, warehousing, and transport • Number of organizational support meetings with analysis team in the last year
Monitoring and evaluation	• Maintain their own records for M&E. high: 40% low: 60% N=25	• Number of M&E reports for medicines, contraceptives, and vaccinations • Visual verification of M&E reports
Product quality assurance	No indicator.	• Percentage of facility reporting problems with the quality of product • Percentage of facility reporting receiving a product with less than 18 months of shelf life
Treatment protocols and client contact	Can modify treatment protocols. high: 34% low: 66% N=265	No performance indicators
Mean total DS	high: 55% low: 45% N=281	

Annex B

Needs Quantification, Procurement, Inventory Control, and Transportation Tables

Needs Quantification Decision Space

Needs Quantification Accuracy and Product Stockouts for Contraceptives and Vaccines on Day of Visit

	Needs Quantification Accuracy Contraceptives (%)	Needs Quantification Accuracy Vaccines (%)	Mean Percentage of FP Products Stocked Out on DOV (%)	Mean Percentage of Vaccines Stocked Out on DOV (%)
Health Area Office	25 (17)	-72 (5)	11 (21)	0 (19)
Hospitals	49 (3)	22 (3)	0 (7)	7 (7)
NGO	---	---	75 (4)	20 (5)
Health Centers	4 (39)	12 (21)	10 (53)	4 (47)
Health Posts	-12 (65)	-22 (27)	8 (133)	26 (97)
Total	-1 (124)	-11 (56)	10 (218)	16 (175)

Mean Percentage of Stockouts for Contraceptives, and Vaccines over the Last Six Months

	Mean Percentage Stocked Out for Contraceptives (%)	Mean Percentage Stocked Out for Vaccines (%)
Health Area Office	26 (21)	10 (21)
Hospitals	11 (7)	25 (8)
NGO	15 (16)	5 (21)
Health Centers	20 (57)	4 (52)
Health Posts	23 (141)	5 (134)
Total	22 (242)	6 (236)

Needs Quantification Decision Space for Drugs, Contraceptives, and Vaccines

	Needs Quantification of Medicines (%)		Needs Quantification of Contraceptives (%)		Needs Quantification of Vaccines (%)	
Type of Facility	**High DS**	**Low DS**	**High DS**	**Low DS**	**High DS**	**Low DS**
Health Area Office	22 (100)	---	22 (100)	---	22 (100)	---
Hospitals	10 (100)	---	9 (100)	---	8 (100)	---
NGOs	33 (78)	9 (22)	13 (72)	5 (28)	19 (73)	7 (27)
Health Centers	54 (95)	3 (5)	56 (98)	1 (2)	56 (98)	1 (2)
Health Posts	135 (90)	14 (10)	135 (91)	13 (9)	135 (91%)	13 (8)
Total	254 (91)	26 (9)	235 (92)	19 (8)	240 (92)	21 (8)

Procurement Decision Space

Order Fill Rates for Contraceptives and Vaccines

	Order Fill Rate—Contraceptives (%)	Order Fill Rate—Vaccines (%)
Health Area Office	16 (15)	0 (8)
Hospitals	-5 (5)	300 (3)
NGO	---	---
Health Centers	-2 (38)	27 (22)
Health Posts	10 (70)	-3 (63)
Total	6 (128)	14 (96)

Procurement Decision Space for Medicines, Contraceptives, and Vaccines

Type of Facility	Procurement of Contraceptives		Procurement of Vaccines	
	High DS	Low DS	High DS	Low DS
Health Area Office	12 (86)	2 (14)	12 (86)	2 (14)
Hospitals	9 (100)	---	9 (100)	---
NGOs	11 (61)	7 (39)	14 (54)	12 (46)
Health Centers	54 (95)	3 (5)	54 (95)	3 (5)
Health Posts	132 (91)	14 (9)	134 (91)	13 (8)
Total	218 (89)	26 (11)	223 (88)	30 (12)

Mean Order Lead Time

	Order Lead Time— Contraceptives	Order Lead Time—Vaccines
Health Area Office	6 (15)	-14 (8)
Hospitals	3 (5)	0 (3)
NGO	---	---
Health Centers	-5 (37)	9 (24)
Health Posts	6 (75)	-3 (65)
Total	3 (132)	-1 (100)

Mean Percentage of Last Four Orders Received According to Schedule

	Last 4 Orders—Medicines (%)	Last 4 Orders—Contraceptives (%)	Last 4 Orders—Vaccinations (%)
Health Area Office	100 (11)	100 (15)	100 (8)
Hospitals	71 (7)	83 (6)	67 (3)
NGO	---	---	---
Health Centers	90 (41)	85 (41)	88 (25)
Health Posts	84 (99)	88 (83)	92 (60)
Total	86 (158)	88 (145)	91 (96)

Inventory Control Decision Space

Inventory Control (Maximum and Minimum) Decision Space for Medicines, Contraceptives, and Vaccines

	Inventory Control of Medicines (%)		Inventory Control of Contraceptives (%)		Inventory Control of Vaccines (%)	
Type of facility	**High DS**	**Low DS**	**High DS**	**Low DS**	**High DS**	**Low DS**
Health Area Office	24 (5)	16 (76)	3 (14)	18 (86)	19 (86)	3 (13)
Hospitals	40 (4)	6 (60)	7 (87)	1 (13)	9 (90)	1 (10)
NGOs	78 (29)	8 (22)	10 (71)	4 (29)	40 (95)	2 (5)
Health Centers	11 (6)	47 (89)	15 (28)	38 (72)	32 (56)	25 (44)
Health Posts	28 (38)	97 (72)	60 (43)	78 (57)	105 (70)	45 (30)
Total	32 (82)	174 (68)	95 (41)	135 (59)	205 (73)	76 (27)

Inventory Calculation for Contraceptives

	Health Area Office (%)	Hospitals (%)	NGO (%)	Health Centers (%)	Health Posts (%)	Total (%)
Population based, estimation, historical, none, other—High DS	24 (5)	86 (6)	85 (11)	44 (23)	28 (38)	48 (45)
Max min only—Low DS	76 (16)	14 (1)	15 (2)	56 (29)	72 (97)	52 (48)
	21	7	13	52	135	93

Inventory Calculation for Vaccines

	Health Area Office (%)	Hospitals (%)	NGO (%)	Health Centers (%)	Health Posts (%)	Total (%)
Population based, estimation, historical, none, other—High DS	70 (14)	86 (6)	88 (15)	69 (35)	---	74 (70)
Max min only—Low DS	30 (6)	14 (1)	12 (2)	31 (16)	---	26 (25)
	20	7	17	51	---	95

Use of the BRES

Percentage who use the BRES	Health Area Office (%)	Hospitals (%)	ONG (%)	Health Centers (%)	Health Posts (%)	Total (%)
Contraception	18 (86)	4 (50)	3 (9)	43 (78)	101 (69)	169 (64)
Vaccines	3 (18)	3 (38)	3 (9)	21 (40)	32 (24)	62 (26)

Percentage of Facilities Who Report Sending BRES for Medicines According to Schedule (within the last two months)

Percentage of facilities who report sending BRES on time	Medicines (%)	Contraceptives (%)	Vaccines (%)
Always	128 (64)	113 (62)	63 (54)
Often	23 (12)	19 (11)	9 (8)
Rarely	48 (24)	49 (27)	45 (38)

Mean Percent Discrepancy between Stock Cards and Physical Inventory

	Percent Discrepancy—Contraceptives (%)	Percent Discrepancy—Vaccines (%)
Health Area Office	90 (21)	89 (18)
Hospitals	38 (3)	54 (4)
NGO	---	----
Health Centers	445 (48)	51 (30)
Health Posts	51 (103)	25 (29)
Total	163 (175)	50 (81)

Stock Status

	Stock Status—Contraceptives (%)	Stock Status—Vaccinations (%)
Health Area Office	24 (21)	10 (19)
Hospitals	---	---
NGO	---	---
Health Centers	33 (49)	20 (35)
Health Posts	33 (106)	27 (51)
Total	32 (176)	22 (105)

Percentage Reporting Problems Detected with the Quality/Efficacy of Medicines within the Last Year

	Health Area Office (%)	Hospitals (%)	NGO (%)	Health Center (%)	Health Post (%)	Total (%)
% reporting problems with quality/efficacy of medicines within the last year	48(10)	30 (3)	10 (4)	18 (10)	16 (24)	18 (51)
Total	21	10	42	57	150	280

Percentage Who Received a Product with Less Than 18 Months of Shelf Life

	Health Area Office (%)	Hospitals (%)	NGO (%)	Health Center (%)	Health Post (%)	Total (%)
% received a product with < 18 mo. shelf life	50 (11)	40 (4)	10 (4)	3 (21)	42 (62)	37 (102)
Total	22	10	42	56	149	279

Percentage of Facilities That Report No Transportation Problems

	No Transportation problems – Contraceptives (%)	No Transportation problems – Vaccinations (%)
Health Area Office	82 (14)	78 (14)
Hospitals	63 (5)	63 (5)
NGO	70 (7)	71 (10)
Health Centers	58 (25)	50 (21)
Health Posts	20 (25)	10 (12)
Total	37 (76)	30 (62)

Percent of Facilities That Reported Stockouts Were Due to Late Delivery

	Contraceptives (%)	Vaccinations (%)
Stockouts due to late order	20 (97)	10 (30)

Transportation

Hire Private Transport or Use Public Transport if Normal Transport Does Not Arrive for Contraceptives

	Health Area Office (%)	Hospitals (%)	NGO (%)	Health Centers (%)	Health Posts (%)	Total (%)
Private/Public—High DS	33 (1)	100 (3)	67 (2)	16 (80)	94 (90)	90 (112)
Wait for regular transport—Low DS	67 (2)	---	33 (1)	20 (4)	6 (6)	10 (13)
	3	1	3	84	96	125

Hire Private Transport or Use Public Transport if Normal Transport Does Not Arrive for Vaccines

	Health Area Office (%)	Hospitals (%)	NGO (%)	Health Centers (%)	Health Posts (%)	Total (%)
Private/Public— High DS	40 (2)	100 (2)	83 (5)	91 (21)	96 (98)	93 (128)
Wait for regular transport— Low DS	60 (3)	---	17 (1)	9 (2)	4 (4)	7 (10)
	5	1	6	23	102	138

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