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Costing Resource Requirements for Integrated Disease Surveillance and Response in Tanzania

January 2006

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Partners for Health Reformplus is USAID's flagship project for health policy and health system strengthening in developing and transitional countries. The five-year project (2000-2005) builds on the predecessor Partnerships for Health Reform Project, continuing PHR's focus on health policy, financing, and organization, with new emphasis on community participation, infectious disease surveillance, and information systems that support the management and delivery of appropriate health services. PHRplus will focus on the following results:

- ▲ *Implementation of appropriate health system reform.*
- ▲ *Generation of new financing for health care, as well as more effective use of existing funds.*
- ▲ *Design and implementation of health information systems for disease surveillance.*
- ▲ *Delivery of quality services by health workers.*
- ▲ *Availability and appropriate use of health commodities.*

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Abstract

Although integrated disease surveillance and response (IDSR) systems play a vital role in national health care systems, few governments know the cost of their country's existing IDSR system, let alone the cost implications of strengthening the system. Such implications include the system's investment costs and the recurrent and capital costs. If IDSR systems are to be sustainable, then national governments and donors that are helping them to strengthen IDSR – the World Health Organization, U.S. Agency for International Development, U.S. Centers for Disease Control and Prevention, and others – must understand the associated long-term resource requirements and the possible sources of financing. As many countries decentralize, many of these resources are expected to come from local health budgets.

This study contributes to the knowledge base on the costs associated with implementing IDSR in the Tanzanian context. The five most significant costs in routine IDSR are: 1) capital costs (depreciation), 2) staff costs, 3) transport, 4) per diems, (supervision, outbreak response), and 5) stationery. Annual costs for IDSR activities (routine and epidemic response) per district in 2004 range from Tsh (Tanzanian shilling) 173 million (US\$ 156 thousand) to Tsh 440 million (US\$ 383 thousand). Though the evidence is not totally conclusive, it would appear that the implementation of the IDSR strategy has had a positive impact on the two key costs associated with routine disease surveillance and response, i.e., staff costs (and numbers) and transportation.

Districts in Tanzania are using this study to budget for IDSR in their Comprehensive Council Health Plans. Findings should also allow Tanzania and other sub-Saharan governments to explore further options for financing the scale-up of IDSR.

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Acronyms{tc "Acronyms"}

ARI	Acute Respiratory Infection
CHMT	Council Health Management Team
FTE	Full-time Equivalent (number of staff)
GIT	Gastro-intestinal Tract
IDS	Infectious Disease Surveillance
IDSR	Integrated Disease Surveillance and Response
MOH	Ministry of Health
MSD	Medical Stores Department
NIMR	National Institute for Medical Research
PHR^{plus}	Partners for Health Reform ^{plus}
STD	Sexually Transmitted Disease
Tsh	Tanzanian Shilling
USAID	United States Agency for International Development
UTI	Urinary Tract Infection
WHO/AFRO	World Health Organization/Africa Regional Office

Currency conversion

Tanzania shillings 1,046 = US\$ 1 (2003)

Tsh 1,107 = US\$ 1 (2004)

(Rates from Bank of Tanzania website: <http://www.bot-tz.org/FinancialMarkets/ExchangeRates>)

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Executive Summary

Background

Integrated disease surveillance and response (IDSR) systems,¹ serve a vital role in national health care systems. The World Health Organization, United States Agency for International Development (USAID), U.S. Centers for Disease Control and Prevention, and other partners are working to strengthen IDSR systems through assessments, development of technical guidelines, training, and other systems supports. However, few, if any, governments know the costs associated with surveillance systems currently in place, nor the costs of strengthening their IDSR system.

The objective of this study is to contribute to the knowledge base on the costs associated with implementing IDSR in the Tanzanian context. To accomplish this, the study sought to answer the following key questions: (1) What are the primary cost drivers of a functioning IDSR system as the system is defined in Tanzania? (2) What start-up (investment) costs are incurred in bringing an IDSR system in Tanzania to a functioning level in a district?² (3) What recurrent expenditures are required to maintain the strengthened IDSR system at district level? (4) What are the implications of “integration” of surveillance systems on the cost of such a functioning IDSR system? What have been the effects of introducing an “integrated” data collection/transmission form on resources used by the district-, region-, and national-level disease-specific programs? (5) What financial resources and mechanisms are available at each level of the health system and local government to cover the recurrent costs of the functioning IDSR system in Tanzania? (7) What are the factors leading toward an economic justification of having an IDSR program in place?

The study obtained data from six districts: four intervention districts that have been strengthened through the introduction of the IDSR strategy and two control districts. This allowed for comparison of costs between the not-yet-strengthened baseline in 2003 and the strengthened state in 2004.

Findings

Key cost drivers: The five key costs in routine IDSR are (in order of importance): 1) capital (depreciation), 2) staff, 3) transport, 4) per diems, and 5) stationery. If capital costs are excluded, staff costs are, not surprisingly, the most significant cost in routine IDSR. This is followed by transport for routine supervision, and then per diem allowances for doing supervision and outbreak response (this latter not separately identified during data collection).

Recurrent costs for a functioning IDSR strategy: The total IDSR-specific costs provided an indication of the cost of running the IDSR strategy in a district. Total costs for the intervention districts in 2004 ranged from TSh 173 million (US\$ 156 thousand) to TSh 440 million (US\$ 383

¹ Infectious disease surveillance is a general term used in many countries. Integrated disease surveillance and response refers to the specific strategy promoted by World Health Organization/Africa Regional Office and currently being implemented in Tanzania. The two terms are often used interchangeably.

² “Functioning” here is measured by a series of indicators of IDSR performance at district level, related to availability of quality data and use of that data for public health decision-making.

thousand). Most districts (intervention and control) experienced an increase in costs between 2003 and 2004. Whether any of the increase can be attributed to the adoption of the IDSR strategy is difficult to say. In Mbulu and Mwanza (both intervention districts), total costs declined between the two years primarily because a lower incidence of disease cases resulted in a decline in disease response costs.

IDSR start-up costs: Start-up costs were largely training related and were incurred by the Partners for Health Reform *plus* project. (The districts themselves did not pay for any of these activities.) Training of trainers took place at the district level, as did training of other district and facility staff. These costs amounted to US\$ 133,543 for all 12 districts, an average of US\$ 11,129 per district. Other start-up costs included the development of training and other materials and supporting districts in all aspects of implementing the new strategy. These costs amounted to US\$ 45,210 per district.

Implications of integration: There was a decline in the number of full-time staff, as well as in the costs of transport. This could be evidence of the positive impact of integration.

Staffing: There were, in general, fewer full-time equivalent (FTE) staff working on routine IDSR in 2004 than in 2003 in all the intervention districts with the exception of Dodoma Rural (Table ES-1). In the two control districts, FTE staff doubled in Hanang and decreased by 32 percent Ilala. These estimates, however, must be used with caution, because they were based on staff estimates of the amount of time they spend on IDSR activities.

Table ES-1. Number of FTE Staff doing Routine IDSR

Number of FTE Staff by Year	Intervention districts				Control districts	
	Tabora Urban	Dodoma Rural	Mbulu	Mwanza	Hanang	Ilala
2004 FTE staff	2.4	2.3	1.1	3.4	3.2	3.7
2003 FTE staff	2.7	1.7	2.5	4.1	1.5	5.5
Increase/(decrease)	(0.3)	0.6	(1.4)	(0.7)	1.7	1.8

Transport: IDSR-related transport costs were calculated by multiplying the total distance traveled on IDSR activities by the cost per mile. The costs decreased quite dramatically between 2003 and 2004 in the intervention districts, with the exception of Dodoma Rural, whose IDSR-related transport costs more than doubled. The reasons for the decrease may be attributable to the integration of IDSR-related supervision with other activities of the Council Health Management Team rather than making separate supervision visits; two intervention districts perceived this specifically as a benefit of IDSR. Transport costs increased in both control districts.

Sustainability of IDSR: Only two of the intervention districts appeared to have a clear idea about the need to make IDSR sustainable. These two identified inclusion of IDSR in the Comprehensive Council Health Plan as part of their strategy for sustainability. Inclusion of IDSR in the plan is an important first step towards institutionalizing the IDSR strategy and ensuring long-term sustainability. In view of the critical role of IDSR in combating new infectious disease threats, it is important that the strategy is give sufficient prominence in the health sector planning and budgeting process at the national level and that this is reflected in the district health plans and budgets.

Economic factors for the justification of investing in IDSR: The period covered by the study was not sufficiently long to allow analysis of trends in costs and outbreak management. Nor was

baseline data collected and compiled by districts in a way that provided a good indication of how outbreaks were managed prior to the introduction of the IDSR strategy.

Conclusions

Though the evidence is not totally conclusive, it appears that the implementation of the IDSR strategy has had a positive impact on the two key costs associated with routine disease surveillance and response, staff costs (and numbers) and transportation. It is not possible to judge whether the investment in IDSR strengthening has been economically justified due to the limited scope of this study and the available data.

1. Introduction

1.1 Purpose and Background

Integrated disease surveillance and response (IDSR) systems,³ play a vital role in national health care systems. The World Health Organization, U.S. Agency for International Development (USAID), U.S. Centers for Disease Control and Prevention, and other partners are working to strengthen IDSR systems through assessments, development of technical guidelines, training and other systems supports. However, few, if any, governments know the costs associated with current surveillance systems. More importantly, there is a paucity of information on the cost implications of “strengthened” IDSR systems, both in terms of investment costs of establishing strengthened systems and in terms of recurrent and capital costs of operating these systems. If IDSR systems are to be sustainable, then governments and donors must understand both the resource implications of these functioning systems and the possible sources of financing for ongoing resource requirements. Without such information, ministries of health and district managers will not know how to ensure adequate resources to maintain the system.

IDSR programs are not independent of the state of the health care system in any given country and indeed can be viewed as part of the global health care. If IDSR breaks down or is inadequate in one country, it is not only that country that might suffer adverse consequences but the region and potentially the global community. While the costing exercise described in this paper focuses on individual countries, the potential costs and benefits are much broader, with IDSR programs having many of the attributes of true global public goods.

Integrated disease surveillance is the collection, analysis, dissemination, and use for decision and action of disease data. It has the following functions:

- ▲ Identify cases
- ▲ Report
- ▲ Analyze and interpret data
- ▲ Investigate and confirm suspected cases and outbreaks
- ▲ Respond
- ▲ Provide feedback
- ▲ Evaluate and improve the system

³ Infectious disease surveillance is a general term used in many countries. Integrated disease surveillance and response refers to the specific strategy promoted by World Health Organization/Africa Regional Office and currently being implemented in Tanzania. The two terms are often used interchangeably.

Because the IDSR strategy is an integral part of a health care system, it shares resources with other components of the system, and thus requires an estimate of joint costs and benefits. The long-term sustainability of the IDSR system is inextricably tied to the sustainability of the health system. Investments made specifically for the surveillance system will be costs added to the health care system and should be viewed and analyzed as incremental costs.

1.2 Context and Background of IDSR in Tanzania

The United Republic of Tanzania has a population of almost 37 million. (Table 1 summarizes key population and health indicators.) It is one of the poorest countries in the world. The economy depends heavily on agriculture, which accounts for almost half of gross domestic product, provides 85 percent of exports, and employs 80 percent of the work force.⁴

Table 1. Tanzania Socio-economic Indicators

Total population (000)	36,919
Annual population growth rate (%)	2.5
Total fertility rate	5.1
Per capita Gross National Income (US\$)	290.0
Population in urban areas (%) (2005)	37.5
Under-five mortality rate, both sexes (per 1000 live births)	165.0
Life expectancy at birth (years) total population	45.0
HIV prevalence among 15-49 year-olds (%)	8.8

Source: WHO statistical database

Tanzania has been a leader among African countries to adopt an Infectious Disease Surveillance (IDS) system that uses the IDSR strategy. It was the first to conduct an assessment and develop a plan of action in 1998. This was followed by the development of a work plan for integrating and strengthening disease surveillance, establishment of an IDSR Task Force (2000), preparation of the National Guidelines for Integrated Disease Surveillance and Response,⁵ development of laboratory-networking guidelines (2001), and adaptation and approval of the WHO Regional Office for Africa (WHO/AFRO) district analysis book (2002). USAID supports the Ministry of Health's (MOH) efforts by providing technical support through the Partners for Health Reform^{plus} (PHR^{plus}) project (USAID's flagship health systems strengthening project) and its local implementing agency, the National Institute for Medical Research (NIMR).

The USAID-supported IDS project was designed to help develop and strengthen a flexible and sustainable IDSR system focused at the district level. This system will build capacity to provide needed information for the execution of prompt, evidence-based disease control and prevention decisions and actions that reduce disease burden and promote the efficient use of human and material

⁴ CIA World Factbook

⁵ Epidemiology and Disease Control Section, Ministry of Health, Tanzania. 2001. *National Guidelines for Integrated Disease Surveillance and Response*. Dar-es-Salaam. October.

resources. The efforts in the project's 12 districts⁶ are designed to facilitate the introduction of the IDSR strategy in the other districts in Tanzania and to provide useful experiences to share with other countries. The lessons learned will focus on mechanisms for improving data quality, decision making, and response, while reinforcing a "culture of information" in which there is a demand for information as the basis of decision-making and where stakeholders value information enough to ensure its quality and use.

1.3 Objectives of Costing Study in Tanzania

Building on ongoing project work with the council health management teams (CHMTs) in the 12 Tanzanian project districts, PHR*plus* and NIMR examined the costs associated with implementing an IDSR system. This study built on and reinforced the ongoing relationship between PHR*plus* and four project districts – Dodoma Rural, Mbulu, Mwanza, and Tabora Urban. The study was also conducted in two control districts – Hanang and Ilala.

In costing implementation of IDSR in the Tanzanian context, the study sought to answer the following key questions:

- ▲ What are the primary cost drivers of a functioning IDSR system as the system is defined in Tanzania?
- ▲ What are the start-up (investment) costs (financial and other) necessary to bring an IDSR system in Tanzania to a functioning level in a district?
- ▲ What recurrent expenditures (from any level) are required to maintain the strengthened IDSR system at the district level at an acceptable level of functionality?
- ▲ What are the implications of "integration" of surveillance systems on the cost of such a functioning IDSR system? What have been the effects of introducing an "integrated" data collection/transmission form on resources used by the district-, region-, and national-level disease-specific programs?
- ▲ What financial resources and mechanisms are available at each level of the health system and local government to cover the recurrent costs of the functioning IDSR system in Tanzania?
- ▲ What are the factors leading toward an economic justification of having an IDSR program in place?

The results are intended to benefit the study districts and the MOH. The data can be used to adjust plans and budgets that take into account the real costs of a functioning IDSR system. In particular, the MOH can use this information to plan for the roll-out of the program to other districts. The WHO/AFRO IDSR Task Force has also identified this subject as a priority research topic and as such its results will have implications beyond Tanzania.

⁶ These 12 districts represent all six zones, and eight of the 26 regions. The districts are: Babati, Mbulu, Dodoma Rural, Mpwapwa, Masasi, Tunduru, Nkasi, Sumbawanga Rural, Igunga, Tabora Urban, Muleba, and Mwanza Urban.

⁷ "Functioning" here would be measured by a series of indicators of IDSR performance at the district level, related to availability of quality data and use of that data for public health decision-making.

2. Costing Methodology

2.1 Study Design

This IDSR costing study used a pre- and post-test design, examining costs and resources prior to training and other strengthening interventions, and again after some level of IDSR functionality was achieved. The time interval between the two phases of the study was not as long as would have been desired due to constraints imposed by the ending of the *PHRplus* project. Sampling was done in two ways. For routine surveillance costs, four districts, Dodoma Rural, Mbulu, Mwanza, and Tabora Urban, were selected from the 12 IDSR project districts to represent the urban-rural, geographic, and infrastructure differences. At least two of these districts had an outbreak in 2003. Data also were collected from two districts, Hanang and Ilala, that did not implement the improved IDSR program thus served as a control group. Within each district, the study sampled from three facilities (one hospital, one health center, and one dispensary). The selection of the facilities was done in collaboration with the respective council health management teams (CHMTs) based on geographic accessibility, staff availability to answer questions, and outbreak information.

Data collection tools used by this study were based on tools created for and used by *PHRplus* to assess the costs of implementing strengthened IDS and vaccine-preventable disease surveillance systems in the Republic of Georgia.⁸ Because this is the first attempt to determine the costs of an IDSR system in an African country, the questions that were developed were not based on other studies in the region.

2.2 Data Collection

The data for this study were obtained by NIMR-employed data collectors with health research backgrounds and extensive data collection experience. For the baseline study, conducted in August and September 2004, four data collectors were divided into teams of two people. The data collectors were trained over a two-day period by research team members from *PHRplus* and NIMR. After training, the data collectors traveled to Kibaha district outside Dar-es-Salaam to pilot the instruments at the district, facility, and laboratory levels. The instruments were then revised before they were used in the study districts.

The data collectors conducted in-person interviews with health workers at the respective levels, reviewed facility registers for outbreak information, and collected information from the district accountant's office in each district. To obtain drug costs for the treatment information of IDSR diseases, the data collectors used the catalogue of the Medical Stores Department (MSD) of Tanzania for 2003. The national-level costs were collected through an in-person interview at the MOH.

⁸ See www.PHRplus.org

For the final round of data collection, the questionnaires were revised based on results from the baseline study: The section on staff time was revised to ensure more consistent responses. Questions on capital costs, such as building and equipment costs, were removed because the baseline study had found that the information was not readily available. The directions for data collectors were written more explicitly to facilitate consistent responses among the data collection teams. The data collectors were provided with a sheet separate from the questionnaires with detailed directions about all of the questions for the final round of data collection.

The final round of the costing study, conducted in May and June 2005, was combined with two other PHR*plus* IDSR studies for logistical and financial reasons. Therefore the final-round data collection teams consisted of three or four people to efficiently conduct all three studies simultaneously. A one-day in-person training was also conducted for all of these data collectors before the final round. The data were collected in the same manner as they were for the baseline study.

Table 2 summarizes the data that were collected in this study:

Table 2. Study Data Needs

	Baseline	Final
Cost data	<ul style="list-style-type: none"> ▲ Current cost structure (capital and recurrent costs) for 2003 ▲ Start-up (Investment) costs for the activities that were started in 2003 and 2004 	<ul style="list-style-type: none"> ▲ Current cost structure (capital and recurrent costs) ▲ Start-up costs to capture the costs of all start-up investments ▲ Incremental costs that were incurred due to implementation of the strengthening activities
Financial data	<ul style="list-style-type: none"> ▲ Current sources and amounts of funding available for IDSR activities in 2003 ▲ Alternative sources available in 2004 ▲ Feasibility of mechanisms for providing sustainable resources for IDSR 	<ul style="list-style-type: none"> ▲ Current sources and amounts of funding available for IDSR activities ▲ Alternative sources available ▲ Feasibility of mechanisms for providing sustainable resources for IDSR
Contextual IDSR data	<ul style="list-style-type: none"> ▲ District information (epidemic profile; communication infrastructure) ▲ IDSR performance prior to interventions 	<ul style="list-style-type: none"> ▲ District information (epidemic profile; communication infrastructure) ▲ IDSR performance post-interventions

2.3 Definitions of Variables

Four sets of variables were analyzed in this study – recurrent (operating) costs, capital costs, financing sources, and IDSR indicators.

2.3.1 Recurrent Costs

Recurrent (operating) costs are those incurred on an ongoing basis to keep the program running. They include the costs of: staff; maintenance of buildings and equipment, utilities (water, electricity), telephone, vehicle fuel and maintenance, office supplies, drugs and medical supplies, and laboratory supplies.

Staff Numbers and Costs

The numbers of staff involved in IDSR work at each level were obtained from whoever coordinates activities at that level. Some staffs were not involved full-time in IDSR and it was necessary to estimate how much of their time was occupied with IDSR activities in a typical day/week/month. This gives an estimate of full-time equivalent (FTE) staff numbers for each staff category. For each staff category, the study also collected data on the average remuneration (salaries and benefits).

Staff costs then were calculated by multiplying total remuneration by the percentage of time spent on IDSR by each category of staff; this number was summed up for all staff to arrive at the total staff costs for the respective levels of intervention.

Transport/Vehicles

Data on vehicle use was obtained by asking the transport officer of the district or the equivalent staff member to estimate the number of kilometers used by each vehicle for IDSR activities. Vehicles include bicycles, motorcycles, cars, and trucks that were owned by the district or the facility.

At the facility level, staff members were asked to estimate the cost incurred by the facility of transporting weekly and monthly surveillance reports to the district level. They were asked to provide the means of transportation used and the distance traveled to deliver the report.

Office Supplies

Data on office supplies used for IDSR was obtained through interviews with the district IDSR focal person and facility staff in charge of IDSR. Supplies included routine surveillance forms (including photocopying), telephones, and phone cards.

Drugs and Medical Supplies

Drugs and medical supplies used in the IDSR system were estimated by using standard usage as determined from the national treatment guidelines or any other documents that guide the response to disease outbreaks. This computation was done on a “bottom-up” basis. The consumption of drugs and medical supplies to treat a single patient during one visit to a facility was estimated based on standard treatment protocols (where these are not available, discussions with clinicians were used) to determine a standard cost of treatment. This standard cost obtained incorporated efficiency standards as well as expected waste.

The total cost of drugs and medical supplies was the product of costs per patient per visit for disease “x”, obtained from the MSD list, and the number of patients treated. The total number of patients treated was estimated from the facility registers.

Laboratory Supplies

The estimation of laboratory supplies was similar to that for drugs and medical supplies. The supplies required for a single laboratory test were estimated by interviewing laboratory staff and their costs were obtained by using the MSD list of drugs and supplies. The utilization of laboratory equipment was also obtained to determine the proportion of their use that pertains to IDSR. The total cost of laboratory supplies was estimated as the product of the total number of laboratory tests for each disease and the volume of tests performed.

2.3.2 Capital Costs

Capital costs are all costs incurred that relate to items that are expected to last longer than one year. Such items include buildings, vehicles, equipment, curriculum/materials development, and initial staff training including training of trainers. The annual portion of such costs was based on a straight-line depreciation of the relevant amount. This was calculated as the cost of the item divided by the number of years of useful life (i.e., the time that the item would benefit the district).

Buildings

The cost of buildings was not available and thus has not been included in the capital costs.

Vehicles

Vehicle costs, including costs of bicycles, motorcycles, cars, and trucks, were collected by interviewing the district transport officers or equivalent personnel at the district level.

Equipment

To obtain costs for equipment including centrifuges and microscopes, laboratory personnel and even some district officials were interviewed. If the lab staff did not know the costs, data collection teams recorded the specific model information for these machines so that the actual costs could be determined.

Materials Development, Training, and Other Start-up Costs

The training of district and facility level staff as well as the training of the trainers was conducted using funds from the *PHRplus* project. The cost data for this was computed by summing the relevant line items from monthly expenditure reports.

2.3.3 Financing Sources

Financing data was obtained from the district accountant's office and facility finance reports in each district. Budgets for all sources of revenue including basket funds, any donor funds directly to the district, community health funds, and other Tanzanian government funds were examined to identify how IDSR activities were financed. National- and regional-level expenditures and financing information were also collected for each of the study districts.

3. Data Analysis

3.1 District Epidemiology Profiles

Table 3 shows the morbidity patterns for the study districts for the ten most pervasive disease conditions in Tanzania, for children under age five, and people age five and above. Among children under five, malaria is clearly the most common disease condition, followed by acute respiratory infections (ARI), pneumonia, and diarrhea. In those age five and above, the top five diseases are malaria, ARI, pneumonia, diarrhea, and intestinal worms. The epidemiology profile is quite similar among the study districts.

Table 3. District Epidemiology Profile

Ranking	Intervention districts				Control districts	
	Tabora Urban	Dodoma Rural	Mbulu	Mwanza	Hanang	Ilala
Age < 5						
1	Malaria	Malaria	Malaria	Malaria	Malaria	Malaria
2	ARI	Pneumonia	ARI	Diarrhea	ARI	Pneumonia
3	Pneumonia	ARI	Pneumonia	ARI	Pneumonia	ARI
4	Diarrhea	Diarrhea	Diarrhea	UTI	Diarrhea	Skin diseases
5	Anaemia	Eye diseases	Intestinal worms	Pneumonia	Eye diseases	Diarrhea
6	Intestinal worms	Intestinal worms	Eye infections	Intestinal worms	Intestinal worms	UTI
7	Skin diseases	Anaemia	Skin diseases	Skin diseases	Skin diseases	Intestinal worms
8	Eye infection	Malnutrition	UTI	Fungal infections	Ear diseases	Anaemia
9	Minor surgeries	Skin diseases	Ear infections	Minor surgical	Genital discharge	Minor surgeries
10	Burn	Ear infection	Animal bites	Schistosomiasis	STDs	Other diseases
Age 5 and above						
1	Malaria	Malaria	Malaria	Malaria	Malaria	Malaria
2	ARI	Pneumonia	ARI	ARI	ARI	Tuberculosis
3	Pneumonia	ARI	Pneumonia	UTI	Pneumonia	Anaemia
4	Intestinal worms	Eye infection	Diarrhea	Intestinal worms	Diarrhea	Pneumonia
5	UTI	Eye diseases	Intestinal worms	Schistosomiasis	Genital discharge	URI
6	Ill-defined symptoms	Tuberculosis	Eye infections	Minor surgery	Eye infections	Minor surgery
7	Diarrhea	Diarrhea	Skin	Diarrhea	Intestinal	HIV/AIDS
8	Genital discharge	Anaemia	UTI	Pneumonia	Skin diseases	Worms
9	Minor surgery	Asthma	Ear infections	Skin diseases	Ear diseases	Other
10	Anaemia	GIT disease	Animal bites	Fungal infection	STDs	None

Note: UTI=urinary tract infection, STD= sexually transmitted disease, GIT=gastrointestinal tract

The number of reported cases of both outbreak and non-outbreak diseases that are tracked by the IDSR system are displayed in Table 4, sorted in order of magnitude of the total number of cases for the six study districts. The control districts (Hanang and Ilala) have similar profiles to the intervention districts and this provides a good basis for comparison of costs.

Table 4. Infectious Disease Cases Reported for Study Districts, 2004

	Intervention districts				Control districts		Total 2004	Total 2003
	Tabora Urban	Dodoma Rural	Mbulu	Mwanza	Hanang	Ilala		
Outbreak-prone								
Bacillary dysentery	0	412	0	5,877	586	6,689	13,564	3,336
Cholera	3	155	0	0	0	577	735	2,066
Meales	14	0	0	267	0	54	335	41
Meningitis	79	0	0	21	0	0	100	27
Rabies	0	0	0	0	0	8	8	0
Plague	0	0	0	0	0	0	0	0
Yellow fever	0	0	0	0	0	0	0	0
Non-outbreak prone								
Malaria	103,231	198,560	62,166	194,617	42,130	317,347	918,051	553,492
Diarrhea	7,007	21,235	14,161	31,111	11,221	18,784	103,519	287,528
Pneumonia	11,323	21,859	20,324	21,054	14,142	-	88,702	178,592
Typhoid	424	14	410	1,476	0	1,774	4,098	1,761
Animal bites	159	393	1,013	188	162	549	2,464	DNA
Diarrhea w/severe dehydration	0	0	1,053	646	0	0	1,699	DNA
Acute flaccid paralysis	0	0	0	1	0	3	4	0
Neonatal tetanus	0	0	0	0	0	0	0	0

DNA = data not available

The pattern of incidence of infectious diseases has remained fairly constant between 2003 and 2004 but the number of cases reported has increased significantly in both the intervention and control districts. This increase could be as a result of better (more complete) reporting or other epidemiologic reasons. Overall, the rankings remain almost unchanged, with the most noticeable change being in the switch between cholera and dysentery. This lends weight to the view that the increased numbers of cases may be due to improved reporting.

3.2 District Cost Profiles

3.2.1 General Health Delivery Costs

IDSR activities in Tanzania are centered at the district level. Analysis of information from health facilities is carried out at there, with laboratory investigations usually at the district or regional hospital where there would be a better-equipped laboratory. The district medical officer is the head of the CHMT and, hence, also head of disease surveillance, and is responsible for mobilizing health workers to respond to any cases of infectious disease outbreak.

Table 5 shows the total recurrent expenditures (for all health care delivery activities) of the study districts as reported by the districts. They only include those costs that have been captured in the district's accounting system; they do not include anything that would not normally be accounted for, e.g., depreciation of capital items, and donated goods. Expenditures are disclosed on a budget line-item basis and are not organized by program or activity.

Table 5. Recurrent Expenditures on Health Care, 2004

	Intervention districts				Control districts	
	Tabora Urban	Dodoma Rural	Mbulu	Mwanza	Hanang	Ilala
	Tsh	Tsh	Tsh	Tsh	Tsh	Tsh
Staff costs	122,157,570	470,969,646	52,583,562	28,528,460	48,941,258	965,729,252
Drugs/Medical supplies	10,363,970	29,000,000	195,298,630	47,000,000	91,160,121	402,805,510
Office equipment/ Furniture/Supplies	2,477,350	13,370,890	24,862,672	3,492,926	10,694,512	236,888,681
Supervision	15,360,000		3,940,000	9,280,000		
Training	1,760,405		19,135,200	7,305,600	6,769,368	
Photocopying	805,000	1,532,400	2,087,360	770,926		
Utilities	323,600	32,471,800	30,322,384	1,320,000		
Communication	297,242	949,200		1,908,000		
Vehicle fuel/maintenance	22,448,970	68,875,000	10,720,000	5,700,000	40,248,720	18,267,196
Renovations	9,984,000		21,742,104			68,829,618
Hospital costs			283,827,117			28,141,900
Other costs		23,674,000	88,928,059			213,021,334
Community outreach activities			12,568,843			
Total recurrent expenditures	185,978,107	640,842,936	746,015,931	105,305,912	197,813,979	1,933,683,491
US\$	168,002	578,901	673,908	95,127	178,694	1,746,778

Staff costs, drugs and medical supplies, and transport (vehicle fuel and maintenance) are the largest three items of expenditure. Mbulu aggregated some of its expenditures (housing, training, entertainment, bank charges, health education, and some transportation) under "other costs"; thus, it was not possible for the data collectors to easily disaggregate this figure into its component parts. Two districts also incurred costs (patient food, patient transport, and other patient-related items) for the district hospitals and health centers, and showed this as "hospital costs." Such expenditures occur when the hospital or health center depletes its budget for that line item and requests the district for supplementary allocation. If the items are paid for directly by the district, they may not be charged to the facility budget; rather, they remain within the district's own budget. This means that expenditures disclosed by the facility would be under-stated and not reflect the full volume of transactions for goods and services received.

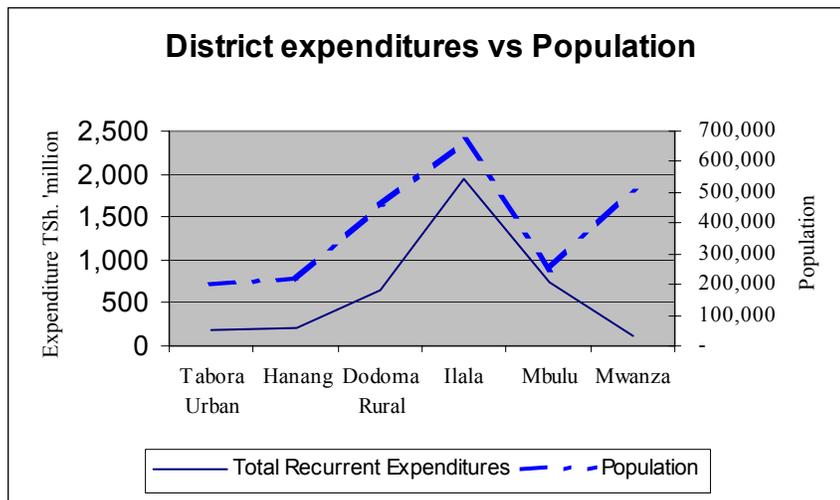
Table 6 shows the sizes of the six districts in terms of population, in order of total population.

Table 6. District Population

	Over 5 years	Under 5 years	Total population	% of under 5s to total	Pop growth rate
Ilala	586,312	79,952	666,264	12%	4.5%
Mwanza	412,333	101,185	513,518	20%	3.20%
Dodoma Rural	363,025	96,500	459,525	21%	2.30%
Mbulu	204,525	51,131	255,656	20%	3.80%
Hanang	176,815	44,204	221,019	20%	3.80%
Tabora Urban	168,151	29,674	197,825	15%	2.36%

Total recurrent costs tend to follow district population size (Figure 1). This is primarily due to population-based budgetary allocation formulae used by the government of Tanzania. Mwanza, with much lower recurrent expenditures than would have been expected, is the exception. It was not possible to establish the reasons for this anomaly.

Figure 1. Recurrent Expenditures and Population



3.2.2 IDSR Costs

3.2.2.1 Total IDSR Costs

IDSR-specific costs were identified in each district (Table 7), through computations based on interviews with staff. As costs are not tracked by activity, it is difficult to clearly isolate those that pertain to IDSR from the other district health delivery costs. The most significant costs disaggregated from the general review (see Section 3.2.1) include staff, drugs, and transport. Attention was paid to these cost items to make sure that calculations were as accurate as possible, including estimates of staff time spent on IDSR activities, mileage covered on IDSR work, and drugs and medical supplies consumed to respond to individual patients (inpatient and outpatient) on any of the IDSR-relevant diseases. Unit costs calculated were applied to the total number of reported cases to compute the total consumption of drugs and medical supplies.

Table 7. IDSR-specific Costs, 2004

	Intervention districts				Control districts	
	Tabora Urban	Dodoma Rural	Mbulu	Mwanza	Hanang	Ilala
	Tsh	Tsh	Tsh	Tsh	Tsh	Tsh
Staff costs – district	4,466,088	4,640,964	1,936,968	5,817,264	3,958,164	7,717,344
Staff costs – outbreak response (incl. facility staff)	66,240,219	133,459,108	57,669,912	143,330,183	40,117,348	182,960,379
Drugs/Medical supplies – outbreak response	133,167,571	259,860,376	103,958,672	265,670,382	72,398,023	366,586,632
Other drugs and medical supplies	50,000,000	716,428	0	1,734,000	60,000	10,477,000
Per diems (supervision, outbreak response)	5,920,000	1,495,000	30,000	0	360,000	18,158,000
Health education	100,800	0	0	375,000	50,000	0
Stationery	125,000	10,000	0	1,679,526	0	0
Transport – routine IDSR	1,651,105	5,580,750	1,195,875	459,216	3444120	51326955
Transport – outbreak response	3,361,206	2,232,300	79,725	153,072	502,268	46,495,620
Capital costs (depreciation)	66,567,307	32,000,250	8,200,000	5625000	39,473,062	12,425,000
Other costs	0	0	0	0	0	11,672,000
Total IDSR costs, 2004	331,599,296	439,995,176	173,071,152	424,843,643	160,362,985	707,818,930
Total IDSR costs, 2003	206,618,840	239,294,490	227,520,356	552,326,002	55,675,966	598,041,300
Change in costs 2003–2004	124,980,456	200,700,686	(-54,449,204)	(-127,482,359)	104,687,019	109,777,630

These IDSR-specific costs are only those that are incurred at the district level, and do not include costs incurred at the facilities. They do include costs that would not normally be captured in the district accounting system, e.g., depreciation, donations, and cost of facility staff who are enlisted to work at the district level in response to outbreaks.

Most districts experienced an increase in total IDSR costs between 2003 and 2004. The increase occurred in the intervention as well as the control districts. Some of this increase is due to the increased incidence of disease outbreak, especially malaria, cases in 2004. In two intervention districts, Mbulu and Mwanza, total costs declined between the two years primarily because of a decline in outbreak response costs resulting from a lower incidence of cases.

3.2.2.2 Routine IDSR Costs

The total IDSR costs above include those related to disease outbreak response. Routine IDSR costs (excluding outbreak response costs) in 2004 are as shown in Table 8.

Table 8. Routine IDSR Costs, 2004

	Intervention districts				Control districts	
	Tabora Urban	Dodoma Rural	Mbulu	Mwanza	Hanang	Ilala
	Tsh	Tsh	Tsh	Tsh	Tsh	Tsh
Total routine IDSR costs	78,830,300	43,726,964	11,362,843	13,956,006	47,285,346	101,299,299
Per capita routine costs	398	95	44	47	214	152
Per capita routine costs (US\$)	0.36	0.09	0.04	0.04	0.19	0.14
Routine costs (excl. depreciation) as % of total district budget	7%	2%	0.4%	8%	4%	5%

The range of routine costs per district per year is quite wide though the overall magnitude of the costs is low: Tsh 11 million (US\$ 10 thousand) to Tsh 101 million (US\$ 91 thousand). It is important to bear in mind that most of these costs, especially staff costs, are not incremental; they would have been incurred whether the IDSR strategy was in place or not. Staff are merely reorganizing their time among their various health activities. There was no indication in discussions with staff that the strategy imposes an unreasonable workload on them. It is evident that, once the initial set-up costs have been incurred, especially the development of training materials and training of staff, the routine costs of implementing the IDSR are not high, ranging from 0.4 percent to 8 percent of the district recurrent budget (in this calculation, depreciation is excluded since it is not accounted for in the district recurrent budget).

3.2.3 Key IDSR Cost Drivers

Table 9 shows the ranking of the above routine IDSR-specific costs.⁹ Capital costs represent the straight-line depreciation of vehicles and equipment adjusted for the time value of money. Of the recurrent costs, staff costs are, not surprisingly, the greatest, followed by transport costs. These two costs are the ones also likely to be favorably impacted by integration of disease surveillance into other health care activities, as this allows staff to save time and transport costs.

Table 9. Key IDSR Cost Drivers

1	Capital costs (depreciation)
2	Staff costs – district
3	Transport – routine IDSR
4	Per diems (supervision, outbreak response)
5	Stationery
6	Health education
7	Other costs

⁹ The cost of per diems was not disaggregated between routine and outbreak response activities; per diems are paid to staff whenever they have to work all day away from their normal duty station.

3.2.3.1 Staff Costs

As was seen in Table 4, between 2003 and 2004, there was a major increase in the number of reported cases of malaria, from a total of 553,000 to 918,000 in the six districts. This had a significant impact on staff involvement in IDSR diseases. The difference in costs between the two years – which, as Table 6 above showed, increased in four of the six study districts – is attributable to the increase in the number of staff employed in IDSR activities due to the increase in the volume of disease cases.

For routine IDSR activities, however, there were fewer FTE staff in 2004 than in 2003 in all the intervention districts with the exception of Dodoma Rural. In the two control districts, FTE doubled in Hanang, but it decreased 32 percent in Ilala. These decreases could be the result of the integration of supervision activities. In any case, the numbers should be used with caution, because they were based on staff estimates of the amount of time they spend on IDSR activities.

Table 10. Routine IDSR Staff Numbers

Number of FTE Staff by Year	Intervention districts				Control districts	
	Tabora Urban	Dodoma Rural	Mbulu	Mwanza	Hanang	Ilala
2004 FTE staff	2.4	2.3	1.1	3.4	3.2	3.7
2003 FTE staff	2.7	1.7	2.5	4.1	1.5	5.5
Increase/(decrease)	(0.3)	0.6	(1.4)	(0.7)	1.7	1.8

3.2.3.2 Drugs and Medical Supplies

The second largest IDSR cost at the district level was expenditure on drugs and medical supplies used in outbreak response. District records showed modest expenditures but they understated the real costs by not including the value of any drugs received directly from donors or from the regional health offices. The study estimated the cost of drugs and medical supplies by multiplying the unit costs of treating one patient (outpatient or inpatient) by the number of patients (Table 11).

Table 11. Costs of Drugs and Medical Supplies for IDSR, in Tsh

	Intervention districts				Control districts	
	Tabora Urban	Dodoma Rural	Mbulu	Mwanza	Hanang	Ilala
2004	133,167,571	259,860,376	103,958,672	265,670,382	72,398,023	366,586,632
2003	59,088,729	127,905,852	107,182,201	337,764,177	3,666,292	229,817,033
Increase/(decrease)	74,078,842	131,954,524	(3,223,529)	(72,093,795)	68,731,731	136,769,599

The cost of drugs and medical supplies varied with the volume of outbreak cases that had to be treated. Mwanza and Mbulu saw a decrease in these costs from 2003 to 2004 because they had fewer cases of the higher-volume diseases: Mwanza had 3,000 fewer cases of diarrhea and 75,000 fewer cases of pneumonia (though 23,000 more cases of malaria were reported in 2004). Mbulu witnessed a decline of 23,000 cases of malaria and 8,000 of pneumonia. These declines were mirrored in declines in drugs and medical supplies for outbreak response as well as in staff costs.

In terms of their preparedness for outbreak response, all districts had emergency supplies of drugs in 2003 and 2004, and the intervention districts did not carry higher quantities of drugs than the control districts. However, other than Mbulu, which doubled its emergency drugs inventory from Tsh 206,760 worth of drugs in 2003 to Tsh 442,200 in 2004, all other districts reduced their inventories.

3.2.3.3 Transport Costs

Transport costs are an important component of district IDSR costs. Transport is required for routine supervision as well as for outbreak response. Within integrated disease surveillance, transport costs are shared among the many district activities that require supervision and this means that there is only rarely IDSR-specific transport for routine supervision; it becomes only one of the many activities that the CHMT will do when they go out on field visits. Table 12 shows estimated transport costs for 2003 and 2004. Transport cost estimates were based on the total distance traveled on IDSR activities multiplied by the cost per mile.

Table 12. IDSR Transport Costs, 2003 and 2004

	Intervention districts				Control districts	
	Tabora Urban	Dodoma Rural	Mbulu	Mwanza	Hanang	Ilala
2004 routine IDSR	1,651,105	5,580,750	1,195,875	459,216	3,444,120	51,326,955
2004 outbreak response	3,361,206	2,232,300	79,725	153,072	502,267	46,495,620
Total 2004	5,012,311	7,813,050	1,275,600	612,288	3,946,387	97,822,575
Total 2003*	104,316,974	3,571,680	37,560,042	14,159,160	951,916	19,939,605
Increase/ (decrease)	-99,304,663	4,241,370	36,284,442	13,546,872	2,994,471	77,882,970

* No breakdown was available between routine and outbreak response transport.

IDSR-related transport costs decreased quite dramatically between 2003 and 2004 in the intervention districts, with the exception of Dodoma Rural. These costs increased in the two control districts. The reasons for this change may have to do with the fact that much of IDSR-related supervision is now carried out during other activities of the Council Health Management Team and not as isolated events. Two districts specifically cited this as one of the perceived benefits of integration of disease surveillance.

3.2.4 IDSR Start-up Costs

Start-up costs are those costs incurred to put in place a program – in this case, the Tanzanian IDSR strategy. They are an investment cost and often are treated like capital costs, i.e., spread over the number of years their benefit is considered to last, usually five years.

The estimates above do not include start-up costs. This is because the costs were borne not by the districts but by the U.S. agencies that provide materials and technical support to the Tanzania IDSR program. Nevertheless, this study separately quantified the start-up costs, because decision-makers in Tanzania need to know the total investment cost of launching the IDSR strategy.

The major start-up cost was the cost of materials development and initial training, especially the training of trainers. The total cost incurred by PHR*plus* from inception to the end of the initial

training in all 12 districts was US\$ 542,521, an average of US\$ 45,210 per district. The cost of training of trainers at the district level as well as training of other district and facility staff amounted to \$133,543 for all 12 districts, an average of US\$ 11,129 per district. Other start-up costs incurred by the project included the development of training and other materials. Materials development involved a lengthy process, as the WHO IDSR guidelines had to be adapted to the Tanzania context and agreement reached with the MOH and other stakeholders about their accuracy and suitability. The materials also had to be translated into Kiswahili.

Most programs would amortize these costs over the number of years their benefit is considered to last, usually five years; beyond this time, staff who benefited from the initial training (usually senior staff) will probably move to other districts or otherwise not be available for IDSR. As noted above, this study quantified training costs for the future information of Tanzanian decision-makers, but it did not amortize the costs, because some of the training was given to members of zonal training centers (ZTCs). The MOH established ZTCs to support districts in implementing various health management activities; each supports a number of districts. The ZTCs responsible for the 12 intervention districts now also serve as a permanent repository of IDSR expertise and can re-train any districts that, for any reason, lose their trainers.

Another start-up cost of IDSR implementation was the establishment of a project office in Dar-es-Salaam, staffed with local IDSR experts and other administrative support.

3.3 Sustainability of IDSR

When asked what plans the district had for the sustainability of their IDSR activities, the control districts mentioned the activities they are doing to strengthen case identification and management of the system but nothing about how these activities will be funded in the long term. Two intervention districts identified inclusion of IDSR in the comprehensive council health plans as part of the strategy for sustainability. Inclusion of IDSR in the plan is an important first step toward making the IDSR strategy part of the district's way of doing things and ensuring long-term sustainability. This should also make it easier in the future to identify IDSR-specific costs within the district budgets, in contrast to the situation encountered in this study, where it was extremely difficult to isolate IDSR costs from other district expenditures. The integration of disease surveillance and response, however, should make it even harder to identify IDSR-specific costs since surveillance will be more and more embedded within the district routine disease reporting and supervision mechanisms.

3.4 Financing of IDSR

IDSR activities are financed through the normal allocations from the district treasury (block grants); only two districts identified other sources of financing of outbreak response costs and only for 2003. In Dodoma Rural, "other" NGOs contributed Tsh 5 million representing 2 percent of total IDSR costs, while in Hanang, Doctors Without Borders contributed Tsh 2 million and a further Tsh 2 million was drawn from the Community Health Fund (a community-based health financing initiative), representing 7 percent of total IDSR costs in 2003.

Given that most IDSR financing comes from the annual budgetary allocations, it is important that districts lobby for adequate funding at the district, since IDSR must compete with other priorities in health. IDSR should be seen not just as a health sector issue but also as a macroeconomic priority due to the impact that disease outbreaks can have on the economy. This would help to make the case for higher and more sustainable funding for IDSR activities.

The reduction of emergency drugs inventories, discussed above (Section 3.2.3.2), may be an indication that the districts are not receiving sufficient allocations for drugs and are having to draw down on their emergency inventories for day-to-day use in their health facilities without the ability to replenish them.

4. Conclusions

Though the evidence is not totally conclusive, it would appear that the implementation of the IDSR strategy has had a positive impact on the two key costs associated with routine disease surveillance and response, i.e., staff costs (and numbers) and transportation.

The quality of data management at the district level continues to be a challenge that requires continued efforts to strengthen it in order to provide a sound base for production of reliable information.

Key IDSR cost drivers: The five key costs in routine IDSR are (in order of importance): 1) capital (depreciation), 2) staff, 3) transport, 4) per diems, (supervision, outbreak response), and 5) stationery. If capital costs are excluded, staff costs are, not surprisingly, the most significant cost, followed by transport for routine supervision. Third are per diem allowances; these include an element of outbreak response costs, as this was not separately identified during data collection.

Recurrent costs for a functioning IDSR strategy: The total IDSR-specific costs provided an indication of the cost of running the IDSR strategy in a district. Total costs for the intervention districts in 2004 ranged from TSh 173 million (US\$ 156 thousand) to TSh 440 million (US\$ 383 thousand). Most districts experienced an increase in costs between 2003 and 2004. Total costs in Mbulu and Mwanza (two intervention districts) declined over the two years primarily because of a decline in disease response costs resulting from a lower incidence of cases. Costs increased in the remaining two intervention districts, and both control districts. Whether any of the increase can be attributed to the adoption of the IDSR strategy is difficult to say.

IDSR start-up costs: At the start-up stage, costs were incurred in training of trainers at the district level as well as training of other district and facility staff; these costs were US\$ 133,543 for all 12 districts, an average of US\$ 11,129 per district. Other start-up costs included the development of training and other materials and supporting districts in all aspects of implementing the new strategy. These costs amounted to \$45,210 per district. The grand total cost for training activities was US\$ 542,521. The districts themselves did not pay for any of these activities.

Implications of integration: There was a decline in the number of FTE staff, as well as in the costs of transport. This could be evidence of the positive impact of integration.

Staffing: There were, in general, fewer FTE staff working on routine IDSR in 2004 than in 2003 in all the intervention districts with the exception of Dodoma Rural. In the two control districts, there was a doubling of FTE in Hanang and a 32 percent reduction in Ilala. It is important to use these numbers cautiously, because they were based on staff estimates of the amount of time they spend on IDSR activities.

Transport costs: IDSR-related transport costs decreased quite significantly between 2003 and 2004 in the intervention districts, with the exception of Dodoma Rural, whose IDSR-related transport costs more than doubled. Both control districts show an increase in IDSR-related transport costs. The reasons for this change may have to do with the fact that much of IDSR-related supervision is now

carried out during other activities of the CHMT and not as isolated events. Two intervention districts specifically cited this as one of the perceived benefits of integration of disease surveillance.

Sustainability of IDSR: Only two of the intervention districts appeared to have a clear idea about the need to make IDSR sustainable. These two identified inclusion of IDSR in their comprehensive council health plan as part of their strategy for sustainability. Inclusion of IDSR in the plans is an important first step towards institutionalizing the IDSR strategy and ensuring long-term sustainability. In view of the critically important nature of IDSR in the face of new infectious disease threats, it is important to give it sufficient prominence in health sector plans and budgets at the national and district levels.

Economic factors for the justification of investing in IDSR: The period covered by the study was not sufficiently long to be able to analyze trends in costs and outbreak management. Nor were the the baseline data collected and compiled by districts reliable enough to indicate how outbreaks were managed prior to the introduction of the IDSR strategy.