

Zimbabwe

Assessing the Cost of Transporting HIV/AIDS Commodities

A Case Study in
Financial
Analysis

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September 2003



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DELIVER

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Abstract

In July 2002, the DELIVER project conducted an assessment of transport costs for HIV/AIDS commodities in Zimbabwe in response to a request for assistance made by the Zimbabwe National Family Planning Council (ZNFPC) to the U.S. Agency for International Development (USAID) in Zimbabwe. Recognizing the serious distribution problems in the public system, the Government of Zimbabwe asked the ZNFPC to distribute all HIV/AIDS-related commodities, including condoms, other contraceptives, and essential medicines. Before accepting, ZNFPC needed to assess their capacity to undertake the work, to understand the costs involved, and to answer the following questions:

1. What caused the current non-availability of HIV-AIDS commodities at the district and health center levels in Zimbabwe; and what portion of supply shortages are due to failures in the transport system.
2. What are the options for integrated distribution of HIV/AIDS condoms, contraceptives, and other HIV/AIDS-related essential medicines at the district and health center level? What roles might ZNFPC and the National Pharmacy Corporation (the government parastatal that procures essential medicines) play as agencies for the integrated system, under each option? What are the recurrent costs of each option? What one-time investment costs are required?

This report describes the approach used to conduct the feasibility assessment. It discusses the purpose and design of the transport assessment, and the methods for data collection and analysis. The case study then describes the findings and how they were used, drawing insights for logistics and financial analysis.

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Contents

Contents	iii
Acronyms.....	v
Summary	1
1. Background	1
Current Situation	1
2. Designing the Analysis.....	5
Purpose and Objectives.....	5
Scope and Approach.....	5
Defining What to Measure	7
3. Collecting Data	7
4. Analyzing and Interpreting Data	8
5. Using Cost Data and Findings.....	13
Factors Affecting Product Availability	13
Costs and Desirability of Alternate Distribution Scenarios	14
6. Insights on Cost Analysis for Logistics.....	14
Appendix A. Budget Analysis.....	17
Budget Analysis.....	19
Essential Drugs	19
Condoms.....	19
Other Contraceptives.....	19
Appendix B. Make or Buy Decision Analysis.....	21
Make or Buy Decision Analysis	23
Measures C1-C8	24
Measure C9	24
Reference	27

Figures

1. Distribution System for Public Sector Medicines and Supplies, Including HIV/AIDS-related Essential Drugs in 2002.....	2
2. Distribution System for HIV/AIDS Condoms and Other Contraceptives in 2002.....	3

Tables

1. Information Needed and Indicators Measured	7
2. Commodity Delivery and Program Monitoring Schedules, Options 1 and 2	9
3. Alternative Scenario Analysis: Information, Indicators, and Calculations	10
4. Summary of Cost Components in Option 1.....	12
5. Budget Analysis: Information, Indicators, and Calculations	20
6. Budget Analysis: Results (Thousands of Z \$)	20
7. Make or Buy Decision Analysis: Information, Indicators, and Calculations	23
8. Cost for Private Commercial Carrier Services, Mashonaland West Province, One Delivery Cycle	24

Acronyms

DFID	British Department for International Development
EU	European Union
GMS	General Medical Stores
HIV/AIDS	human immune deficiency virus/acquired immune deficiency syndrome
MOHCW	Ministry of Health and Child Welfare
NatPharm	National Pharmacy Corporation
PHC	primary health care
PMD	Provincial Medical Director
SDP	service delivery point
STI	sexually transmitted infection
UNFPA	United Nations Population Fund
USAID	United States Agency for International Development
ZNFPC	Zimbabwe National Family Planning Council

Summary

In July 2002, DELIVER conducted an assessment of transport costs for HIV/AIDS commodities in Zimbabwe (Alt and Noguera 2002). Recognizing that serious problems existed in the public system for distribution from the district to the health center level, the Government of Zimbabwe asked the Zimbabwe National Family Planning Council (ZNFPC) if it would be willing to assume distribution of HIV/AIDS-related commodities, including condoms, other contraceptives, and essential medicines. Before accepting this responsibility, ZNFPC wanted to assess their capacity to undertake the work and to understand the costs involved. ZNFPC asked the U.S. Agency for International Development (USAID) to help them conduct this feasibility assessment, and USAID requested the assistance of DELIVER. Government, ZNFPC, and USAID program managers felt that a financial analysis would help them consider transport alternatives and the expenditures needed for consistent and reliable delivery down to the lowest level in the system.

This case study examines lessons learned from the Zimbabwe assessment study. The case study discusses the purpose and design of the transport assessment, as well as methods for data collection and analysis. The case study then describes the findings and how they were used, drawing insights for logistics and financial analysis.

1. Background

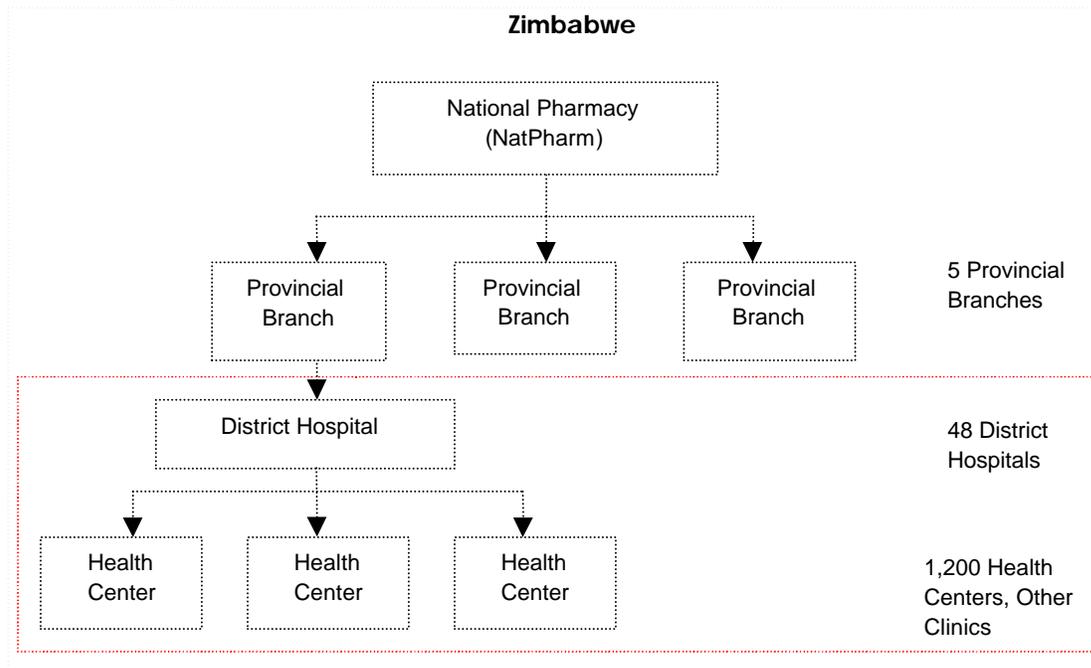


Zimbabwe is a country of 11.4 million, divided into eight provinces and 48 districts. Each district has a hospital, and the country has about 1,200 health centers and other clinics. For the distribution system, little distinction is made between public and private non-commercial outlets that support the public programs.

Current Situation

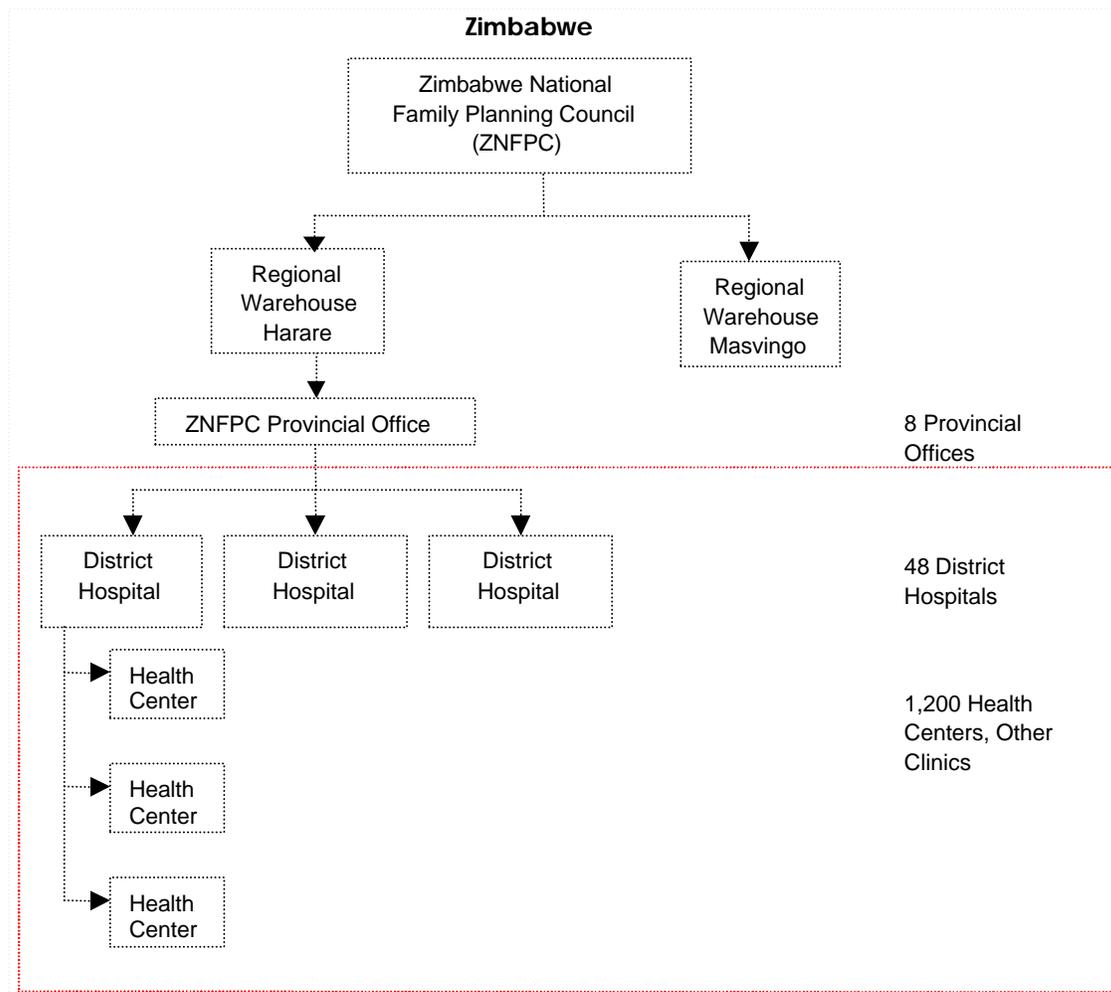
The Zimbabwe transport cost study was complex because ZNFPC was being asked to assume responsibility for integrated delivery of commodities from two commodity management systems. Figure 1 shows the structure of the distribution system for public-sector *essential medicines* (including HIV/AIDS-related medicines) at the time the study took place, while figure 2 shows the distribution system for *condoms and other contraceptives* (including HIV/AIDS condoms). The structure and operations of the two systems are described briefly.

Figure 1.
Distribution System for Public Sector Medicines and Supplies, Including HIV/AIDS-related Essential Drugs in 2002



Note: • NatPharm Central branch delivers directly to national, regional, specialty, and provincial hospitals.
• Dotted line ————— indicates MOHCW health system.

Figure 2.
Distribution System for HIV/AIDS Condoms and Other Contraceptives in 2002



Note: • ZNFPC supplies nongovernmental outlets also.
 • Dotted line indicates MOHCW health system.

Essential Medicines

Within this system, the National Pharmacy Corporation (NatPharm), a government parastatal, fills monthly orders sent from teaching and specialty hospitals, district hospitals, and rural health centers. The orders from the rural health centers are first sent through the district hospital and checked by the Provincial Medical Director (PMD). In better economic times, the orders would be filled through the five provincial NatPharm warehouses, and drugs would be delivered down to the facility level, but over the past years this system had deteriorated badly. First, due to high drug prices on the international market, devaluation of Zimbabwe's currency, and declining government budgets, medicines were often out of stock in NatPharm's warehouses. In addition, what trucks NatPharm had were very old and unreliable. NatPharm had a mandate to perform commercially viable procurement services for the government and other customers, and NatPharm management did not see distribution as a core function in its business model. Finally, early in 2002, NatPharm informed the Ministry of Health and Child Welfare that it could no longer deliver medicines to the health center level, only to the district hospitals. The Government would have to find another way to deliver the medicines to the primary care facilities.

Supply problems at the national level would be somewhat alleviated by a shipment of Euro 26 million in HIV/AIDS-related essential medicines purchased through a European Union-funded health program. The shipment, due to arrive starting in late 2002, was expected to cover two years' of requirements for most peripheral-level facilities.

Condoms and Contraceptives

The ZNFPC is a government parastatal organization created in 1985 to coordinate the national family planning program. The ZNFPC purchases contraceptives and receives donations from bilateral and multilateral organizations, including the British Department for International Development (DFID), USAID, and the United Nations Population Fund (UNFPA). Unlike essential drugs, there are adequate supplies of condoms and other contraceptives at the national level.

Orders from government district hospitals and rural health centers are first consolidated at the district hospital level, and then sent to the provincial medical director for approval. Government clinics do not need to pay for condoms, because they are all donated; however, for other contraceptives the PDM must first check that the order does not exceed the district's budget line item for contraceptives.¹ After making sure the budget is adequate, the PMD forwards the order to the ZNFPC provincial office. Orders are filled at one of two regional warehouses (one in Harare and one in Masvingo) and sent back to the provincial offices.

In theory, the PMD or a district official is supposed to pick up the order from the ZNFPC provincial office and deliver it to district hospitals and health centers. But, provincial medical offices lack vehicles and for many reasons cannot access the central government motor pool vehicles.² There are no storerooms either, and orders that cannot be delivered immediately to the periphery are at risk of theft and deterioration. Clinic staff coming to the provincial office for other reasons can sometimes pick up an order, but condoms are bulky and this can be difficult and

¹ Contraceptives had been separated from the medicines budget line item because of fears that health staff who were not in favor of family planning would spend the medicines allocation on other supplies instead of purchasing contraceptives. As shown later in the case study, the line item budgeting system proved to be a significant constraint for HIV/AIDS condoms and contraceptive supply, independent of transportation system problems.

² While the central motor pool has vehicles, the charges (internal prices charged to ministries using the vehicles) are expensive compared to the MOHCW budget, and the service is not seen as reliable.

costly for staff using public transportation. For these reasons, the ZNFPC decided to deliver HIV/AIDS condoms and other contraceptives directly to the district hospital level, on a pilot basis, starting in November 2001. This improved availability at the district level, but the problem of moving the orders down to the health centers remained unresolved.

When the Government of Zimbabwe asked the ZNFPC to help with distribution to the peripheral level, it seemed logical to consider the two types of commodities together. The following section describes how the study team defined the scope, objectives, analytical approach, and data collection methods for the analysis.

2. Designing the Analysis

Purpose and Objectives

The study team was asked to assess the capacity of ZNFPC to ensure reliable distribution of HIV/AIDS commodities (including essential medicines, condoms, and other contraceptives) to the district hospital and rural health center level. The assessment was to look particularly at whether ZNFPC had the resources needed to do the job, and, if not, what additional resources would be needed. The study team addressed the following questions:³

1. What are the causes for the current lack of availability of HIV/AIDS commodities at the district and health center levels in Zimbabwe? What percentage of supply shortages can be attributed to failures in the transport system?
2. What are feasible options for integrated distribution of HIV/AIDS condoms, contraceptives, and other HIV/AIDS-related essential medicines to the district and health center level? What roles might ZNFPC and NatPharm play as responsible agencies for the integrated system under each option?
3. What are the recurrent costs of each of the options? What one-time investment costs are required?

Two technical consultants were engaged to conduct the analysis over a four-week period, with additional time for data analysis and report writing in the United States.

Scope and Approach

The purpose of the study was to consider national distribution options; therefore, the analysis needed to be generalized at the national level.⁴ The study team collected data that covered a complete delivery cycle in one sample province (Mashonaland West), then extrapolated annual costs for the country. The study used fiscal year 2001 data and projections based on FY2002 year-to-date figures.

The study team conducted field visits to four provinces. Approximately 50 provincial, district, and health center staff were interviewed. The team also interviewed NatPharm staff from three provincial branches. These interviews helped establish assumptions such as efficient routing and distances, road conditions and vehicle speeds, commodity weights/volumes, and cost parameters.

³ The team also addressed a fourth question: How feasible would it be to contract out delivery services to a private commercial firm, and what would this cost? The analysis is presented in appendix C.

⁴ The study excluded the cities of Harare and Bulawayo where supply problems were less pressing.

Zimbabwe: Transporting HIV/AIDS Commodities

Three approaches were used to collect the information needed to answer the study questions. These included alternative scenario analysis, budget analysis, and *make or buy* decision analysis. This case study focuses mostly on the alternative scenario analysis. Details of the other analyses are in appendices B and C.

The team began by thinking about the factors or *drivers* that were most likely to affect the total cost of a distribution system. In this case, these included the following:

Cost Driver	Options Analyzed		
	Less Costly	→→→→→→→→	More Costly
Type of Vehicle	Large-capacity delivery truck (3-ton)	Small pickup truck	Land cruiser
Frequency of Delivery	Quarterly	Bimonthly	Monthly
What Gets Delivered (Level of Integration)	Essential drugs alone	Essential drugs, condoms, and contraceptives	

The cost differences among options are not always readily apparent. For example, while large-capacity delivery trucks are more expensive to purchase and operate per kilometer (due to higher depreciation expense), they also use less fuel and can complete a delivery cycle in fewer days, because they do not need to go back to the warehouse to reload orders between service delivery points. The net effect is that using large-capacity delivery trucks lowers total distribution expense.⁵

Sometimes, frequency of delivery also drives costs in uncertain ways; although quarterly delivery incurs lower travel costs,⁶ the less frequent schedule requires more investment in warehousing and security functions to avoid losses from spoilage and theft.

The level of integration affects total distribution cost because it influences the volume of consignments and the length of time it takes to deliver. Finally, as responsibilities are shifted between agencies like ZNFPC and NatPharm, the cost burden for the distribution system may begin to shift in ways that affect staffing and investment planning. The study team examined many of these options before choosing alternative scenarios to compare, as described in section 4.

Ultimately, the study team developed two alternative scenarios for integrated distribution of contraceptives by NatPharm and ZNFPC.⁷ The cost question facing the study team was how costs would change if distribution was integrated and tasks reassigned between NatPharm and ZNFPC.

⁵ The ratio of costs for the three types of vehicles, using the 3-ton truck as the index, was 1.0 (3-ton truck), 1.40 (pickup), and 1.64 (Land Cruiser). Delivery by Land Cruiser was 64% more costly than delivery by 3-ton truck. See section 4, discussion of measure B6, for the assumptions involved.

⁶ Bimonthly deliveries of all commodities was estimated to cost 2.5 times the cost of quarterly deliveries. See section 4, measure B6.

⁷ The study team quickly ruled out other government agencies (namely, the provincial medical director's office and district hospitals) due to human resource constraints and the large investment required for vehicles.

Defining What to Measure

Table 1 shows the information needed for the alternative scenario analysis. Sections 3 and 4 discuss how data were collected and how the indicators were calculated.

Table 1. Information Needed and Indicators Measured

Information Needed	Indicator Measured or Data Collected
Annual operating costs for <i>option 1</i> (integrated delivery from districts to SDPs, with delivery truck <i>top up</i> system for condoms/contraceptives).	1. Annual cost of delivery of HIV/AIDS condoms and contraceptives <i>to district</i> level, using ZNFPC national staff.
	2. Annual cost of delivery of HIV/AIDS essential medicines <i>to district</i> level, using NatPharm staff.
	3. Annual cost of delivery of all commodities <i>from districts to SDPs</i> , using ZNFPC provincial staff.
One-time investment cost for option 1.	4. One-time purchase of vehicles, plus a list of training and technical support activities requiring one-time financial resources.
Annual operating and investment costs for <i>option 2</i> (integrated delivery from provinces to SDPs, bypassing the districts without a <i>top up</i> system).	5. No separate data were collected for this indicator. Instead, the study team estimated how costs for option 2 would be similar or different from costs for option 1.
Sensitivity of option 1 to assumptions about delivery schedules and vehicles.	6. Cost estimates for quarterly, bimonthly, and monthly deliveries of commodities from district or province to SDPs; cost estimates using three different size vehicles.

3. Collecting Data

The study team started by interviewing key stakeholders and conducting field visits to four provinces out of the total eight provinces in Zimbabwe. The cost data was collected from one province: Mashonaland West, which was selected because it had the best available information about routing distances and other assumptions that were important for costing. Mashonaland West was not the largest or smallest province, so it was assumed that extrapolations from this sample would not grossly overestimate or underestimate national costs.⁸ In addition, the study had time and financial constraints that did not allow a more random selection of sample areas.

During field visits and through interviews with district and health center staff, the study team collected information on routing distances, road conditions, and approximate volumes and weights of commodities. They also gathered data on the current functioning of the stock control system and logistics information system at the different sites. At the national and provincial ZNFPC offices, the team gathered information on the fleet structure and capacity, fleet management practice, costs of vehicle insurance, other standing costs, vehicle running costs, and human resources capacity. Section 4 describes the analyses in more detail.

⁸ Mashonaland West is the fourth largest province, with approximately 13.4% of the population (excluding the cities of Bulawayo and Harare). Its population of 1.1 million (1998) is slightly larger than the mean population for all eight provinces (1.0 million). Provinces in Zimbabwe range in size from 0.6 million (Matabeleland South) to 1.5 million (Manicaland).

4. Analyzing and Interpreting Data

As described in section 2, the study had three objectives or key questions:

Question 1: What caused the current lack of availability of HIV/AIDS commodities at the district and health center levels in Zimbabwe? What percentage of supply shortages can be attributed to problems in the transport system?

Through interviews and discussions with key personnel, the project team began to suspect that some of the supply problems being experienced in Zimbabwe might be due to inadequate budgets for contraceptives at the district level and below. If this was true, then putting in place a new and improved transport system was unlikely to relieve the problem. The team felt it was critical to investigate the budget issue before any further costing was done.

This question was answered through a budget analysis. The procedures followed for the budget analysis are described in detail in appendix B. The analysis showed that the estimated shortfall in resources for contraceptives was Z\$35 million, almost all attributed to shortfall in the MOHCW facility budgets. Records showed that in the first half of 2002, MOHCW had already spent Z\$34 million or 97 percent of their total budget for contraceptives. The MOHCW would have to add Z\$35 million to the contraceptives budget line item to allow districts and health centers to purchase all the contraceptives they were projected to need. The study team concluded that the budgetary constraints were a significant factor affecting supply, even more important than the problem of transportation. This finding of the study was very significant as it highlighted a problem that was not generally known or appreciated among policymakers in the government or donor community.

Question 2. What are feasible options for integrated distribution of HIV/AIDS condoms, contraceptives, and other HIV/AIDS-related essential medicines to the district and health center level? What roles might ZNFPC and NatPharm play as responsible agencies for the integrated system under each option?

—and—

Question 3. What are the recurrent costs for each option (over and above what the ZNFPC and NatPharm are now incurring)? What one-time investment costs are required?

Both questions were answered through a scenario analysis. Scenarios for quarterly, bimonthly, and monthly delivery were considered and costed; however, the team decided that because of storage and security issues, the recommended options would consider *monthly* delivery of HIV/AIDS-related essential medicines, and *bimonthly* or *monthly* delivery of condoms and contraceptives.

The team then created two options for integrated distribution systems:

Option 1: Integrated delivery from district to SDPs (District to SDP).

Option 1 retained the current *pull* order system for *essential medicines*.⁹ NatPharm would continue to fill these orders and deliver to the district level. At this point, the provincial ZNFPC staff would assume monthly delivery of the pre-packaged essential drug orders to the SDPs.

⁹ In *pull* systems, lower-level facilities order contraceptives as the need arises. In *push* systems, a higher-level facility decides what commodities move down the system and when they move down.

Option 1 changes the *condom and contraceptive* supply system from a pull system to a push system based on logistics information (stocks and consumption). Every two months, the ZNFPC central office would make a bulk delivery of contraceptives and condoms to district health offices. From there, ZNFPC provincial teams would deliver the contraceptives to the SDPs. Unlike essential drugs, orders would not be pre-packaged; instead, the provincial ZNFPC staff would calculate consumption and quantities required while at the SDP.¹⁰ Delivery staff would gather data for the logistics management information system and discuss results during the delivery trips. In addition, health staff would be encouraged to take trips bimonthly to perform program monitoring and provide technical support.¹¹

Option 2: Integrated delivery from province to SDPs (province to SDP).

Option 2 creates a fully integrated pull order system for medicines and contraceptives/condoms. NatPharm provincial warehouses would stock contraceptive items, fill SDP orders, and deliver them as far as the district level. From there, the provincial ZNFPC staff would assume monthly delivery of the pre-packaged essential medicines and contraceptives to the SDPs. Like the first option, option 2 would include monitoring of logistics management, and would encourage health staff to accompany delivery trucks every other month to perform program monitoring and technical support activities. Table 2 summarizes the commodity delivery and program monitoring schedules costed in options 1 and 2.

Table 2. Commodity Delivery and Program Monitoring Schedules, Options 1 and 2

Month	Commodity Delivered ^a	Commodity Delivered ^a	Program Monitoring and Technical Support
	Option 1	Option 2	
1	EM	EM&CC	No
2	EM&CC	EM&CC	Yes
3	EM	EM&CC	No
4	EM&CC	EM&CC	Yes
5	EM	EM&CC	No
6	EM&CC	EM&CC	Yes
7	EM	EM&CC	No
8	EM&CC	EM&CC	Yes
9	EM	EM&CC	No
10	EM&CC	EM&CC	Yes
11	EM	EM&CC	No
12	EM&CC	EM&CC	Yes

Notes: a. EM = essential medicines; EM&CC = essential medicines; condoms, and contraceptives

¹⁰ This is called a delivery truck topping up system.

¹¹ The original cost study presents a more detailed description of option 1 and 2 and the tasks involved in the monitoring.

Costs for option 1 and option 2 were calculated as described in table 3.

Table 3. Alternative Scenario Analysis: Information, Indicators, and Calculations

Information	Indicator Measured	Calculation
Annual recurrent costs for option 1 (districts to SDPs).	B1. Annual running cost of delivery of HIV/AIDS condoms and contraceptives from ZNFPC central office to district level, using ZNFPC national staff.	Cost per delivery is total kilometers traveled (based on maps of districts in the sample province) times average ZNFPC vehicle cost per kilometer, including amortization (from ZNFPC accounting records), then using days traveled to arrive at per diem costs. Days were calculated by dividing kilometers traveled by average speed per hour, then converting hours to days and adding in time to load/unload. Costs were annualized by multiplying times six deliveries per year, then extrapolated to national level by multiplying times eight provinces.
	B2. Annual running cost of delivery of HIV/AIDS essential drugs to district level, using NatPharm staff.	Estimate of NatPharm costs based on Measure B1, correcting for the greater volume of essential medicines and shorter travel distances from warehouses to districts.
	B3. Annual cost of delivery of all commodities from districts to SDPs using ZNFPC provincial staff. Assumes bimonthly delivery of HIV/AIDS condoms and contraceptives, and monthly delivery of HIV/AIDS-related essential medicines.	Cost per delivery is kilometers traveled (based on delivery schedule) times average vehicle cost per kilometer, including amortization, plus allowances based on days traveled. Days were calculated by dividing kilometers traveled by average speed per hour, then converting hours to days and adding time to load/unload. Costs were calculated separately for the bimonthly joint deliveries and for bimonthly delivery of medicines alone. Costs for each type of delivery were multiplied by six deliveries per year, then extrapolated to national level by multiplying by eight provinces. Costs were added to obtain annual cost of delivery for all commodities, nationwide.
One-time investment cost for option 1.	B4. One-time purchase of vehicles, plus training and technical support requiring resources.	Number of trucks needed was estimated by taking total kilometers in provincial delivery route, divided by average vehicle speed (km per hour), divided by hours/day, adding a factor for vehicle down time (times 125%), plus loading/ unloading time (estimates from key informants, see below). Total days were then divided by 5 to calculate vehicle-weeks per delivery cycle. Separate calculations were made for the integrated bimonthly delivery versus monthly deliveries of essential drugs alone because loading and unloading time varied (the team estimated that integrated deliveries would require 1 hour per clinic to load/unload, compared to 15 minutes per clinic for essential drugs alone). Technical assistance and training are described without detailed costing.
Costs for option 2 (provinces to SDPs).	B5. No separate data were collected for this indicator. Instead, the study team estimated how costs for option 2 would be different from cost estimates for option 1. See discussion in text.	
Sensitivity analysis to assumptions.	B6. Separate estimates were made for quarterly, bimonthly, and monthly deliveries of the different types of commodities from district to SDPs. Also, the cost of delivery rounds using three different kinds of vehicles were calculated: Land Cruiser, Hilux with canopy, and T3500 with box. See original cost study, appendix E.	

Measure B1

The annual cost of delivery of HIV/AIDS condoms and contraceptives from ZNFPC central level to the districts (measure B1) included the vehicle running expenses plus an allowance for amortization for one recently donated 8-ton truck. The study team used the rate established by the ZNFPC accounting office (Z\$120 per kilometer). Travel and subsistence allowances were calculated using the established ZNFPC daily rate (Z\$4,500) times the number of delivery personnel times days required for one delivery round. ZNFPC specifically asked the study team not to consider salary costs or overhead expenses as these were not seen as incremental expenses. The total cost for one delivery round in the sample province (Z\$119,580) was multiplied by six, because the study team had decided that bimonthly delivery was the preferred schedule. The annual costs for the sample province were then multiplied by eight (total number of provinces in the country) to obtain a national cost estimate of Z\$5,740,000.

Measure B2

The study team did not analyze costs at NatPharm. Instead, the annual cost of delivery for essential medicines from the NatPharm provincial warehouses to the districts (measure B2) was estimated in relation to measure B1 (ZNFPC costs for moving condoms and contraceptives). The study team corrected for the greater volume of essential medicines to be transported, as compared to the condoms and contraceptives (NatPharm's volume was estimated to be three times that of ZNFPC's), and the shorter distances to be traveled (NatPharm has five provincial warehouses, versus the two central warehouses of ZNFPC). The overall estimate for essential medicines delivery was, therefore, assumed to be Z\$10,000,000 or roughly 57 percent higher than the cost of delivering condoms and contraceptives to the district level.

Measure B3

Because of perceived storage pressures and potential danger of theft at the health center level, the study team assumed monthly delivery of HIV/AIDS-related essential medicines from the districts to the SDP. Every other month, the delivery of pre-packaged essential medicines orders would be combined with delivery of HIV/AIDS condoms and contraceptives, and staff would carry out supervision and monitoring tasks at the same time. The bimonthly joint commodity deliveries required one hour for unloading and monitoring tasks, while the monthly deliveries of pre-packed essential medicines alone were estimated at only 15 minutes for unloading.

The team assumed that deliveries would be made in a 3-ton delivery truck with 23.0 cubic meter carrying capacity, more than sufficient for the delivery amounts and number of sites in an average district. The study team considered other types of smaller vehicles, but these were much less efficient due to the need to make multiple trips for reloading at the district level.¹² Costs included the vehicle running costs and amortization (estimated at Z\$90 per kilometer)¹³, plus the cost of travel and subsistence allowances for delivery staff (two staff, times the number of days needed, given travel schedule and unloading times Z\$4,500 per day). As with previous measures, the cost estimate did not include organizational overhead, salaries of ZNFPC delivery staff, or the cost of personnel at the district and SDP level involved in loading and unloading orders.

¹² See appendix E, costing 5 (Alt and Noguera 2002), for additional details of these cost estimates and the assumptions used. The study team calculated the average volume per order, and estimated the number of service delivery points each type of delivery vehicle could reach before having to reload. Overall the cost per delivery round included the cost of travel back and forth to the district level for necessary reloading.

¹³ This is lower than the Z\$/km rate used in measure 1, because the vehicle running costs and amortization for the 3-ton trucks are lower than the costs for the 8-ton vehicle.

Costs per delivery round were multiplied by six deliveries per year, then multiplied by eight provinces to obtain an estimate of Z\$50,760,000 in nationwide, annual delivery costs for all commodities, from the districts to the SDPs.

Measure B4

Based on volume of commodities, delivery routes, and schedule, and existing capacity at ZNFPC, the team estimated that an additional 12 three-ton trucks would be needed to implement option 1, at a cost of U.S.\$250,000 to \$300,000. One province requires eight vehicle-weeks to complete a bimonthly delivery of orders for condoms, contraceptives, and essential drugs; two vehicles can make bimonthly deliveries by being in one province during one month and in a second province the next month; thus, eight vehicles can cover the eight provinces in the country. Adding the monthly deliveries of essential drugs (with vehicle-weeks calculated similarly) requires an additional four vehicles, bringing the total vehicles to 12. Other one-time investments in technical assistance tasks and training activities were outlined in the original cost study report, but these activities were not costed.

Table 4 summarizes the annual recurrent costs of delivery and one-time vehicle investment costs needed under option 1.

Table 4. Summary of Cost Components in Option 1

Measure	Cost of Delivering	Currency	Cost in Thousands
B1	HIV/AIDS condoms and contraceptives from central to district level.	Z\$	5,740
B2	HIV/AIDS-related essential medicines from central to district level.	Z\$	10,000
B3	All commodities from district to service delivery level (six joint deliveries per year of condoms, contraceptives, and essential medicines together, and six deliveries per year of essential medicines orders alone).	Z\$	50,760
	All commodities, annually, central to SDP level.	Z\$	66,500
B4	One-time investment cost (vehicles only) for option 1.	U.S.\$	250–300

Measure B5

The study team did not independently cost out option 2. Instead, they discussed how the costs for option 2 would be different from the cost estimate for option 1. For example, by transporting products directly from provincial warehouses to SDPs, option 2 avoids costs associated with delivery and storage at the District level. On the other hand, the distances that must be traveled from provinces to SDPs are greater than the distances from districts to SDPs. The team felt that these factors would be offsetting, and that operating costs for the two options were approximately the same.¹⁴ The investment costs for option 2 were likely to be somewhat less because it would be unnecessary to design a top up logistics system and train staff to operate the system.

¹⁴ The original report acknowledges that NatPharm may have minor additional expenses for stocking, picking, and packing the contraceptive items, and suggests a just-in-time delivery schedule from ZNFPC for condoms to reduce NatPharm’s storage space burden.

Measure B6

Sensitivity analysis is helpful to assess whether different assumptions used in a cost analysis are likely to influence the results enough to change the decision being made. Sensitivity analysis is recommended when assumptions are uncertain and decision makers want to evaluate multiple options. In this study, the team developed estimates for quarterly, bimonthly, and monthly deliveries of commodities to show how annual costs will vary depending on the delivery schedule. The sensitivity analysis found, for example, that quarterly delivery of all commodities from district to SDP level would cost Z\$20,160,000, or less than half what option 1 would cost (measure B3, Z\$50,760,000) (Alt and Noguera 2002, appendix F). Yet, the team argued that the more frequent delivery schedule avoids potentially large (though not quantified) losses due to theft and spoilage or expenditures needed to improve storage and security to minimize these losses.

The team also analyzed the cost differences produced by using vehicles with different levels of carrying capacity (e.g., Land Cruisers versus delivery trucks). This sensitivity analysis found that using smaller capacity vehicles instead of delivery trucks increased the cost of delivery by more than 60 percent, due to the need for multiple trips to reload supplies.¹⁵

5. Using Cost Data and Findings

Factors Affecting Product Availability

While the study was initially focused on transportation options and costs, the team quickly realized that there were other constraints on supply reaching the SDP. The budget analysis revealed financial impediments to adequate supply that would not be resolved by reorganizing the transportation system. While contraceptive supplies were adequate at the national level, budgets allocated by the government for purchase of these items by the districts and SDPs were too small. To achieve the goal of reliable, consistent supply of health commodities at the health center level, changes in this internal budgeting system would be required.

The study team recommended that the Ministry of Health and Child Welfare seek an increase in the government budget for contraceptives. If this effort was unsuccessful (given the current economic situation in Zimbabwe, the government was unlikely to have additional funds to allocate), the study team recommended changes in the current budgeting system to eliminate the contraceptives sub-item in facility budgets, moving instead to a flat grant system from the government to ZNFPC, to cover distribution costs.

The cost study served to highlight an important problem about which the Government, ZNFPC, and other development partners were unaware. More analysis and discussion would be needed to solve the problem, but the findings of the cost study served an important function in raising and framing the issues for further debate.

¹⁵ Implementing option 1 with Land Cruisers would cost Z\$80,332,000 versus Z\$50,760,000 using 3-ton trucks such as the Mazda T3500 with box.

Costs and Desirability of Alternate Distribution Scenarios

A large part of the study team's work was actually planning alternative options for distribution and describing how they would work. This involved many discussions with stakeholders and key informants at all levels of the system. The study team showed that if ZNFPC and NatPharm shared integrated delivery of commodities down to the SDPs, they would incur about Z\$66.5 million per year in additional operating costs under either of the two options considered (85 percent of these expenses would be incurred by ZNFPC; see section 4B). In addition, a one-time investment of U.S.\$250,000 to \$300,000 would be needed to purchase delivery trucks.

The report discusses a number of potential funding sources for these costs: first, essential medicines donated by the European Union (EU) could be priced to recover some of the recurrent costs of distribution. In addition, commodity donors such as USAID and DFID might be willing to pay a portion of distribution costs as a temporary measure, given the economic crisis and the HIV/AIDS emergency. Finally, the team had suggestions for cost reduction, including suspending any effort to build vehicle replacement funds temporarily. The government could approach development partners to support the investment costs for vehicles, information systems hardware and training, and other technical assistance needed.

The results of the cost study convinced the government and development partners in Zimbabwe that their investments in health commodities would be wasted without additional investment in the transportation system. In particular, the study findings convinced DIFD and USAID that they needed to make additional investments to ensure adequate transportation for the donated HIV/AIDS commodities.

Influenced by the study results, the EU did agree to buy five large trucks. For reasons unrelated to cost, the government decided that the EU-donated trucks should go to NatPharm, and that commodities distribution would not be integrated. Instead, NatPharm would use the trucks to deliver essential medicines down to the SDP level. While this was not one of the options costed in the transportation cost study, the data from the cost study provided essential information needed to assess the expenses related to this new option.

In addition, USAID decided to invest in the HIV-AIDS condom distribution system through the DELIVER project, which was tasked in 2003 with developing a logistics information system for HIV/AIDS-related commodities and providing material support to ZNFPC-managed distribution systems. At the same time, DIFD is providing assistance for contraceptive products and distribution systems.

6. Insights on Cost Analysis for Logistics

Sometimes opportunity knocks before we are ready: one may not have the time or understanding of the local situation to develop the best design and select the most appropriate methods. Despite these limitations, a financial analysis can still be useful.

Serious supply shortages were disrupting health services in Zimbabwe, and the study team was asked to analyze the resources needed to resolve them. DELIVER took advantage of this window of opportunity to help local policymakers and managers make more informed decisions. But the situation was not ideal: only one trip could be made, and there was not time or sufficient knowledge of the country situation to create a rigorously designed study. As such, the study results must be interpreted with caution.

For example, the study team collected data from one province selected because it had good data and was about average in size. Though these characteristics are important in sample selection, the appropriateness of generalizing about a country based on one province should be questioned. At the same time, adding additional provinces to the sample to improve accuracy of the cost estimates might have required a great deal of additional time and expense. These are trade-offs that must be made when designing a cost study. Guiding principles for choosing sampling methods include how quickly a decision must be made and how the information will be used.

In this case, the study results served as more of a call to arms to invest in transport systems, rather than as a blueprint for how to budget for a specific future scenario. The accuracy of the results served the purpose for which the study was used. However, the original purpose of the study was to determine what it would actually cost ZNFPC to implement option 1 or option 2. The sampling methods chosen may not have provided the accuracy to serve this original purpose.

Another important methodological choice facing study designers involves extrapolation. Cost studies use methods of extrapolation to infer what the findings would be for a whole population, based on the results observed in the sample. In the Zimbabwe cost study, the costs for the sample province were multiplied by eight to obtain an estimate for the nation (because there are eight provinces in Zimbabwe). This method of extrapolation is appropriate if we assume that districts, SDPs, population, and commodity needs are evenly spread through the provinces, and that delivery routes in each province are about the same length, with similar road conditions. However, we don't know if this is true. An alternative method of extrapolation to consider would be to determine district-based costs in the sample province, then calculate a weighted per capita distribution cost, and multiply this by the whole population of Zimbabwe. This extrapolation method compensates somewhat for district-driven cost differences and cost variance related to population size.

Where it would be expensive or difficult to quantify costs, important information can still be gained by describing them.

The study team spent a lot of time clarifying the problems facing commodity distribution systems in Zimbabwe. With two separate commodity management systems and many alternatives for integrating delivery at different levels of the system, the decision of what to cost was complicated. Early in the study, time was well spent trying to understand how systems operate, how responsibilities are divided, and where resources are available or where they are in short supply. As distribution system alternatives became clearer, the team made decisions based on many factors besides cost minimization. For example, although a quarterly delivery schedule would have been the least expensive delivery option, the team chose to recommend bimonthly delivery of condoms and contraceptives, and monthly delivery of essential medicines, to reduce problems of theft and spoilage. In addition, the team chose not to evaluate but try to optimize the current delivery route schedules, another possible source of cost savings. Cost analysts need to describe and justify design decisions as best they can. In this way, the study becomes more useful to others who may want to define options in different ways.

This insight is also illustrated by the study team's decision not to actually cost out option 2. Instead, the team discussed how the costs in option 2 might be different from option 1. While distances for delivering from the provinces to the SDPs would be greater in option 2, there would be no costs involved in delivering to the districts, as option 2 bypasses the district level. The team concluded that the implementation cost for distribution under the two options would be similar.

This assumption was reasonable because of the way the study was actually used. However, if decision makers had tried to use the study results to budget for the implementation of option 2, the cost description provided might not have been sufficient. Had time and expenses allowed further analysis, it would have been very helpful to actually calculate the costs for the two options and compare them.

A study with clear assumptions can often provoke useful discussion and generate ideas for further analysis.

Every cost study relies on assumptions. The clearer the assumptions, the easier it will be to test them; modify them, if needed; and monitor their impact. This makes the cost information gained through the study much more useful for decisions. In the Zimbabwe cost study, some of the assumptions that have generated discussion may suggest avenues for additional research including—

- Use of consumption data from 2001–2002 to determine volume of product to transport. When making decisions about future costs, an alternative assumption is to base volume estimates on expected increases (or decreases) in consumption rather than historical consumption data. These assumptions could also be the basis for a financial model for budgeting and strategic planning.
- Use of ZNFPC-calculated rate per kilometer and travel and subsistence expense. The total cost estimates are very dependent on these unit cost estimates. More information on what is included in these rates and some independent verification of ZNFPC's calculations might increase the level of trust in these assumptions and the resulting cost estimates.
- Estimated time for loading and unloading at each site. The cost study doesn't appear to include costs for vehicle downtime or waiting time needed at sites to make sure someone is available to receive shipments. More conservative assumptions might also be tested.
- Basing NatPharm costs for distribution to the districts (measure B2) on the estimated costs for ZNFPC, corrected for volume and distance. It is not clear if the cost structure and drivers of the two organizations will be the same, and if the corrections made are based on accurate statistics. As a portion of overall delivery costs for option 1, NatPharm's costs are small (15 percent), but doubts about these assumptions may mean that actual costs are higher or lower than anticipated.
- Exclusion of staffing costs and indirect costs. Although ZNFPC urged the study team to exclude these cost items, it seems likely that under either option ZNFPC will need to hire new drivers and delivery staff, and will need to anticipate some increase in fixed costs, such as supervisor salaries. In addition, some warehousing expenses may be incremental, especially for the National Pharmacy to begin stocking contraceptive items, as proposed for option 2. As a result of these assumptions, national costs may be underestimated.

Appendix A
Budget Analysis

Budget Analysis

Question 1: What caused the current lack of availability of HIV/AIDS commodities at the district and health center levels in Zimbabwe? What percentage of supply shortages can be attributed to problems in the transport system?

In answering question 1, the team considered each type of commodity separately: essential drugs, condoms, and contraceptives.

Essential Drugs

As noted in section 1, Zimbabwe anticipated receiving a shipment of Euro 26 million in HIV/AIDS-related essential drugs starting in the last quarter of 2002. A separate study examined how prices for these drugs would be set by NatPharm to ensure affordability while covering the costs of distribution to peripheral facilities. Transport appeared to be the major constraint to availability.

Condoms

Looking at condoms, the team noted that facilities did not have to pay for HIV/AIDS condoms, and ample safety stock was in the ZNFPC warehouses, so lack of available supply was again mostly due to transport system failures.

Other Contraceptives

For other contraceptives, such as pills and injectables, the study team found that budgetary constraints were also a factor in causing supply shortages. MOHCW facilities were required to pay for the contraceptives provided by ZNFPC, and it received a line item budget for this expense.¹⁶ However, the study team learned that many government facilities had exhausted their budget by July, and did not plan to order more contraceptives in 2002. The study team decided to do a budgetary analysis to determine the extent of the resource shortfall for contraceptives. Table 5 shows how the analysis was done.

¹⁶ The revenue paid to ZNFPC was originally to fund both distribution costs and replacement of commodities, paving the way for a sustainable supply system. However, due to decreasing government operating subsidy to ZNFPC, by 2002 the charges for contraceptives were only covering ZNFPC's distribution costs to the District level.

Table 5. Budget Analysis: Information, Indicators, and Calculations

Information	Indicator Measured	Calculation
Budget shortfall preventing districts and health centers from purchasing adequate supplies of contraceptives.	A1. Estimated resources available for contraceptives in 2002.	Estimated 2002 ZNFPC revenue from sales of contraceptives to all non-MOHCW delivery points (estimated from actual year-to-date revenues Jan. to June 2002), plus 2002 MOHCW budget line item for contraceptives.
	A2. Cost of contraceptives estimated to be consumed in 2002 (i.e., estimated government and NGO need).	Price charged by ZNFPC to district hospitals, health centers, and other facilities, for each type of contraceptive, times the number of units of each contraceptive estimated to be consumed in 2002 (obtained from the USAID's 2002 <i>Contraceptive Procurement Tables</i>). Add across all contraceptive types provided (Ovrette POP, Lo-Femenal CDC, and Depo-Provera®).
	A3. Resource surplus or shortfall.	Estimated resources available for contraceptives (measure A1) minus cost of contraceptives estimated to be consumed in 2002 (measure A2).

The analysis showed that the estimated shortfall in resources for contraceptives was Z\$35 million (see table 6); almost all was attributed to shortfall in the MOHCW facility budgets (Alt and Noguera 2002). Records from ZNFPC showed that in the first half of 2002, MOHCW had already spent Z\$34 million or 97 percent of their total budget for contraceptives. The MOHCW would have to add Z\$35 million to the contraceptives budget line item to enable districts and health centers to purchase all the contraceptives they needed. The study team concluded that the budgetary constraints were a significant factor affecting supply, even more important than the problem of transportation.

Table 6. Budget Analysis: Results (Thousands of Z \$)

Measure	MOHCW	Non-MOHCW Facilities	Total
A1. Cost of contraceptives estimated to be consumed in 2002.	Not given	Not given	110,500
A2. Estimated resources available for contraceptives.	35,000	40,500	75,500
A3. Resource surplus (shortfall).			(35,000)

Appendix B
Make or Buy Decision Analysis

Make or Buy Decision Analysis

The ZNFPC also faced a *make or buy* decision; i.e., should ZNFPC manage the condom and contraceptives distribution system in-house or contract out to a private, commercial firm? For this decision, the study team determined the cost of contracting out delivery, and compared this cost with central to district level distribution costs incurred by ZNFPC under option 1.

The study team evaluated the commercial carrier Swift Transport as a potential option for contracting out distribution services. Swift is the largest general freight haulage service in the country, with experienced staff, a young fleet of trucks, and a reputation for reliability. The study team analyzed the option of using Swift for delivery from the national to the district level only, not to the SDP level. Details of the analysis are shown in table 7.

Table 7. Make or Buy Decision Analysis: Information, Indicators, and Calculations

Information	Indicator Measured	Calculation
Annual cost of delivery of HIV/AIDS condoms and contraceptives from ZNFPC central office to the districts, using private commercial carrier.	C1. Average consignment volume per delivery round, per district.	Estimated annual consumption quantity by contraceptive type for sample province, divided by six districts, divided by six deliveries per year, converted into cartons and then into cubic meters (using units per carton and carton volume statistics from USAID's 2002 <i>Contraceptive Procurement Guide and Product Catalog</i>).
	C2. Average consignment weight.	Delivery volume (measure C1) times 400 kilograms per cubic meter (Swift haulage rate figure for low density consignments).
	C3. Minimum charge per consignment.	Obtained from Swift published rate schedule.
	C4. Weight included in minimum charge, by district.	Obtained from Swift published rate schedule.
	C5. Charge per kilogram above minimum weight, by district.	Obtained from Swift published rate schedule.
	C6. Kilograms above minimum weight, by district.	Average consignment weight (measure C2) minus weight included in minimum charge (C4).
	C7. Total charge for weight above minimum, by district.	Charge per kg above minimum weight (measure C5) times kilograms above minimum weight (measure C6).
	C8. Total charge per delivery round in sample province.	Minimum charge per consignment (measure C3) times six districts, plus total charge for weight above minimum (measure C7) added across the six districts in sample.
	C9. Annual cost for nationwide delivery to district.	Total charge per delivery round (measure C8) times six deliveries per year, extrapolated to national level by multiplying times eight provinces.

Table 7. Make or Buy Decision Analysis: Information, Indicators, and Calculations (continued)

Information	Indicator Measured	Calculation
Annual cost of delivery of HIV/AIDS condoms and contraceptives from ZNFPC central office to the districts, using ZNFPC provincial staff.	See Indicator B1	

Measures C1-C8

Delivery volume (measure C1) was estimated to be 3.88 cubic meters per delivery round, per district, on average. Using the minimum weight standards set by Swift for such low density consignments, the average consignment weight (measure C2) was calculated as 1,552 kilograms (3.88 cubic meters times 400 kg/cubic meter). Table 8 displays how the other cost measures were calculated for the sample province (Alt and Noguera 2002). Also see appendix E.

Table 8. Cost for Private Commercial Carrier Services, Mashonaland West Province, One Delivery Cycle

District	Min. Charge (C3) (Z\$)	Average Weight (kg) (C2)	Weight Included in Min. Charge (kg) (C4)	Weight Above Min. (kg) (C6 = C2 - C4)	Charge per Kg Above Min. (C5) (Z\$)	Total Charge for Weight Above Min (C7= C5 x C6) (Z\$)	Total Charge (C8 = C3 + C7) (Z\$)
Kadoma	8,330	1,552	314	1,238	26.553	32,873	41,203
Kariba	8,330	1,552	196	1,356	42.426	57,530	65,860
Chinhoyi	8,330	1,552	345	1,207	24.126	29,120	37,450
Banket	8,330	1,552	345	1,207	24.126	29,120	37,450
Chegutu	8,330	1,552	314	1,238	26.553	32,873	41,203
Karoi	8,330	1,552	249	1,303	33.417	43,542	51,872
Total¹⁷							275,038

Measure C9

To calculate the cost of using Swift for nationwide delivery to the districts over a full year, the study team multiplied the total charge per delivery round in the sample province (measure C8) by six deliveries per year and by eight provinces. The estimated cost for nationwide delivery to the district level using the private commercial carrier Swift (measure C9) was Z\$13,201,824, not including 15 percent sales tax that might be applied and with only minimal insurance coverage. This figure is more than twice the cost of delivery by ZNFPC to the district level (see measure B1, table 4). In addition, Swift reportedly did not offer service to some districts in the country.

The study team concluded that commercial delivery of commodities was an expensive option for Zimbabwe. At the same time, commercial distribution might offer advantages for greater

¹⁷ This figure is slightly different from the figure in the original cost study due to an error in the original calculation of delivery costs for the Karoi district, where the minimum charge was mistakenly omitted.

reliability and lower storage costs at the district level (assuming Swift deliveries could be synchronized with district to SDP delivery schedules). The team recommended further discussions with Swift to determine service coverage areas and possibly to negotiate lower charges.

One insight to be gained from this analysis is that the true cost of contracting out a service is whatever the commercial provider is willing to accept as payment. Why not ask Swift to provide a cost proposal? Depending on the firm's business strategy and other contracts, they might be willing to perform the service at less than full cost, as long as marginal costs are covered and there is some contribution to fixed direct and indirect costs. Procurement regulations may make it difficult to quickly obtain a cost proposal from prospective bidders, however. The government, and cost analysts also, must be careful to follow transparent procedures for soliciting cost estimates from private firms who may later be invited to compete for government business. Procurement experts should be consulted before any firm is asked to submit a cost proposal.

Reference

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