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Assessing the Effectiveness of an Intervention Package for Improving Analysis and Response of the Infectious Disease Surveillance System in Tanzania

May 2006

Order No TE 097

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Mission

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.*

May 2006

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Abstract

It is widely recognized that the analysis and use of information for decision-making are essential components of a functioning integrated disease surveillance and response (IDSR) strategy. During the period 2002 to 2005, the Partners for Health Reform*plus* Project and the National Institute of Medical Research in Tanzania provided technical support to the Ministry of Health of Tanzania with the aim of strengthening IDSR activities within 12 districts of Tanzania. The two primary objectives of this operations research study are: 1) to document the implementation and perceived effectiveness of a surveillance strengthening intervention package in promoting desired analysis and response at the district level, and 2) to provide an in-depth assessment and description of how individual-and system-level factors influenced the perceived effectiveness and success of the intervention package. Data for the study come from a baseline and follow-up surveys of district health workers, as well as in-depth interviews and focus group discussions in two districts. The results suggest that some of the components of the intervention package were implemented as intended, but two components were implemented only partially. There is limited quantitative evidence that suggests that the intervention led to improvements in perceived availability of quality data, capacity to perform analysis, and motivation to perform data analysis and to use analyzed data. However, the limited time between the introduction of the components and the follow-up survey may have contributed to this, and there were a series of system barriers that adversely affected the effectiveness of the intervention. It is hoped this report can inform other African countries in the development, revision, and scale-up of IDSR systems.

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Acronyms{tc "Acronyms"}

A&R	Analysis and Response
CHMT	Council Health Management Team
DHO	District Health Officer
DMO	District Medical Officer
DQM	District Quarterly Meeting
FGD	Focus Group Discussion
HFS	Health Facility Staff
HIV	Human Immunodeficiency Virus
HMIS/MTUHA	Health Management Information System (MTUHA is Kiswahili)
IDSR	Integrated Disease Surveillance and Response
IDWE	Infectious Disease Week Ending
MCH	Maternal-Child Health
MOH	Ministry of Health
NIMR	National Institute for Medical Research
PHR*plus*	Partners for Health Reform*plus*
SCD	Standard Case Definition
SMS	Short Message Service
USAID	U.S. Agency for International Development
WHO	World Health Organization
WHO/AFRO	World Health Organization Regional Office for Africa

Acknowledgments

Executive Summary

It is widely recognized that the analysis and use of information for decision-making are essential components of a functioning integrated disease surveillance and response (IDSR) strategy. Analysis and response can be defined as the process of analyzing and summarizing epidemiologic and programmatic data, interpreting results, and using these results to help guide decisions regarding infectious disease interventions and responses, improving existing IDSR activities, and allocating resources. At the local level, the process of analysis and response should be driven by the program manager's capacity to use IDSR data to improve decision-making. In order for this to occur, surveillance information must be perceived as useful for decision-making, and expectations for analysis, interpretation, and translation into action must be clearly defined. If, as is typically the case at the district level, the decision maker is not the same as the analyst, then the results of the analysis must be summarized and disseminated in timely and standardized formats which make them useful to decision makers.

During the period 2002 to 2005, the Partners for Health Reform*plus* Project (PHR*plus*) and its implementing agency, the National Institute for Medical Research (NIMR) of Tanzania, provided technical support to the Ministry of Health (MOH) with the aim of strengthening IDSR activities within 12 districts of Tanzania. Tanzania was a leader among African countries to adopt the IDSR strategy, being 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 (MOH 2001), development of laboratory-networking guidelines (2001), and adaptation and approval of the World Health Organization Regional Office for Africa (WHO/AFRO) district analysis book (2002).

The intervention focused on the dissemination of standards, improved tools, capacity building and strengthening of inter-sectoral linkages. Two control districts were selected to be used as the comparison groups. This operations research study has two primary objectives: 1) to document the implementation and perceived effectiveness of the surveillance strengthening intervention package in promoting desired analysis and response at the district level; and 2) to provide an in-depth assessment and description of how individual- and system-level factors influenced the perceived effectiveness and success of the intervention package.

This report is intended to inform IDSR decision-makers of the development, revision, and scale-up of IDSR systems in Tanzania and in other African countries. While the results of the IDSR intervention were modest due to a number of program and operational constraints, this report provides a solid description of the intervention, the operations research intended to measure the effectiveness of the intervention, as well as the barriers and constraints that affected both the intervention and the operations research intended to evaluate it.

The first operations research objective, the evaluation of the intervention package, was accomplished primarily with the implementation of a survey questionnaire focusing on issues of analysis and response among individuals working at district health offices who are responsible for analysis and response of IDSR data. Survey data were supplemented by focus group discussions and

in-depth interviews among the health staff at the district and health facility levels within two of the 12 districts.

The overall intervention consisted of the following components developed and initiated by NIMR/PHR*plus*: IDSR training for facility- and district-level staff; the introduction of minimum standards for analysis and response; the introduction of tools for IDSR data management and analysis; the introduction of a job aid for IDSR data interpretation; the introduction of IDSR-related items to be included in supervision checklists; the introduction of guidance on feedback mechanisms; and monitoring and evaluation. Due to the long travel distances between the 12 districts, the interventions were implemented in a staggered fashion. The effectiveness of the analysis and response intervention package (objective 1) was assessed with a pre-post quasi-experimental research design. Individuals at the 12 district offices who reported being responsible for analyzing or utilizing IDSR data were targeted for the quantitative component of the study. Four types of indicators were used for this component: 1) implementation of the intervention, 2) availability of quality surveillance data, 3) analysis of surveillance data, and 4) use of surveillance data. For objective 2, IDSR trained staff from two districts were eligible for inclusion in the study. Staff from these areas were selected for this research because the intervention activities had started in these districts, giving them the longest time to gain experience with the IDSR strengthening activities and tools.

The following are major findings of this study:

Objective 1: Effectiveness of the intervention package

- ▲ Was the job aid intervention successfully implemented and did it function as intended? The following five components making up the IDSR intervention package were implemented within the 12 intervention districts with varying degrees of success: a) IDSR training for facility and district-level staff; b) minimum standards for analysis and response; c) tools for IDSR data management and analysis (database); d) a job aid for IDSR data interpretation (interpretation guide); and e) guidance of feedback mechanisms. More than three-quarters of respondents within intervention districts reported receiving the IDSR training (86.8%) and IDSR database (77.6%). However, only 57.0% stated their district had received the analysis standards, while only 61.9% stated their district had received the interpretation guidelines. These data suggest there is a gap, at least in perception, between knowledge of the above-mentioned components by district epidemiology staff and the full (100%) coverage the intervention was intended to have across all 12 intervention districts. The lack of full coverage by the intervention package, whether real of in perception, may have limited the effectiveness of the intervention package on analysis and response as measured from the questionnaire designed to ascertain self-reported information.

- ▲ Did the expected improvements in analysis and response occur after implementation of the job aid intervention package? Overall, there was limited evidence that the expected improvements in analysis and response occurred after the implementation of the IDSR intervention package. While the point estimates did move in the desired directions, there was no significant increase in the mean score of the index measuring perceived availability of quality surveillance data, as well as perceived capacity to perform data analysis. In fact, the proportion of respondents who stated they agreed to the specific question of "I feel fully capable of carrying out specified analysis of IDSR data" did not change significantly between baseline and follow-up (76.6% vs. 74.3%) (no significant difference). The proportion of respondents from the intervention districts who stated they were motivated to perform analysis of IDSR data remained unchanged from baseline (73.4%) to follow-up (72.6%). Further, the proportion of respondents within the intervention districts who stated

they were motivated to use analyzed IDSR data for decision-making actually decreased slightly (not significant) between baseline (93.6%) and follow-up (87.3%). Similarly, the mean score measuring perceived value of using analyzed IDSR data for decision-making remained unchanged between baseline and follow-up.

There are several possible explanations as to why the expected improvements in analysis and response were not observed following the implementation of the IDSR intervention package. First, there may have been a lack of understanding and knowledge about the intervention among some of the IDSR staff within the intervention districts. This is supported by the fact that only a little more than half (65.6%) stated they themselves received the training on the intervention package. Additionally, only 57.9% stated their district had received the analysis standards while only 61.9% stated their district received the data interpretation guide. Again, even if these components were present, between 40-50% didn't know about them post-intervention. One possible explanation for this result relates to staff turnover. It is plausible that the respondents weren't the ones who received the training and to whom the analysis standards and data interpretation guide were given. Second, the time between the roll-out of the intervention package and the time of follow-up survey was only 4-6 months. As changes in behavior and perceptions can take considerable time to actualize and be measured by a questionnaire, there may have been insufficient time between the implementation of the intervention and the follow-up data collection to capture any resultant changes.

▲ What were the resultant improvements in analysis and response? There was little consistent evidence from the quantitative analysis to suggest that the IDSR intervention package was responsible for any of the modest improvements in analysis. Table 16 provides a summary of the analysis of the primary indicators for measuring program effectiveness and impact. While point estimates did move in desired directions (i.e., they were all positive), there were only two instances where the treatment group x survey round interaction terms were significant, suggesting the intervention package was responsible for any resultant changes. Such an impact was observed from the perception of availability and quality of surveillance data and the reported level of perceived capacity to perform analysis. However, in both instances the primary reason for the significance of the interaction term was driven by significant decreases in the scores for the indexes measuring these areas within the control districts. There were no significant increases within the intervention districts. While it may be possible that without the intervention package the proportion of respondents reporting perceived availability of surveillance data and capacity to analyze them would have also decreased, such a trend is unlikely. Rather, the decrease within the control districts was likely due to either measurement error or some level of social-desirability bias that was differential between the baseline and follow-up data collection rounds.

Objective 2: In-depth assessment of factors that affect effectiveness of the intervention package.

The qualitative component of the research, carried out in two of the 12 intervention districts, provides sometimes contradictory findings to those of the self-administered survey:

▲ Both district and health facility staff members commented that the availability of IDSR data had greatly improved as a result of the intervention.

▲ Participants have shown that they are "committed to the idea of maintaining a disease surveillance program" and have demonstrated they are looking for ways to overcome the challenges facing them.

- ▲ Participants have clearly stated the benefits to improving their ability to better diagnose priority diseases, respond more rapidly to disease outbreaks, and improve the medicine supply orders.

- ▲ Participants mentioned that it is possible to improve disease detection, reporting, and response using existing staff and within their normal routine.

- ▲ Participants mentioned that the IDSR intervention activities have enabled close working relationships between public and private health facilities, and other community stakeholders.

- ▲ Participants commented that the IDSR interventions can be integrated into the district health activities and can be taken up by the district councils (some of which have already committed funds for such activities).

- ▲ Staff members report that they have been motivated to take up the IDSR intervention and have been eager to implement it at all levels.

The results of the qualitative analysis also suggest that the following points will need to be addressed if the IDSR strengthening program is to be implemented successfully in other parts of the country and sustained in the existing districts:

- ▲ The need to integrate information requests through the health management information system.

- ▲ The need to further improve communication between health facilities and district health offices.

- ▲ Increased capacity for the diagnostic laboratories at the facility and district levels in order to confirm cases of priority infectious diseases.

- ▲ The need to prioritize and continue funding. To maintain IDSR system functioning, it is essential that districts prioritize surveillance activities and continue to allocate sufficient funds for disease surveillance activities.

- ▲ The need to encourage continued cooperation with other IDSR stakeholders (e.g., religious or community leaders).

- ▲ Training effectiveness and future training needs.

- ▲ There is a continued need to build and maintain organizational capacity. It is possible to improve disease detection, reporting, and response using existing staff and within their normal routine; however, chronic staff shortages will continue to plague the effective maintenance of the IDSR system. It is vital to recruit/train new staff members (training for redundancy) and conduct regular refresher trainings as one effort to address the shortage issue.

- ▲ Integration is essential to ensure sustainability. It has been demonstrated that the IDSR interventions can be integrated into the district health activities and taken up by the district councils, some of which have already committed funds for such activities.

▲   Supervision and feedback are clearly in need of improvement, especially in one of the two districts. Supervision has to be seen as a priority, and steps taken so that supervisors can spend more time with staff, with focused goals and objectives.

The conclusions of the analysis are the following:

▲   Some components of the intervention package, including the training, the IDSR data management database, and the guidance of feedback mechanisms, were successfully implemented in the 12 intervention districts primarily as intended. However, responses from the questionnaire indicate the analysis standards and interpretation guide were implemented only partially.

▲   Overall, there is limited quantitative evidence that suggests that the IDSR intervention led to improvements in perceived availability of quality data, capacity to perform data analysis, motivation to perform data analysis, motivation to use analyzed data, and perceived value of analyzed data. However, regarding the perceived availability of data, the qualitative analysis provides conflicting evidence, as participants from the two districts that were first exposed to the intervention mentioned improvements in the availability of data through improved timeliness of submitting reports, and in the analysis of data.

▲   The limited time between the introduction of many components of the intervention and the follow-up survey may have an important explanation for why the expected improvements in perceived capacity and motivation were not evident in the data.

▲   There exist several barriers that operate at the health systems level that adversely affected the effectiveness of the intervention in influencing the availability of data, analysis and response. These include: overburdened health facility staff; poor communication; poor laboratory capacity; poor incentives; poor organizational capacity; and insufficient financial resources.

▲   Among the suggestions to improve the effectiveness of the IDSR intervention in the future include: enhance the training modules that focus on the analysis of data; continue to conduct the training in Kiswahili as well as English in order to improve comprehension, particularly at the facility level; provide frequent refresher courses; improve capacity to use spreadsheet software (Excel) among district staff responsible for data entry and analysis; ensure that working computers and printers are available; and clarify the understanding of supervisory roles and responsibilities.

1. Introduction

It is widely recognized that the analysis and use of information for decision-making are essential components of a functioning integrated disease surveillance and response (IDSR) strategy. Analysis and response can be defined as the process of analyzing and summarizing epidemiologic and programmatic data, interpreting results, and using these results to help guide decisions regarding infectious disease interventions and responses, improving existing IDSR activities, and allocating resources. At the local level, the process of analysis and response should be driven by the program manager's and capacity to use IDSR data to improve decision-making. In order for this to occur, surveillance information must be perceived as useful for decision-making, and expectations for analysis, interpretation, and translation into action must be clearly defined. If, as is typically the case at the district level, the decision maker is not the same as the analyst, then the results of the analysis must be summarized and disseminated in timely and standardized formats which make them useful to decision makers.

During the period 2002 to 2005, the Partners for Health Reform*plus* Project (PHR*plus*) and its local implementing agency, the National Institute for Medical Research (NIMR), provided technical support to the Ministry of Health (MOH) with the aim of strengthening IDSR activities within 12 districts of Tanzania. The intervention focused on the dissemination of standards, improved tools, capacity building and strengthening of inter-sectoral linkages. The tools component of the intervention was designed to standardize and facilitate IDSR analysis and its translation into public health action (response) by identifying epidemiological, as well as operational, aspects of IDSR analysis and response that are insufficient; it also would identify a format for specifying actions to be taken to remedy such insufficiencies.

This operations research study has two primary objectives: 1) to document the implementation and perceived effectiveness of the surveillance strengthening intervention package in promoting desired analysis and response at the district level; and 2) to provide an in-depth assessment and description of how individual- and system-level factors influenced the perceived effectiveness and success of the intervention package. It is hoped that the study will lead to a better understanding of how such an intervention package can best be refined across all of Tanzania, as well as designed and implemented in other countries in need of IDSR strengthening.

The first operations research objective, the evaluation of the intervention package, was accomplished primarily with the implementation of a survey questionnaire focused on issues of analysis and response among individuals working at district health offices who are responsible for analysis and response of IDSR data. These data were supplemented by focus group discussions (FGDs) and in-depth interviews among the health staff at the district and health facility levels within two of the 12 districts.

The following specific research questions are addressed under this first operations research objective:

- Was the job aid intervention package successfully implemented and did it function as intended?

- ▲ Did the expected improvements in analysis and response occur after implementation of the job aid intervention package?

- ▲ To what extent did the package of interventions contribute to resultant improvements in analysis and response? And how do individual- and system-level factors affect the effectiveness of the job aid intervention package?

The second operations research objective, the assessment of factors that influenced the effectiveness of the intervention package, was accomplished primarily through qualitative methods (in-depth interviews and FGDs) of district health office staff and health facility staff (HFS). The following specific sub-objectives are addressed under this second operations research objective:

- ▲ Description of individual- and system-level incentives and barriers that affect the use of the intervention package and analysis of IDSR data and response

- ▲ Perceived usefulness of the intervention package in facilitating analysis and response

- ▲ Description of how the intervention package could be improved to better enhance analysis and response

- ▲ Description of how the intervention package has been used for planning and/or decision-making based on infectious disease data analysis

2. Description of the IDSR Intervention

2.1 Background

Tanzania was a leader among African countries to adopt the IDSR strategy, being 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 (Ministry of Health 2001), development of laboratory-networking guidelines (2001), and adaptation and approval of the World Health Organization Regional Office for Africa (WHO/AFRO) district analysis book (2002). The National Guidelines for IDSR focused on 13 priority diseases, which are listed in Table 1.

Table 1: List of Priority Diseases in Tanzania

Epidemic-prone diseases	Cholera
	Bacillary dysentery
	Plague
	Measles
	Yellow fever
	Cerebro-spinal meningitis
	Rabies / animal bite
Diseases targeted for elimination/eradication	Acute flaccid paralysis
	Neonatal tetanus
Diseases of public health importance	Diarrhea in children < 5 years
	Pneumonia in children < 5 years
	Malaria
	Typhoid fever

Since 1998, two assessments of the infectious disease surveillance system in Tanzania suggested that the analysis and response components of the system were weak, and as a result, were affecting the performance of the system. An assessment carried out by WHO/AFRO and U.S. Centers for Disease Control in 1998 revealed a general disconnect between data collection and analysis in the separate information systems used at different levels (MOH 1999; Nsubuga et al. 2002). A situation analysis in two districts (Babati and Dodoma Rural) in 2002 also revealed weaknesses in data analysis at the district and facility levels (Franco et al. 2003). In general, existing information was not regularly used to monitor disease trends at the local level, and surveillance information was underutilized for program decision-making. In addition, there was little assessment at the district level of the availability and quality of data produced by the surveillance system. As a result, key operational problems were not readily identified and remedied on a routine basis.

2.2   Components of the Intervention

The U.S. Agency for International Development (USAID) supported the MOH's efforts by providing technical support through the PHR*plus* project and NIMR. Assistance was also provided by the U.S. Centers for Disease Control, the Change Project (Academy for Educational Development), and the World Health Organization (WHO). The technical support was designed to build capacity and to clarify roles, responsibilities, and expectations among district and facility health workers in order 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 resources. By clarifying how information will be used for planning and decision-making, the intervention was expected to improve both the value that health workers place on IDSR information and their motivation for evidence-based decision-making. As a result of the intervention, it was hoped that, by the end of the intervention period, district health workers would be analyzing their epidemiological and IDSR performance data regularly, and using that information to take appropriate actions (i.e., improving system performance, responding appropriately to outbreaks, planning for resources and activities, etc.). It was also expected that facilities would do more analysis of their own data.

The intervention was carried out in 12 districts in Tanzania. Figure 1 shows a map of Tanzania with the IDSR project districts. The districts represent all six of Tanzania's MOH zones, and eight of the 21 regions. The 12 districts are Babati, Mbulu, Dodoma Rural, Mpwapwa, Masasi, Tunduru, Nkasi, Sumbawanga Rural, Igunga, Tabora Urban, Muleba, and Mwanza City.

Figure 1: Map of Tanzania with IDSR Project Districts
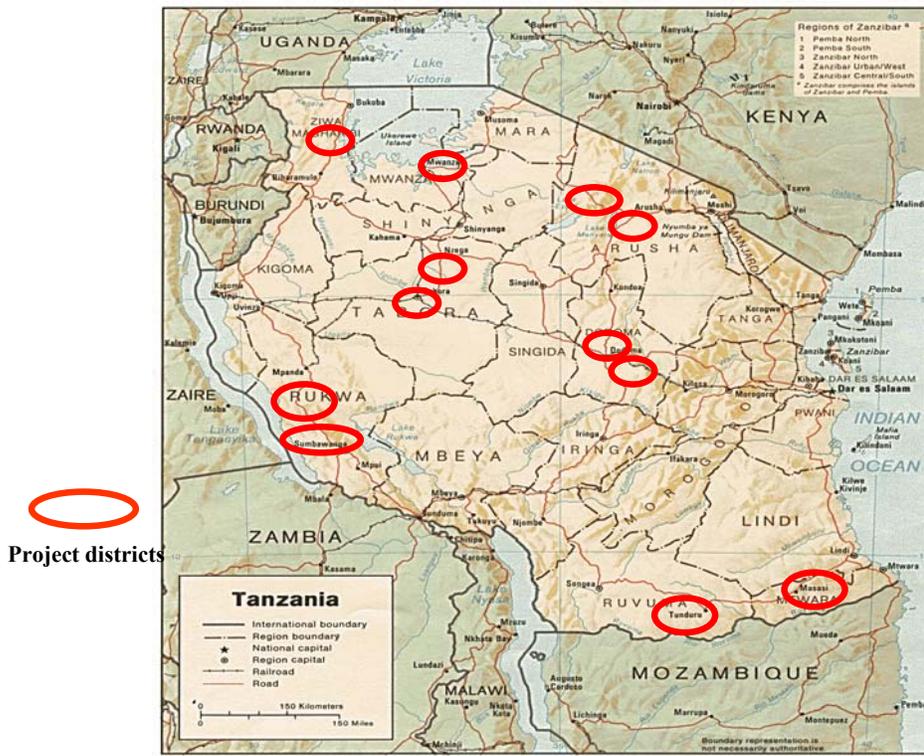
The overall intervention consisted of several components developed and initiated by NIMR/PHR*plus*. These include:

- ▲ IDSR training for facility- and district-level staff;

- ▲ Tthe introduction of minimum standards for analysis and response;

- ▲ The introduction of tools for IDSR data management and analysis;

- ▲ The introduction of a job aid for IDSR data interpretation;

- ▲ The introduction of IDSR-related items to be included in supervision checklists;

- ▲ The introduction of guidance on feedback mechanisms; and,

- ▲ Monitoring and evaluation.

Because of the long travel distances between the 12 districts, the interventions were implemented in a staggered fashion. The intervention components and the timing of their introduction in each of the districts are presented in Annex A.

Below is a brief description of each component of the intervention.

2.2.1   Minimum Standards for Analysis and Response

The minimum standards for data analysis and response at the district level was introduced to district workers as a job aid to assist district-level staff to perform regular analyses of IDSR systems performance and epidemiological data. This job aid included the purpose and time frame (monthly, quarter, and annual) for each analysis. Each of the analyses detailed in this job aid are relevant to responses possible at the district level. This job aid was introduced to district IDSR data teams during follow-up visits after training.

2.2.2   Data Management and Analysis Tool

The tool was an Excel spreadsheet for IDSR weekly and monthly reporting data entry, storage, management, and analysis at the district level. The database was designed around the minimum standards for analysis described above, and incorporated verification checks on data quality. It was hoped that districts would use this tool to maintain a computerized record of IDSR weekly and monthly reporting forms submitted from health facilities. The spreadsheet automatically calculated the minimum analyses and produced graphs and tables that could be used to monitor disease trends and provide feedback to health facilities regarding IDSR performance.

2.2.3   Interpretation Tool

This interpretation tool was a job aid (two-page guide) on how to interpret results of specific analyses. It was designed around the minimum standards for analysis, and was supposed to lead those using the tool to specific actions and action planning. This job aid demonstrates how to interpret different types of results a district may find in its analyses, and was meant to assist district officials to

know when the data suggest that actions should be taken and to know what types of actions would be appropriate in different situations.

2.2.4   IDSR Training

Training in IDSR was conducted at the district and facility levels. The district-level training materials were adapted from generic WHO IDSR training materials, and the project developed a complementary set of facility-level materials. Both sets of materials were developed using adult education principles and techniques to maximize their effectiveness. The training included modules on the following key concepts related to analysis and response:

- ▲   Collecting and analyzing data on priority IDSR diseases;

- ▲   Interpreting and using data to respond to priority diseases;

- ▲   Investigating and responding to outbreaks;

- ▲   Developing action plans;

- ▲   Supervising and providing feedback; and

- ▲   Monitoring and evaluating IDSR implementation.

After completing training, districts received assistance to initiate and maintain a schedule of IDSR-focused district quarterly meetings. It was hoped that during these meetings, districts would review current IDSR system performance, identify IDSR-related topics that should be addressed, and work on problem-solving to improve IDSR performance. In addition to the formal district quarterly meeting, separate follow-up visits were carried out with districts as needed to address all aspects of IDSR strategy performance.

2.2.5   Feedback Mechanisms

A quarterly report format was developed so that districts can provide feedback on IDSR performance to facilities. This report is generated in part by the data analysis software used in the district and provides comparative performance on timeliness and completeness of reporting for all facilities in each district.

3. Methodology

3.1 Research Design

The effectiveness of the analysis and response intervention package was assessed with a pre-post quasi-experimental research design. The intervention group consisted of all 12 districts where NIMR/PHR*plus* implemented its IDSR program. In order to help validate any resultant changes in analysis and response, a convenience sample of two control districts were selected (Ilala and Hanang). Outcomes pertaining to analysis and response within intervention and control groups were measured both before and after the implementation of the intervention. The impact of the intervention on analysis and response was assessed by the comparison of the two groups with respect to the relative changes of outcome measures pre- and post-test. The units of analysis include district health offices, as well as individuals from health facilities, district health offices, and regional offices.

All 12 districts were exposed to the same package of interventions (training, introduction of data analysis and interpretation tools and job aids, etc.). However, the timing of the introduction of package components was staggered. For example, four districts at a time were trained over a period of approximately nine months.

In general, the research design can be depicted as:

X Baseline   **X** Post-test measure

O Baseline   **A&R Intervention package**   **O** Post-test measure

→

TIME

X = Districts outside of intervention areas (control group);
O = Districts receiving intervention package (intervention group).

The net effect of the intervention package within this design can be though of as:

Net effect **=** (Outcome of intervention group post-test **—** Outcome of intervention group pre-test) **—** (Outcome of control group post-test **—** Outcome of control group pre-test)

a. Sample Size and Target Populations

An individual-level assessment of practices, motivation and attitudes regarding the analysis and use of surveillance data was conducted with all Council Health Management Team members from the intervention and control areas. All individuals at the district health offices who are reported to be responsible for analyzing or using IDSR data were targeted. Typically these individuals consist of the following:

- ▲ Council health management team (CHMT) – this is the district health team and generally consists of: district medical officer, district health secretary, district health officer, district nursing officer, district laboratory technician in-charge, district pharmacist, and district dental officer. Often one of these CHMT members acted as the district IDSR focal person.

- ▲ Medical officer in-charge of district hospital.

- ▲ Other district health staff with a role in surveillance – may include district reproductive & child health coordinator, health management information system (HMIS) focal person, district cold chain coordinator, district AIDS control coordinator, etc.

In addition, in-depth interviews and FGDs were used to assess individuals' analysis and response capacity from selected health facilities, district health offices, and regional offices. Table 2 shows the sample sizes for the various units of analysis.

Table 2: Sample Sizes for Baseline and Follow-up Quantitative Surveys of District-Level Health Workers

District	Baseline	Follow-up
Control		
Hanang	5	8
Ilala	5	23
Total	**10**	**31**
Intervention		
Babati	10	4
Dodoma	7	10
Igunga	7	10
Masasi	8	7
Mbulu	10	5
Mpwapwa	4	6
Muleba	4	4
Mwanza	9	4
Nkasi	9	7
Sumbawanga	9	6
Tabora	7	9
Tunduru	9	4
Total	**94**	**76**

Point estimates and their relative directions were calculated as the sample sizes were insufficient to detect meaningful statistically significant differences between comparison groups, especially at the level of district offices.

For the qualitative component of the study, IDSR-trained staff from Babati and Dodoma were eligible for inclusion in the study. Staff from these areas were selected for this research because the intervention activities had started earliest in these districts, giving them the longest time to gain experience with the IDSR strengthening activities and tools. Staff members in these districts were trained during February and March 2004. IDSR-trained staff at the district level included various individuals: 1) members of the CHMT, 2) the designated district-level IDSR focal person, and 3) staff from the district hospital. Other district-level staff who had a role in district-level surveillance planning activities and who had taken part in the IDSR training, were also considered eligible for the study.

Since the IDSR training was carried out separately for staff at the district level and health facility levels and emphasized different levels of training capacity, we treated each level as an important subgroup in the study.

IDSR-trained facility in-charges from all six health centers and 68 health dispensaries in Dodoma Rural District and all three health centers and all 37 health dispensaries from Babati District were eligible for inclusion in the study. Due to resource limitations, we further stratified our sample. We purposely selected facility in-charges from the two largest health centers in Dodoma district (out of six possible health centers) and one facility in-charge from the largest health center in Babati district (one out of three possible health centers). Due to the large number of health dispensaries and limited funds for conducting data collection activities, we drew a separate random sample from health dispensary lists obtained from each district. We sorted the list alphabetically and selected every seventh dispensary from each list. From the Babati dispensary list, we randomly selected seven dispensaries and from the Dodoma district dispensary list, we randomly selected 11 dispensaries representing between 16% and 17% of the total eligible dispensaries.

As indicated in Table 3, a total of 11 interviews and seven FGDs were completed. Fifty-one health personnel from Babati (n=26) and Dodoma health districts (n=25) participated in the study. Thirty-three percent were female and 67 percent were male. The average age of participants was 44 years (males, 45 years; females, 42 years). On average health staff reported working in their current professions 15.8 years (ranging from 1 to 40 years) and in their current positions an average of 8.9 years (ranging from 0.5 to 30 years). Professional training of participants varied somewhat, with the majority being clinical/medical officers (12), followed by nurses (11). Six staff reported receiving training in public health; the remainder had training in other fields (health education, environmental health, laboratory and pharmaceutical technician, health secretary, maternal and child health (MCH), rural medical aid, and dental medicine).

A total of 19 participants were the in-charge at their health facility, while the remaining were district-level staff members holding various positions. Among the 32 district-level participants, 14 reported they were currently acting as focal persons for the following departments: the entire district (two), Reproductive and Child Health (two), HMIS (two), Human Immunodeficiency Virus (HIV) (two), IDSR (two), Expanded Program on Immunization (two), TB/leprosy (one), laboratory (one), and other (one).

Forty-seven study participants reported that they had attended the IDSR training, while three reported they were receiving IDSR training on the job. One participant had been instructed by her supervisor (who did attend the IDSR training) to sit in on a FGD.

Table 3. Sampling Strategy and Data Collection Methods for Focus Group Discussions and In-depth Interviews

Dodoma	Babati
Interviews (6)	Interviews (5)
(District level) assistant medical officer	(District level) IDSR focal person
(District level) IDSR focal person	Medical officer in-charge, Dareda Hospital
(Facility level) IDSR data person	Data recorder, Dareda Hospital
Lab technician, Mvumi Hospital	Health facility worker
(Health facility level) Facility in-charge (2)	Health facility in-charge
Focus Group Discussions (3)	Focus Group Discussions (4)
(District level) CHMT	(District level) CHMT
(Facility level) Mvumi Hospital staff	Babati Hospital staff
(Health facility level) facility in-charge	Dareda Hospital staff
	(Health facility) in-charge (1)

b. Indicators

The impact of the intervention package on analysis and response (objective 1) was assessed using a combination of multiple data points, including information from the quantitative survey and the FGDs. The information collected from the quantitative survey was used to compare the level of observed changes in outcome indicators (post-test – pre-test) between intervention and control groups. Results are presented for four types of indicators: 1) implementation of the intervention; 2) availability of quality surveillance data; 3) analysis of surveillance data; and 4) use of surveillance data. The indicators are presented below:

Implementation of the intervention

Indicator 1: Proportion of staff that agree there are written guidelines to help guide data analysis

Indicator 2: Proportion of staff that agree there are written guidelines to help make use of surveillance data (defined as identifying problems with health facilities with prevention and control of reportable diseases)

Availability of quality surveillance data

Indicator 3: Mean score for Likert scale questions measuring perceptions of availability and quality of surveillance data

Analysis of surveillance data

Indicator 4: Mean score of respondents for Likert scale questions measuring reported level of perceived capability to perform analysis

Indicator 5: Mean score of respondents for Likert scale questions measuring motivation to carry out analysis

Use of surveillance data

Indicator 6: Mean score of respondents for Likert scale questions measuring perceived value of using analyzed surveillance data

Indicator 7: Mean score of respondents for Likert scale questions measuring perceived motivation to use analyzed surveillance data to improve prevention and control of infectious diseases and/or improve the functioning of the surveillance system

c.   Data Collection

District surveillance staff surveys: Survey questionnaires were administered to all district surveillance staff to assess practices, motivation, and attitudes regarding the analysis and use of surveillance data. As part of the IDSR program monitoring and evaluation (for program monitoring and improvement purposes), a baseline survey was administered within all 12 intervention districts prior to the introduction of the intervention package (February/March 2004). This survey provided a baseline against which to monitor district performance throughout the program and to enable NIMR/PHR*plus* to tailor its tools and approaches to best meet the needs of the 12 intervention districts. The baseline surveys were administered to district surveillance staff within the two selected control districts in September/October 2004. One follow-up data collection round was conducted between April and June 2005 within both intervention and control districts. The survey questionnaires were used to generate quantitative data for ascertaining individual-level outcome indicators. District surveillance staff surveys addressed the following:

- ▲   Perceived value of information;

- ▲   Motivation to analyze and interpret data;

- ▲   Incentives perceived as important to perform analysis and response;

- ▲   Perceived self-efficacy;

- ▲   Time spent on analysis/interpretation; and,

- ▲   Constraints faced in trying to implement the analysis/response tasks.

In-depth interviews and FGDs: The qualitative research was carried out in two districts, Babati District in Manyara Region, and the Dodoma Rural District in Dodoma Region. These districts were selected for this research because the intervention activities had started earliest in these districts and thus their district and facility staff had the longest time to gain experience with the IDSR strategy and the tools and activities introduced by NIMR/PHR*plus*. These staff members received training between the months of February and May 2004. Only IDSR-trained staff from the district and health facility levels were included in the study. Because the IDSR training was carried out separately for staff at the district and health facility levels and emphasized different levels of training capacity, we treated each level as a subgroup in the study. Members of the CHMT, the designated district-level IDSR focal person (if not a CHMT member), and staff from the district hospital were included in the sample. Other district-level staff who had a role in district-level surveillance planning activities were also considered eligible for the study.

IDSR-trained facility in-charges from six health centers and 68 health dispensaries in Dodoma Rural District and three health centers and 37 health dispensaries from Babati District were eligible

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for inclusion in the study. Facility in-charges from the two largest health centers from Dodoma Rural District and one from Babati District were included in the study. Due to the large number of health dispensaries, we drew a 20 percent random sample of dispensary staff from lists obtained from each district.

FGDs and in-depth interviews were used to collect the qualitative data. Among district-level staff, in-depth interviews were carried out with those individuals who had specific roles in the IDSR surveillance program or held key administrative or resource procurement positions related to the administration of IDSR surveillance activities. In-depth interviews were held with facility in-charges from health centers since they were few and their facilities functioned somewhat differently than dispensaries.

Four different discussion guides (two interview guides and two FGD guides) were prepared for the study. Each emphasized different aspects of the IDSR surveillance program and different levels of training that district and health facility staff received. Two in-depth interview discussion guides were prepared each for the district medical officer and the person identified as being responsible for IDSR data analysis. Interviews with IDSR focal persons and other district staff involved in IDSR data analysis /interpretation emphasized use of the surveillance job aids and IDSR software that had been developed for use. We also developed a FGD guide for the district-level staff (CHMT staff and district hospital staff) and for the HFS (used with dispensary-level staff and modified for use with health center staff).

The qualitative data collection activities were conducted primarily in Kiswahili. All sessions were tape recorded (with permission from participants). These tapes were transcribed and then translated into English. All transcripts were reviewed by the data analyst for clarity and consistency. Electronic files were created for each transcript.

d. Data Analysis

Likert scale variables were generated from the surveillance staff survey questionnaires for individual-level data. The Likert scale variables that were intended to address related issues of analysis and response were grouped and then combined using a Cronbach coefficient alpha correlation analysis. Cronbach coefficient alpha provides a statistical means for assessing the internal consistency of questions within a questionnaire (McDowell and Newell 1996). This allowed the mean of the combined variables to be calculated to represent underlying constructs of analysis and response.

The impact of the intervention package on analysis and response was assessed by comparing the level of observed changes in outcome indicators (pre-test – post-test) between intervention and control groups. A univariate analysis was done to compare district health office- and individual-level outcomes pre-/post-test within intervention districts, as well as between treatment groups. Multivariate analyses to control for confounders were limited due to limited sample sizes.

Qualitative data were analyzed using standard qualitative methods. All FGDs and interview notes were transcribed, translated, coded, and entered into the NVIVO© (QSR International Pty, Sidney, Australia) qualitative data software package. Data were analyzed using an inductive approach (i.e., data examined to see thematic patterns emerging, hypotheses formed, and data revisited to test hypotheses). During this process, a series of validity checks are used, which involve shifting between emic and etic perspectives (Miles and Huberman 1994).

4. Results

4.1   Objective 1: Effectiveness of the Intervention Package

This section identifies and elaborates on major themes regarding the effectiveness of the intervention, organized around the following topics: implementation of intervention; availability of quality surveillance data; analysis of surveillance data; and use of surveillance data.

4.1.1   Implementation of the Intervention Package

A series of questions were asked to respondents in the intervention group regarding the intervention at follow-up data collection (Table 4). The majority of the intervention respondents (86.8%) agreed that to their knowledge, people in their district had attended the NIMR/PHRplus-sponsored district-level IDSR training, with more than half (56.6%) stating they themselves attended the training. All of the respondents who were responsible for data entry (100.0%) within the intervention group stated that to their knowledge, their district had received and installed the IDSR database. All of these respondents stated they or other staff in their district were using the IDSR database, but only five of 11 (45.5%) stated that their database contained all relevant data reported by health facilities between January 2005 and the time of the survey. Computer problems and recent IDSR database installation were cited as reasons why the database was not being used. Only six of 11 (54.5%) data entry staff reported having prior experience using EXCEL. More than half (57.9%) of intervention respondents also said that their district had received the IDSR Analysis Standards. Of these, 84.1% said that the standards were being used. In terms of the IDSR Data Interpretation Guide, 61.9% said that their district had received the guide, and 82.6% of this group agreed that the guide was currently being used. The reasons cited why the guide was not being used included that the district had just received it and that not enough guides had been distributed.

Table 4: Breakdown of Districts that Received Intervention Package among Respondents at Baseline within Intervention Districts

	n	Yes / Agree [n (%)]
Did your district receive IDSR training?	76	66 (86.8)[1]
Did you personally receive the training?	76	43 (56.6)[2]
Did the district receive the IDSR database?	12*	12 (100.0)
If yes, using IDSR database to enter data?	11*	11 (100.0)
If yes, does database contain all ISDR data since January 2005?	11*	5 (45.5)
Received IDSR Analysis Standards?	76	44 (57.9)[3]
If yes, using IDSR Analysis Standards?	44	37 (84.1)[4]

Received IDSR data interpretation guide?	76	47 (61.9)[5]
If yes, using IDSR data interpretation guide?	47	39 (82.6)[6]

*Asked only of staff responsible for IDSR data entry
[1] 6 (7.9%) "Don't know"; 1 (1.3%) missing
[2] 0% "Don't know"; 2 (2.6%) missing
[3] - 23 (30.3%) "Don't know"; 5 (6.6%) missing
[4] % "Don't know"; % missing
[5] 0% "Don't know"; 4 (9.1%) missing
[6] 1 (1.2%) "Don't know"; 1 (1.2%) missing

4.1.2   Availability of Quality Surveillance Data

The proportion of respondents within the intervention group that agreed that the availability and quality of surveillance data was satisfactory increased between baseline and the follow-up for all such questions assessing this issue (Table 5). Most notably, the proportion of respondents within intervention districts that agreed that surveillance data were accurate last year increased from 71.0% at baseline to 90.4% at follow-up. In contrast, the proportion of respondents within the control group that agreed that the availability and quality of surveillance data was satisfactory decreased between baseline and the follow-up for all such questions assessing this issue.

Table 5: Availability and Quality of Surveillance Data

Question	Round	Group (n)	% Agree[‡]
All health facilities reported their surveillance data in a timely manner last year.	Baseline	Intervention (94)	66.0
		Control (10)	100.0
	Follow-up	Intervention (74)	78.5
		Control (32)	62.5
Completeness of reporting by health facilities was very good last year.	Baseline	Intervention (93)	83.9
		Control (10)	80.0
	Follow-up	Intervention (73)	86.3
		Control (31)	61.3
Surveillance data reported by all health facilities were accurate last year.	Baseline	Intervention (93)	71.0
		Control (10)	70.0
	Follow-up	Intervention (73)	90.4
		Control (31)	67.7

[‡]Includes "agree" and "strongly agree."

The responses on the three survey questions on timeliness, completeness and accuracy of surveillance data from health facilities were averaged to form a single index score as an indicator for perceived availability of quality surveillance data [(Cronbach coefficient alpha (raw) = 0.72; mean score = 2.95; SD = 0.61; n = 103] (Table 6). There was a modest increase within the intervention group between the baseline and follow-up by a mean index score of 0.3, as compared to a decrease of a mean index score of 0.4 among the control group. Accordingly, the effect of the intervention package was found to be statistically significant (P-value = 0.002) on the perception of the availability of quality surveillance data based on the treatment group x survey round interaction term.

Table 6: Mean Score for Index that Measures Perceived Availability of Quality Surveillance Data

Group	Baseline	Follow-up
Intervention	2.8	3.1
Control	3.1	2.7

4.1.3   Analysis of Surveillance Data

Capacity to analyze surveillance data: Approximately three-quarters of intervention respondents agreed they had sufficient capacity to analyze surveillance data across both study rounds (Table 7). While there was little change among intervention respondents for the two questions asking about perceived capacity to analyze surveillance data, perceived capacity to analyze such data dropped substantially between the baseline and follow-up round among control respondents.

Table 7: Perceived Capacity to Analyze Surveillance Data

Question	Round	Group (n)		% Agree[‡]
I currently understand and am familiar with the types of analysis expected from my position.	Baseline	Intervention	(93)	77.4
		Control	(10)	90.0
	Follow-up	Intervention	(72)	80.6
		Control	(30)	53.3
I am fully capable of carrying out basic analysis of surveillance data.	Baseline	Intervention	(94)	76.6
		Control	(10)	80.0
	Follow-up	Intervention	(74)	74.3
		Control	(31)	38.7

‡Includes "agree" and "strongly agree."

The responses on these two survey questions were averaged to form a single score measuring the level of perceived capability to perform analysis [Cronbach coefficient alpha (raw) = 0.86; mean score =2.88; SD = 0.86; n = 102] (Table 8). Largely due to a drop in the perceived capacity to analyze surveillance data from baseline to follow-up among control respondents, the effect of the intervention package on the perception of the capacity to analyze surveillance data was found to be statistically significant (*P-value* = 0.003), based on the treatment group *x* survey round interaction term.

Table 8: Mean Score for Index that Measures Perceived Capability to Perform Analysis

Group	Baseline	Follow-up
Intervention	2.9	3.1
Control	3.3	2.4

Motivation to carry out analysis of surveillance data: There was no change in the self-reported motivation to perform analysis of surveillance data among the intervention respondents following the IDSR intervention package, with majority (73.0%) stating they were motivated to perform such analysis (Table 9). In contrast, the self-reported motivation to perform analysis dropped from 70.0% at baseline to 56.7% at follow-up among control respondents.

Table 9: Motivation to Perform Analysis

Question	Round	Group (n)	% Agree[‡]
I am very motivated to perform analysis of surveillance data on a regular basis	Baseline	Intervention (94)	73.4
		Control (10)	70.0
	Follow-up	Intervention (73)	72.6
		Control (30)	56.7

[‡]Includes "agree" and "strongly agree."

Accordingly, the IDSR intervention package was found to have had no significant effect on the perceived motivation to carry out analysis of surveillance data, based on the treatment group x survey round interaction term (Table 10).

Table 10: Mean Score of Perceived Motivation to Perform Analysis of Surveillance Data on a Regular Basis

Group	Baseline	Follow-up
Intervention	2.9	2.9
Control	2.8	2.7

4.1.4 Use of Analyzed Surveillance Data

Perceived value of using analyzed surveillance data: There were three primary questions used to assess the perceived use of analyzed surveillance data, with respondents answering with a four-level Likert scale response from "never used" to "always used" to statements on the various uses of such data (Table 11). There was a significant increase (X^2 = 19.26; *P-value* < 0.001) in the proportion of respondents in the intervention group that stated surveillance data were used to assess the performance of health facilities in prevention of priority infectious diseases from baseline (68.8%) to follow-up (95.9%). However, the proportion of control respondents who answered that the data were used for this purpose was unchanged from baseline (90.0%) to follow-up (74.%) (X^2 = 1.10; *P-value* = 0.2937). There were no significant changes in the proportion of respondents regarding the use of surveillance data to plan actions for preventing and controlling infectious diseases or for planning and ordering drugs and supplies needed for the surveillance and response to infectious diseases between baseline and control for both treatment groups.

Table 11: Use of Surveillance Data

Group	Round	Group (n)	% Used‡
How often are surveillance data routinely used by the CHMT to identify the performance of health facilities in the prevention and control of priority infectious diseases?	Baseline	Intervention (93)	68.8
		Control (10)	90.0
	Follow-up	Intervention (73)	95.9
		Control (31)	74.2
How often are surveillance data routinely used by the CHMT to plan actions for preventing and controlling infectious diseases in your district?	Baseline	Intervention (93)	85.0
		Control (10)	90.0
	Follow-up	Intervention (71)	83.1
		Control (30)	76.7
How much are surveillance data used for planning and ordering drugs and supplies needed for the surveillance and response to infectious diseases?	Baseline	Intervention (93)	82.8
		Control (10)	100.0
	Follow-up	Intervention (71)	85.9
		Control (30)	83.3

‡includes categories "used often" and "always used."

Responses to the three questions from Table 10 were averaged to form a single score measuring level of perceived value of using analyzed surveillance data [Cronbach coefficient alpha (raw) = 0.85; mean = 3.32; SD = 0.74; n = 97] (Table 10). The IDSR intervention package was found to have had no significant effect on the perceived value of using surveillance data for decision-making, based on the treatment group x survey round interaction term (*P-value* = 0.195) (Table 12).

Table 12: Mean Score for Index that Measures Perceived Value of Using Analyzed Surveillance Data

Group	Baseline	Follow-up
Intervention	3.3	3.4
Control	3.4	3.2

The vast majority of both intervention and control respondents agreed they were very motivated to use analyzed surveillance data, with 93.6% and 90.0% agreeing respectively (Table 13). The proportion agreeing with this statement at follow-up decreased slightly among the intervention group to 87.3% (not statistically significant), and decreased to 71.4% within the control group.

Table 13: Motivation to Use Analyzed Surveillance Data

Group	Round	Group (n)	% Agree‡
I am very motivated to use analyzed surveillance data to improve prevention and control of infectious diseases and /or improve the functioning of the surveillance system	Baseline	Intervention (94)	93.6
		Control (9)	90.0
	Follow-up	Intervention (71)	87.3
		Control (28)	71.4

‡Includes "agree" and "strongly agree."

As measured by the treatment group *x* survey round interaction term in the linear regression model, the IDSR intervention package had no significant effect (*P-value*= 0.174) on the mean score measuring motivation to use analyzed surveillance data for decision-making (Table 14).

Table 14: Mean Score on Perceived Motivation to Use Analyzed Surveillance Data to Improve Prevention and Control of Infectious Diseases and/or Improve the Functioning of the Surveillance System

Group	Baseline	Follow-up
Intervention	3.6	3.4
Control	3.7	3.0

4.2 Objective 2: In-depth Assessment of Factors that Affect Effectiveness of the Intervention Package

This section provides the results of the qualitative assessment that was carried out in two of the 12 intervention districts (Dodoma and Babati) to provide further insights on whether the intervention was effective and, if so, to examine the factors that contributed to its effectiveness. Three topics are discussed: 1) the situation before the introduction of the IDSR intervention, 2) post-intervention changes in the availability, analysis, and use of quality surveillance data at both the district and facility levels, and 3) perceptions among both district and facility respondents of the effectiveness of the intervention components.

4.2.1 Situation before the Introduction of the IDSR Interventions

Prior to the introduction of the NIMR/PHR*plus* IDSR interventions, the MOH had already set up the HMIS (known as MTUHA in Kiswahili) in the two districts. In the MTUHA system, the HFS fill a log of cases of diseases they attend. The filling of the log (referred as *MTUHA Book Number Five*) takes place daily. The information is then forwarded to the district health office, where it is compiled quarterly for the whole district and sent to the MOH.

Also prior to the NIMR/PHR*plus* IDSR interventions, there was also a disease reporting system referred to as Infectious Disease Week Ending (IDWE). This program was also operated by the MOH and sought to control infectious diseases through facilitating reporting from the health facilities. The HFS compiled reports of certain diagnosed infectious diseases in their areas which were supposed to be reported weekly under the IDWE program. It is important to note that the MOH had adopted the IDSR strategy in 1998, and in 2001 the National Guidelines for IDSR were developed. Districts and regions began reporting on IDSR priority diseases thereafter. The IDSR strategy was in place, and IDSR reporting was already happening on various levels, when the NIMR/PHR*plus* intervention began.

Staff also commented on different aspects of their clinical skills prior to the IDSR interventions. In one FGD, for example, HFS noted they had had little understanding of epidemic preparedness or how to analyze data in a way that an outbreak could be identified (early detection). Nor did they know how to respond quickly (disease surveillance and early response) to a disease outbreak should one occur, such as diarrheal outbreaks.

Staff at the health facility level also felt their diagnostic capabilities were not as good as they could be. Respondents identified a number of themes that characterized the disease detection,

reporting, and response in the two districts before the IDSR intervention was introduced. The more commonly reported themes are discussed in more detail below.

Lack of timely and accurate reporting. Poor and unreliable communication, lack of personal responsibility, and poor linkages between the district health offices and health facilities were ways in which respondents characterized the system before the introduction of the IDSR intervention activities. These problems in turn resulted in a lack of timely and accurate routine reporting. The immediate reporting of disease outbreaks, for example, was carried out only after outbreaks had already occurred (examples cited were cholera and meningitis).

A number of barriers appear to have contributed to the lack of timely and accurate reporting. One HFS participant felt that, under the old system, the reporting system was not taken seriously and that the significance of timely reporting was neither understood nor appreciated by HFS.

A CHMT participant explained that reports were not coming in from the health facilities in a timely manner. She felt that this was because the staff did not know the importance of reports being delivered on time. On the other hand, a HFS participant opined that, "*In the past, really we were not serious; even if we get these diseases I mean you just report… if it was monthly we had to report monthly.*" At this respondent's health facility, reports were prepared monthly. He felt that because of the monthly reporting format, the reports were not accurate nor could they be timely. As a point of contrast, he noted that since receiving the training, "*… right now we shall be accurate because once it occurs if it needs to be reported immediately, then we report it immediately.*"

During one FGD, several CHMT members cited problems of transport and communication before the program started. There was no possibility of using public transport in the districts, for example, which resulted in poor communication. Distance was also another problem. Reports were often delivered late; as one CHMT participant noted, "*…they had to be weekly but they were coming late.*" This same respondent went on to say, "*…but after this system, we have seen that they are weekly but they come on time because its network is somehow going on smoothly.*" Another respondent further explained that before the IDSR strengthening interventions, there was really no format that enabled staff to make a formal weekly report; there was only a quarterly format.

Lack of responsibility and clear accountability was another important barrier that was expressed among study participants. One CHMT FGD participant had this to say:

> "*The entire district as a team didn't …was not dealing with this very closely, and it didn't know that there was someone who had been chosen to prepare them. He could only prepare them and keep them, but those others were also dealing with other things. It appeared as if it was just the job of that person who was entrusted with the job, even at the centers they were mainly being filled up by the health officers. In the past the majority…it was the health officers who were completing those IDWE forms.*"

As a point of contrast, this same respondent further noted:

> "*But after this training it has helped very much; even at the centers all of them have realised that it is their responsibility. It is their responsibility even if…there is no specific person, as this person is away then it can't be prepared, everybody has to see that he has the responsibility of giving the required report. Also even here at the district, right now if you ask about the district team, everybody can explain to you*

quite well how these diseases and their reports are being followed up... and there is also a focal person."

Poor record keeping also characterized the previous system. This in turn contributed to the lack of timely and accurate reporting. During one FGD with HFS members, participants briefly described their "Cabinet File System," which was apparently very slow, cumbersome, and not too systematic. "*We were sorting the data, one-two, one-two,*" one member noted. "*It [the system] was bothering us very much,*" another concluded. "*Formerly we didn't have…particularly about its use; sometimes these reports were not systematic,*" another person observed. Thus, prior to the introduction of the IDSR system, the routine reporting process (the MTUHA system) appears to have been cumbersome, costly, difficult to maintain, and with little accountability, motivation, or structure to ensure that reports came in a timely fashion. (It is important to note that the IDSR system did not replace MTUHA system. Rather, the IDSR system is meant to complement the MTUHA system.)

A lack of accuracy in reporting the correct diagnosis. Many respondents commented on the inability of staff to accurately diagnose and report the correct diagnosis. Lack of consistent and accurate use of standard case definitions leads to surveillance data of questionable quality and meaning. This was seen as a big problem at all levels. The example below highlights the reporting of plague and tetanus.

> *Therefore it [IDSR interventions] is helping us even in the correction of errors, because it was … even if it had mistakes, it could perhaps happen even in the village that they perhaps wrote …he wrote 'tetanus' or he wrote 'plague,' that there is plague (tauni) but you would be surprised because they were just sending it because it had to be sent, that's all. But right now it has to be checked to see if what has been written there is true, that it is true that there is tetanus here. Is he really having tetanus or is it really plague?"*

This same respondent notes a clear contrast following the introduction of the IDSR system:

> *"Now you have to make sure that it is correct or not correct. But at that time there was nothing like that, but at that time even if the report had mistakes, because at that time you had only to fill in zero, zero, he could put one (zero) without expecting, and even we at the district office couldn't discover that mistake, but when it was taken to the regional office, it was discovered that we had this case, then we became surprised, what is this. But at present we are following up very closely, everybody is following up closely because there is a district team."*

This theme echoed among other respondents in both districts, and there was a general consensus that data reporting accuracy dramatically improved after the IDSR intervention training.

Poor utilization of collected information. Especially at the health facility level, before the intervention, there was little awareness of how or even why collected information should be used among respondents. One HFS participant could not understand the purpose of the reports they were supposed to send: "*We send it, after sending it to them, then it became as if the purpose of those reports were not for the purpose of the users [here] …*" Another theme expressed during FGDs was the lack of ownership or personal connection with the information being gathered. One HFS member reported:

> *"…Even that about data analysis, in past even if they managed to deliver them, people at the centres felt as if it was a report for the district office only… But we didn't see that they were reports or data that were helping us here, in checking our situation…"*

Before the program started, another CHMT staff member noted, reports from the district and health centers appeared as though they only came from certain individuals. He further noted that this task was designated to just a small number of people who would prepare them and keep the information, usually the health officers. He contrasted this situation with the present circumstances.

One hospital staff member in charge of analyzing data did, however, note that even before the IDSR system was introduced, he regularly analyzed the data from the MTUHA system. He attributed this practice to the training that he had received in college. He noted, *"…You know, I have read it [data] even before [the IDSR data analysis system]."* When the researcher asked where he had read it, he responded, *"In the college…we were reading research so often…there was this one too."* This respondent was referring to the trend charts produced by the IDSR system, which he had apparently learned to analyze in college.

Acute staff shortages. The issue of chronic staff shortages resulting in heavy workloads came up in both CHMT and HFS FGDs. The burden of heavy workloads among staff is viewed as a primary barrier to accurate and timely record keeping. In Dodoma Rural, for instance, CHMT staff noted an acute staff shortage of nearly 50 percent. One staff member (who recorded data at a hospital) cited patient load as a significant factor preventing accurate and complete record keeping and data analysis. He would compare what was recorded in the record books against his observations of patients being seen and would note discrepancies. When initially asked why this was so, this respondent cited "laziness." After further reflection, he ruled out the record-keeping process, which he described as "simple."

When asked what an average staff workload might be on any given day, this respondent also mentioned that it was sometimes as many as 50 patients. He also pointed out that staff have many responsibilities, where they have to write MTUHA details, treat patients, fill in insurance paperwork, and track down medicines and medicine history on individual patients (which can be quite time-consuming). The following statement summarizes this situation:

> *"So all these, you alone have to assist them, so you should, here we are only four clinical officers, so you find that there are so many patients beyond our capacity."*

Another hospital staff member explained that where he works they have no days off and when they return to the office from their clinical duties they are quite tired. Analysis of surveillance data can be curtailed or is not carried out as a result.

Other concerns. Other concerns raised by participants actually describe in more detail the situation before the NIMR/PHR*plus* IDSR intervention was implemented. Common themes included no IDSR training or motivation for staff and little involvement of other stakeholders (such as community leaders and traditional healers) in the early detection and reporting of disease.

Other participants mentioned the lack of working tools, such as guidelines, reporting forms, and computer hardware and software, or no opportunity for radio calls. (Noteworthy is that the lack of working tools appeared to be an ongoing concern even at the time this research was carried out, particularly with the shortage of resources needed to increase the opportunity for radio calls).

4.2.2 Changes in Data Availability, Analysis, and Response at the District Level

In the two districts in which this research was carried out, it was reported that, in general, the IDSR intervention has greatly improved the situation with regards to disease detection, reporting, analysis, and response.

Availability of quality surveillance data. District-level participants noted that there was great improvement in getting weekly and monthly reports on time from the health facilities. Respondents at the district level also said that the completeness and overall quality of the reports had improved. It was also reported that all health facilities made sure to submit their weekly and monthly reports to their districts without missing reports. Each district had developed a system of recording the day the weekly or monthly report was received from each health facility. This information was charted and displayed on the wall in the offices of the district health officer (DHO) or district medical officer (DMO). The health workers in charge of the health facilities were given immediate feedback when they brought their reports if their reports were on time or late. The researchers saw the report submitting charts displayed in the offices of the DHO in Dodoma Rural and DMO in Babati.

DHOs were reported to have initiated a system of using incentives to encourage health facilities that submitted their reports on time. For example, in Babati, each HFS was given 2,000/- Tanzanian shillings (equivalent to 2 US dollars) each time they submitted their weekly reports to the district health office. It was reported that, due to the increased costs of transport and accommodation, this amount had been reviewed and raised to 5,000/- Tanzanian shillings.

As a way of encouraging timely reporting, the DHOs have written congratulatory letters to the health facilities that have consistently submitted their weekly or monthly reports in time. The HFS said that these letters have motivated them to make sure that they continue to submit their reports on time. The HFS who had submitted their weekly or monthly reports late have also received written letters from the DHOs encouraging them to make sure that they submit their reports on time. This practice of writing congratulatory letters is not an explicit NIMR/PHRplus intervention activity, but seems to have arisen from the broader strategy of encouraging more active participation among HFS (a stated expectation of the IDSR training program according to district-level staff).

Analysis of surveillance data. In Babati, the same person charged with handling MTUHA data also handled IDSR data. In Dodoma Rural there was a specific person who handled the IDSR data and another person who handled the MTUHA data. Both data analysts from Dodoma Rural said that they worked very closely together in compiling and analyzing the data. Different types of analysis were being carried out by these analysts. These included outpatient department priority disease monthly reports, annual reports, and summary reports that were produced by the IDSR software. One data person noted that he did analysis to review the trends of priority diseases (he mentioned malaria, pneumonia, and diarrhea); however, a number of barriers existed making dissemination of the information a challenge. At the time of the interview he was not able to produce reports because he did not have an operating printer and it was problematic for him to print out reports on other computers because he had no spare diskettes (which were initially provided to him by NIMR/PHR*plus*) to transfer the information. The data recorder at one of the district hospitals noted that he produced a weekly chart tracking the malaria cases for patients under five years of age and five years of age and older.

Use of surveillance data. The districts have shown that they are comfortable in using the surveillance data for the early detection of suspected epidemics and prompting early investigation and response. For example, Dodoma Rural staff reported that toward the end of the year 2004, there were

many cases of dog bites in one area of the district. This prompted the district health authorities to take appropriate action to prevent a possible outbreak of rabies. Dodoma Rural CHMT members said that the high number of cases of dog bites were captured in the data analysis conducted by the IDSR data analyst. This finding was discussed at a CHMT meeting and referred to the district planning meeting that is attended by the district commissioner. Participants at that meeting (also attended by members of other departments such as education, agriculture, and veterinary) decided that the veterinary department should conduct a campaign to vaccinate dogs in the area. Respondents who cited the story felt that the campaign was conducted successfully and there was no outbreak of rabies.

In other instances, the district health department has cooperated with the water supply department to work out plans for preventing cholera outbreaks, especially during the rainy seasons. Respondents pointed out that the IDSR interventions have facilitated a combined approach to disease control by the different departments in the districts.

CHMTs also used surveillance data for ranking and priority setting. This was done at the CHMT meetings after reviewing the disease prevalence analyses prepared by the IDSR data person. For example, one CHMT member in Dodoma Rural said:

> *"We bring [the analysis report] to the CHMT meeting and read it. We also look at the annual trends…how it is compared to the past year. We see where we need to put more effort depending on the data we have…we can see if in one place there is an increased prevalence of a certain disease"*

Disease surveillance data has also been used by the pharmacy departments in the districts to order and stockpile drugs for diseases that are common in certain periods of the year. For example, since malaria cases have been seen to increase during the rainy season, the district pharmacists make sure that there are enough malaria drugs during that time.

The CHMT members also pointed out that their districts have allocated money for disease surveillance activities. For example, in Dodoma Rural, the researchers were shown the district budget for the year July 2004 to July 2005 which contained an item allocation for money for disease surveillance activities.

4.2.3 Changes in Data Availability, Analysis, and Response at the Facility Level

Availability of quality surveillance data. The HFS reported that the IDSR interventions had enabled them to improve the timeliness and accuracy of disease reporting. They said that, since the introduction of the IDSR interventions, the weekly and monthly reporting forms were available throughout the year. They said that they were usually given enough forms for the whole year when they took the reports to their district headquarters. The HFS said that the availability of forms had enabled them to compile and report cases of the priority diseases accurately.

Many HFS also said that in the past they thought that, if there were no cases of certain diseases in their area, then there was no need of reporting to the district headquarters. However, since the introduction of the IDSR interventions, they had learned that even zero cases are important to report, as they are equally important in disease surveillance. They said that currently they included reports of zero cases in their monthly reports to the districts.

Districts have invented their own ways of facilitating the reporting of the priority diseases from the health facilities. For example, in Dodoma Rural, the CHMT has taken the initiative of entering into an agreement with bus operators in the routes where their health facilities are located. The bus operators have agreed to take the weekly and monthly reports from the health facilities to the district capitals for free. Staff at the health facility compile the weekly and monthly reports and give them to the bus drivers or conductors who take them to Dodoma town. The CHMT in Dodoma Rural has put up wooden boxes at bus stands where the bus drivers/conductors drop the reports. The wooden boxes (similar to postboxes) are locked using a padlock, and a designated worker from the district office fetches the reports from the bus stand every week (Mboera et al., 2005).

In Babati, it was reported that, in areas where there is a mobile phone network, health workers used mobile phones to send short message services (SMSs) summarizing the disease situation in their area. These SMSs are text messages sent via cell phones that mention the number of cases for the IDSR priority diseases (including reporting zero cases). Some HFS staff sent the weekly and monthly reports with other department staff when traveling to the district capital. For example, teachers were usually requested to take the weekly and monthly reports when traveling to their district capitals for other official or personal purposes.

Better communications and improved cooperation with community members and other stakeholders were mentioned as factors that helped improve the availability of data. Communication with the district medical office and health facilities has improved as districts have bought radio equipment to make calls for several health facilities. The respondents said that those health facilities without radio equipment used the radios of nearby health centers for reporting (traveling to nearby health facilities by bicycle). However, during the rainy season, traveling by bicycle becomes difficult, therefore disrupting the sending of reports to districts.

Study participants indicated that the IDSR intervention had encouraged the health workers to conduct outreach campaigns to educate community members on the importance of reporting disease episodes to them. During these health education sessions, they also emphasized the importance of disease prevention. One HFS said:

> "On the side of providing health education to the community, we usually educate the women when they come for the MCH clinic. We usually use the standard case definition guide to provide the education…therefore it helps the community. When they suspect that a child has severe pneumonia they take him/her quickly to the health facility…this is different from how it was in the past."

Traditional healers have also been involved in facilitating disease surveillance in the districts. The IDSR training covered techniques to mobilize key community stakeholders in the disease surveillance process at the community level. The strategy recognized community stakeholders as key in the early detection of disease outbreaks and in mobilizing resources for communicating data more quickly. For example, one health facility worker in Babati described how he had been cooperating with traditional healers in his area. He said that during the previous year he facilitated a meeting of traditional healers in his area to discuss the importance of reporting the priority IDSR diseases to his health facility. The meeting was possible through the involvement of the leaders of the association of traditional healers in the area who were instrumental in inviting their members to the meeting. During the meeting, the traditional healers discussed, among other things, the diseases that they can cure and those which they can't. It was then agreed that they should refer the diseases they can't cure to the health facility or district hospital.

Based on information obtained through HFS FGDs, key informant interviews with HFS, and observations at the health facilities visited by the researchers, it was evident that the staff-to-patient ratio is very high in all the health facilities. HFS have to cope with a high load of patients on a daily basis, and are therefore tired and keen to tend to patients as quickly as possible in order to see as many as possible. While they appreciate that certain IDSR functions, such as filling out case forms, should constitute a high priority, patients will always come first. In these circumstances, filling out the MTUHA register and IDSR case forms becomes an extra task, carried out at the end of a long work day, and mistakes are made and forms may not be completed properly. Participants commented that it is common practice for them to stay longer to carry out these additional duties, but it is an extra burden. It should be acknowledged, however, that this is a general contextual problem of the health service provision in the country. As such, a single intervention project like the NIMR/PHR*plus* IDSR intervention cannot address this issue alone. It requires a broader set of recommendations to the appropriate authorities, such as the district councils which are responsible for the resources needed to support more HFS.

Analysis of surveillance data. The HFS said that, by tabulating and plotting the case data for the different diseases in their health facilities, they were able to see the trends of the different diseases very easily. For example, some HFS in Dodoma and Babati said that they had discovered that the number of malaria cases was high during the rainy season. One FGD participant said:

> *"For example, when it reaches October, with the early rains starting, there is an area known as Gidinoti in my service area when most of the time there in an outbreak of dysentery. We were getting a lot of dysentery patients coming, but later we involved the village leadership, and when I went to inspect their homes, I discovered that those people had no latrines at their homes. When I further analysed the data I also discovered that many diarrhea cases happen in May…and in July there are many severe pneumonia cases for children under the age of five."*

Use of surveillance data. The HFS reported that by conducting simple analysis at the facilities, they were able to plan accordingly (e.g., by ordering enough drugs for malaria from the district during the rainy season). The HFS said that in the past they thought the disease reports were only being compiled to be forwarded to the districts and had no use at their health centers.

4.2.4 Implementation of the IDSR Interventions at the District Level

Data analysis software. In both districts NIMR staff members had installed the data analysis software and the appointed data persons received a two-day training in its use. The IDSR data analysts reported that the software had simplified their task of analyzing data. They said that in the past they had analyzed data manually using the "cabinet" system. During that time, data were only stored in filing cabinets and had to be take out from the cabinets and analyzed manually.

In Dodoma Rural, data managers reported that the data analysis software did not work very well, as it could not generate summary tables for the different diseases for the whole year. The software could only generate the monthly tables; thereafter, the data person had to manually compile the data for the whole year for each disease. No problems were reported for the data analysis software in Babati. Data managers in both settings, however, expressed the concern that there is more they could do with the software, but their knowledge of how to operate the system limited them from doing many of the functions. Each expressed the need for refresher training and someone to provide them with ongoing support. And, discussed earlier, printing data outputs and disseminating analysis reports has been hampered by lack of functioning printers and diskettes to transfer data files.

Training. CHMT staff attended a five-day training session. Generally, district-level respondents agreed that training met their overall expectations and felt that most activities were satisfactory. A number of training benefits were mentioned by district-level respondents. An important theme that emerged among respondents on the benefits of training was how staff learned to recognize the value and importance of the data collection process. One CHMT respondent underscored this theme in the following statement:

> *"It really awakened the situation on the collection of data for the different diseases and to be able to use them . . . not for the purpose of just going there to get medicine and to take them where they are needed, but in fact it gave me [motivation] to get those data and be able to work on them personally."*

He reflected further and felt that his view about data had changed since being trained. He explained that data are not just "theirs" (someone else's records and data), but in fact the data are important and can be useful for the individual health worker. Training apparently increased staff awareness in a number of other key areas, including the importance of working with other stakeholders and resource people in order to counter problems of infectious diseases. One CHMT participant commented that, before the training, he felt that the "job of infectious disease control" was his alone; after training, he realized that other stakeholders can also be involved. He notes, *"But in fact, you can use the community [and] do an even better job than us because we only give reports/information, but the implementers are the clinics."* Communities, he further noted, could be mobilized to assist in taking information/reports to the district offices. Patient follow-up, according to one district hospital staff member, is something he learned to appreciate after the training. He explains this view and the importance of relaying information in the following exchange:

> Respondent: *"I mean for instance an incident takes place, let's say, perhaps in the village…Where you begin [to manage the incident] and where you should end so that training instructed me very well."*
>
> Researcher: *For instance what were you told to do if such a thing happens, if an epidemic occurs there, for instance?*
>
> Respondent: *"A big example there is to relay information… You see in the past we were making mistakes, you reach a point perhaps you want to do a certain thing, for instance giving reports first then follow-up on another thing…but after being taught it was seen that it means a chain in relaying information was good, although we [now] know that if a disease occurs in most cases we have to make follow-ups, we will investigate the source, we will begin fighting it, we were making mistakes there in relaying information…"*

CHMT participants recited many examples of how IDSR data were being used. Many examples have already been highlighted in earlier sections.

Although respondents perceived the training as being very useful, a number of recommendations were provided to improve training. There was a clear consensus of respondents who felt that the amount of time for training was far too short for the amount of material covered and that refreshers are an absolute must. Several respondents noted the lack of time to revisit topics or information. Several mentioned that training should be carried out over a period of several weeks. One FGD respondent noted the following:

> *"It was somehow difficult to understand quickly, time was short. Time for those modules should be extended. Also right now even a refresher course would be welcomed."*

A hospital-based discussant also pointed out that, while the training was good, the time was too short and many participants didn't benefit as much as they could had the training been longer. Because of the reading at night, many participants felt they were not benefiting from the morning sessions since they were "*slumbering because they were so tired."* A couple of respondents felt that the amount of homework assigned was excessive. These comments came from a group who traveled nearly 20 km to and from the training site and sometimes stayed as late as 7 to 8 p.m. at the training site.

Among district-level staff, more training is needed in several key areas. Consistently, staff mentioned that they needed more training on how to analyze data. Several wanted more demonstrations, especially from laboratory staff, on proper data reporting procedures. Data collection procedures were also mentioned by hospital staff, including how to collect data, store data, send reports at the appropriate time, and how to take statistics to the community and present the results.

Supervision by district-level staff. The level of supervision carried out by CHMT staff varied greatly between the two districts. CHMT staff from one district freely discussed the fact that they were lagging behind and had not been actively carrying out any type of supervision. They were in the process of establishing a timetable, but noted that lack of resources for transport was their ongoing challenge. Staff from the hospital in this district reported having little to no direct supervision from the district. Supervisory visits typically did not include them. One participant noted:

> *"I am saying so because right now for instance we are there at MCH but we are often supposed to get supervision in order to know where we have done well and where we have gone wrong, like improvements and what, but you can stay for the whole year without seeing them."*

In the second district, CHMT staff had a regular supervision schedule in which three visits per year were made to each health facility. One CHMT staff member described what should happen during a supervisory visit at a health center:

> *"Therefore we exchange ideas with those workers at the centres, and those areas which have defects and how to rectify them. But also even during the distribution of drugs/medicines, vaccines and tools, contraceptives and other working tools, we discuss with them."*

District hospital staff from this second district discussed their supervisory experiences. After the visit, a letter is written to the facility or hospital providing feedback, which was described as being open and frank. During the visit the patient register is examined and attention is paid to the accuracy of data being gathered. Both CHMT and district hospital participants said little with regard to supervision related to IDSR activities and reported that generally IDSR issues are not specifically addressed. District hospital staff reported that sometimes supervisors would look over data reports and discuss accuracy issues, but generally supervisory visits are made by the hospital director only and do not include the staff who participated in the study.

Participants noted that in this district the DMO generally carried out the supervisory visit; however, other CHMT staff also helped out as needed.

4.2.5   Implementation of the IDSR Interventions at the Facility Level

Training. HFS participants reported that the facility-level training was very comprehensive in that it covered all the topics outlined in the training manual. There was a general agreement among participants that training had greatly improved their work performance. Many respondents said they found most of the topics easy to understand. One HFS noted during a FGD that the training helped especially in the area of statistics: "*These statistics have helped me on one thing; after analyzing them you can understand an increase in [that area] or once there has been an increase, do people increase or decrease*?" (referring to a change in disease rates).

During this same FGD several other HFS staff commented on how the training has fed into their work performance, and perhaps has improved their ability to identify and prioritize disease trends. One respondent felt that what he had learned (how to analyze data) had improved his job efficiency and had taken some of the guesswork out of ordering medicines:

> "*This [training] helps me to know the efficiency of my job... that I am doing my job well or poorly, after analyzing those statistics and even in ordering medicines, perhaps it helps me, it makes me to be certain in making orders [pharmaceutical orders] without guessing…and one staff member noted how much more serious he was about the record keeping and it took some of the guesswork out of medicine orders. ..Let's say without keeping records…So you work by guessing.*"

Another staff member felt the training had improved his ability to monitor disease trends and to develop an early response plan:

> "*It helps me at the time of analyzing those data, perhaps you may find that you have got an increase of diarrhea patients, now you have to begin thinking...If I am there at the centre I begin thinking what has caused this increase of diarrhea patients.. Then I will just know what it is. I will begin following up to know if it's water issue, perhaps water is so scarce, it is dirty. Then I begin taking a step to rectify that problem and educate residents how to boil drinking water, use latrines, and keep the surroundings [clean] in general. Then by that time I have got a way of helping me reduce that problem.*"

However, the respondents pointed out two topics that they found difficult to grasp: data analysis and action planning. Some of the respondents said that they found conducting data analysis through tabulation and plotting it on graphs difficult to understand. They said they needed more time devoted to this topic in order to understand it well. Unfortunately, when probed to elaborate on what they found difficult about the analysis, most respondents could not adequately articulate what they meant. Their statements concluded that they found the whole topic difficult and would be grateful if it were taught all over again.

[Author's note: the fact that respondents found it difficult to articulate what they found also reflects their level of comprehension. This language difficulty could be another facet of this finding and is discussed in more detail below.]

When asked how the training could be improved, all of the participants said that the time set for the training was not sufficient. They indicated that five days were not enough for them to absorb the theoretical and practical aspects of the training. They said that, as a result of the number of days allotted for covering the material, the training days were long, starting in the morning and lasting until late in the evening. They also pointed out that at the end of the day they were given homework to

complete at night to present the next day. Most respondents found this schedule to be very tiring and inhibited their ability to internalize effectively what was being taught. As described by one respondent:

> *"I was also very happy with the training. The teachers taught very well, and we understood them. But I have some comments…The time was too short…to be honest we had to do the training continuously without any rest…we were getting very tired…sometimes we were finishing the sessions at night…so that also contributed to reducing what we had gained since morning."*

The respondents proposed that the training should take two weeks. They said that they believed two weeks would be sufficient to cover all the topics without the pressure of time. They also requested refresher courses so that they would not forget what they were taught.

A few respondents said that they wished the training had been conducted in Kiswahili (the national language) to improve their comprehension. More time is needed in order for English to be translated into Kiswahili. Some respondents noted that some participants pretended that they understood what was being taught in English because they were ashamed to say that they did not follow the language very well. [Researcher's note: This may very well be why many participants are having difficulties with the analysis and interpretation aspects of the system and may be a primary inhibitor to better use of surveillance data at the facility level.] However, it should be noted that after the first group of four districts were trained (which included Dodoma Rural and Babati), the facility-level IDSR trainings were conducted in both Kiswahili and English to minimize this issue.

Additional job aids. HFS were trained to use the standard case definition (SCD) job aid, which was designed to assist staff to carry out their duties with greater efficiently and accuracy. The SCD job aid is a printed sheet listing the SCDs for the 13 priority diseases and aimed to assist clinicians to help decide if a person has a presumed disease and to exclude other optional disease diagnoses. The job aid also assists clinicians to take action for reporting and investigating quickly if the clinical diagnosis takes longer to confirm. Most respondents felt that the job aids were very useful in facilitating how they carried out their jobs. Most facility-level staff said that the SCD job aid had particularly helped them in making the correct diagnosis of illnesses. For example, some HFS said that before getting the SCD job aid they had difficulty in diagnosing measles cases. Other HFS said that before getting the SCD job aid they had difficulty in diagnosing cases of acute dysentery in children. One FGD participant in Babati said:

> *"For all the thirteen diseases we are very careful…bearing in mind that we were taught about the standard case definitions…how to recognize the thirteen diseases…there was pneumonia, severe pneumonia, non-severe pneumonia, severe malaria, non-severe malaria, severe diarrhea, non-severe diarrhea…we really understand them."*

Some HFS had photocopied the SCD forms; they either hung them on the walls or put them on their office tables to refer to. Significantly, many HFS reported that the SCD job aid was being used by other staff at their health facilities who did not attend the IDSR training.

Supportive supervision. Most HFS acknowledged the value and importance of regular supervisory visits. "*Feedback is very important*," one HFS noted. Another HFS stated why supervision is important, noting, *"It would be good because when changes take place we go with those changes. Perhaps there is a certain procedure, ministry guidelines; now we want to go with those changes."* Other HFS stated they liked getting feedback on their reporting format, analysis, how

they are constructing and analyzing graphs and charts, or how they are responding to epidemic outbreaks in their communities.

Participants reported few significant changes in how supervision visits to health facilities had been carried out since the intervention began. HFS varied according to their responses on how frequently supervisory visits occurred. Many stated they continued to receive "*supportive supervision*" visits quarterly, while at least one HFS mentioned that he had not received any supervisory visits since he completed the IDSR training in 2004. One person indicated that when he wanted feedback he would go himself to the district office to discuss his reporting process. Several staff mentioned that they had received letters of appreciation from the district level on their performance and hard work, which they appreciated. While motivational, these letters did not give the type specific feedback which staff thought could be useful to improve their performance. Sometimes staff received feedback during radio calls, but these too were very short and often focused on giving and receiving information. Supervisory visits cover many aspects and rarely did the HFS receive specific feedback on IDSR activities. Supervisors often try to cover many facilities in one day. One participant explained:

> "*It's just the same thing. We often lack time to talk with them because they often come there late. You find that you are going far so they can't stay at one centre too long… so you will just talk about light issues and then they shall leave. So we request that perhaps even just as (another respondent) there just said, it should be separated, if its supervisions they only come for a certain thing, that's all, if it's IDSR issues then it's only IDSR issues.*"

This respondent also suggested that IDSR visits be considered separately. Several other HFS respondents felt the same way. Respondents also suggested that a timetable would enable staff to plan for and anticipate supervisory visits:

> "*So really it comes without a good plan which we should work on it…So once they arrive there it's already night and they are just in a hurry, we don't get even time perhaps to discuss with them other problems which we have…*"

HFS offered some suggestions for improving the supervisory process. Many expressed the sentiment that they wished they could get more time with their supervisors during the visits in order to discuss specific issues related to the IDSR system. Many wished they could have more visits from the IDSR training staff to provide additional on-the-job supervision and training in the areas initially covered by the IDSR training.

Table 15 provides a general summary of the reported benefits, constraints, and needs of the IDSR interventions among HFS.

Table 15. HFS Benefits, Constraints, and Needs related to the IDSR Intervention

Benefits	Constraints	Needs
▲ More knowledge of disease reporting requirements ▲ Increased ability in disease diagnosis (use of standard case definitions) ▲ Improved ability to analyze data and respond accordingly ▲ Increased outbreak preparedness due to analysis of disease trends ▲ Motivated by training and availability of support tools (e.g., job aids, reporting forms) ▲ Appreciation of a holistic approach to disease detection, reporting, and response ▲ Appreciation of the need of involving other actors (e.g., community members and leaders)	▲ High case load ▲ Weak supportive supervision ▲ Lack of incentives ▲ Weak link with other actors such as traditional healers	▲ Refresher training ▲ Reduced information – need pressure from upper cadres through integration ▲ Strengthened collaboration with other actors such as welfare organizations, legal institutions, and nongovernmental organizations

5. Discussion

5.1 Perceived Effectiveness of the Intervention Package

This section summarizes the results that address the major themes that are the focus of the study: 1) was the NIMR/PHR*plus* IDSR intervention package successfully implemented?; 2) did the expected improvements in analysis and response occur after implementation of the intervention package?; and 3) to what extent did the package of interventions contribute to resultant improvements in analysis and response? Table 14 presents the results for the seven primary indicators that are intended to help answer these questions.

1. **Was the job aid intervention package successfully implemented, and did it function as intended?**

The following five components making up the IDSR intervention package were implemented within the 12 intervention districts with varying degrees of success: 1) IDSR training for facility and district-level staff; 2) minimum standards for analysis and response; 3) tools for IDSR data management and analysis (database); 4) a job aid for IDSR data interpretation (interpretation guide); and 5) guidance of feedback mechanisms. More than three-quarters of respondents within intervention districts reported receiving the IDSR training (86.8%) and IDSR database (77.6%). However, only 57.0% stated their district had received the analysis standards, while only 61.9% stated their district had received the interpretation guidelines. These data suggest there is a gap, at least in perception, between knowledge of the above-mentioned components by district epidemiology staff and the full (100%) coverage the intervention was intended to have across all 12 intervention districts. The lack of full coverage by the intervention package, whether real or in perception, may have limited the effectiveness of the intervention package on analysis and response as measured from the questionnaire designed to ascertain self-reported information.

2. **Did the expected improvements in analysis and response occur after implementation of the job aid intervention package?**

Overall, there was limited evidence that the expected improvements in analysis and response occurred after the implementation of the IDSR intervention package. While the point estimates did move in the desired directions, there was no significant increase in the mean score of the index measuring perceived availability of quality surveillance data, as well perceived capacity to perform data analysis. In fact, the proportion of respondents who stated they agreed to the specific question of "I feel fully capable of carrying out specified analysis of IDSR data" did not change significantly between baseline and follow-up (76.6% vs. 74.3%) (no significant difference). The proportion of respondent from the intervention districts who stated they were motivated to perform analysis of IDSR data remained unchanged from baseline (73.4%) to follow-up (72.6%). Further, the proportion of respondents within the intervention districts who stated they were motivated to use analyzed IDSR data for decision-making actually decreased slightly (not significant) between baseline (93.6%) and follow-up (87.3%). Similarly, the mean score measuring perceived value of using analyzed IDSR data for decision-making remained unchanged between baseline and follow-up.

There are several possible explanations as to why the expected improvements in analysis and response were not observed following the implementation of the IDSR intervention package. First, there may have been a lack of understanding and knowledge about the intervention among some of the IDSR staff within the intervention districts. This is supported by the fact that only a little over half (65.6%) stated they themselves received the training on the intervention package. Additionally, only 57.9% stated their district had received the analysis standards, and only 61.9% stated their district received the data interpretation guide. Again, even if these components were present, 40-50% didn't know about them post-intervention. One possible explanation for this result relates to staff turnover. It is plausible that the respondents weren't the ones who received the training and to whom the analysis standards and data interpretation guides were given. Second, the time between the roll-out of the intervention package and the time of follow-up survey was only 4-6 months. As changes in behavior and perceptions can take considerable time to actualize and be measured by a questionnaire, there may have been insufficient time between the implementation of the intervention and the follow-up data collection to capture any resultant changes.

5.1.1   Resultant Improvements in Analysis and Response?

There was little consistent evidence from the quantitative analysis to suggest that the IDSR intervention package was responsible for any of the modest improvements in analysis. Table 16 provides a summary of the analysis of the primary indicators for measuring program effectiveness and impact. While point estimates did move in desired directions (i.e., they were all positive), there were only two instances where the treatment group x survey round interaction terms were significant, suggesting the intervention package was responsible for any resultant changes. Such an impact was observed from the perception of availability and quality of surveillance data and the reported level of perceived capacity to perform analysis. However, in both instances, the primary reason for the significance of the interaction term was driven by significant decreases in the scores for the indexes measuring these areas within the control districts. There were no significant increases within the intervention districts. While it may be possible that without the intervention package the proportion of respondents reporting perceived availability of surveillance data and capacity to analyze them would have also decreased, such a trend is unlikely. Rather, the decrease within the control districts was likely due to either measurement error or some level of social-desirability bias that was differential between the baseline and follow-up data collection rounds.

As indicated previously, there are several possible explanations as to why the intervention package may not have had a significant impact on analysis and response. First, there may have been a lack of understanding and knowledge about the intervention among some of the health workers within the intervention districts. Second, there may have been insufficient time between the implementation of the intervention and the follow-up data collection to capture any resultant changes and subsequent impact of the intervention. However, an analysis of respondents disaggregated by intervention districts that received the intervention package early versus late showed no consistent patterns that length of time had between the implementation and follow-data collection on the primary outcomes of interest. Thus, they may all have had insufficient lag time for the intervention to take hold. Third, high staff turnover may have masked any resultant changes in perceptions of analysis and response as only half (46.1%) of the intervention group stated at follow-up that they had participated in the baseline follow-up data collection.

Table 16: Summary Table of Primary Indicators for Measuring Program Effectiveness and Impact

Indicator (outcome)	Means of evaluating effectiveness			
	Comparison group	*Assessment method*	*Coefficients (follow-up)**	*P-Value*
Proportion of staff that agree there are written guidelines to help guide data analysis	Intervention only, Pre-post	Chi-square	0.248	0.618
Proportion of staff that agree there are written guidelines to help make use of surveillance data	Intervention only, Pre-post	Chi-square	0.692	0.405
Mean score for Likert scale questions measuring perceptions of availability and quality of surveillance data	Intervention-Control Pre-post	Linear regression	0.702	0.002
Mean score for Likert scale questions measuring reported level of perceived capability to perform analysis	Intervention-Control Pre-post	Linear regression	1.010	0.003
Mean score for Likert scale questions measuring motivation to carry out analysis	Intervention-Control Pre-post	Linear regression	0.138	0.723
Mean score for Likert scale questions measuring perceived value of using analyzed surveillance data	Intervention-Control Pre-post	Linear regression	0.374	0.195
Mean score for Likert scale questions measuring perceived motivation to use surveillance data	Intervention-Control Pre-post	Linear regression	0.469	0.174

5.2 In-depth Qualitative Assessment of Factors that Affect Effectiveness of the Intervention Package

Although the quantitative analysis offers mixed results of the effectiveness of the intervention, the qualitative analysis based on data collected in two of the 12 sample districts (Babati and Dodoma Rural) suggest that the IDSR intervention activities resulted in a number of important accomplishments. These included the following:

▲ Both district and health facility staff commented that the availability of IDSR data had greatly improved as a result the intervention. Among the reasons that were mentioned for the improvement were clearer roles and responsibilities as a result of the training and job aids, improved communications and cooperation with community members and other stakeholders, and a monetized incentive system that encourages health facilities to submit reports. The incentive system was not a part of the IDSR intervention package, and whether the system was previously in place prior to the intervention is not known.

▲ Participants have shown that they are "committed to the idea of maintaining a disease surveillance program" and have demonstrated they are looking for ways to overcome the challenges facing them.

▲ Participants have clearly stated the benefits to improving their ability to better diagnose priority diseases, respond more rapidly to disease outbreaks, and improve the medicine supply orders.

▲ Participants mentioned that it is possible to improve disease detection, reporting, and response using existing staff and within their normal routine.

- Participants mentioned that the IDSR intervention activities have enabled close working relationships between public and private health facilities, and other community stakeholders.

- Participants commented that the IDSR interventions can be integrated into the district health activities and can be taken up by the district councils (some of which have already committed funds for such activities).

- Staff members report that they have been motivated to take up the IDSR intervention and have been eager to implement it at all levels.

Despite the successes of the IDSR interventions, many challenges remain. The results of the qualitative analysis suggest that the following points will need to be addressed if the IDSR strengthening program is to be implemented successfully in other parts of the country and sustained in the existing districts:

- The need to integrate information requests through the HMIS. This will reduce the pressure of information requests at the facility level, where so much information is requested by the different health programs (e.g., the National Malaria Control Program, the National AIDS Control Program, and the National Tuberculosis and Leprosy Control Program).

- The need to further improve communication between health facilities and district health offices (e.g., ensuring that all health facilities have a functioning radio call or regular access to radio calls in other facilities; in Dodoma Rural only 19 of the 81 health facilities had a radio call).

- Increased capacity for the diagnostic laboratories at the facility and district levels in order to confirm cases of priority infectious diseases. This is currently a significant barrier that will prevent optimal response to disease outbreaks within the district. Samples need to be sent to the regional and referral hospitals, and this may impair response, as health staff remain unsure of the disease in question.

- Unfortunately, due to past and current experiences of other project activities, staff expect payments for taking part in activities, even those related to their work. In many parts of the country there appears to have developed an expectation that staff are to be paid for work associated with projects. This may present a problem as NIMR/PHR*plus* IDSR strengthening activities are scaled up to other districts.

- The need to prioritize and continue funding. To maintain IDSR system functioning, it is essential that districts prioritize surveillance activities and continue to allocate sufficient funds for disease surveillance activities.

- The need to encourage continued cooperation with other IDSR stakeholders (e.g., religious or community leaders).

- Training effectiveness and future training needs. There will need to be refresher courses that cover all aspects of the IDSR training content, but especially information about diseases and how to analyze and interpret data. Data managers will need training on use of Excel for analyzing and generating data reports and ongoing technical support for the IDSR database. This is particularly true given high staff turnover.

- ▲ There is a continued need to build and maintain organizational capacity. It is possible to improve disease detection, reporting, and response using existing staff and within their normal routine; however, chronic staff shortages will continue to plague the effective maintenance of the IDSR system. It is vital to recruit/train new staff members (training for redundancy) and conduct regular refresher trainings as one effort to address the shortage issue.

- ▲ Integration is essential to ensure sustainability. It has been demonstrated that the IDSR interventions can be integrated into the district health activities and be taken up by the district councils, some of which have already committed funds for such activities. Several participants strongly recommended that there be a focused effort, however, to further integrate the IDSR and MTUHA and other data requests into one system in order to minimize the workload of staff at the facility and district level. While the IDSR strategy uses the MTUHA tool to capture primary data for routine reporting, the existing MTUHA system is not sufficient to meet all of the IDSR program needs. This action, however, will require working with the HMIS section at the national level.

- ▲ Supervision and feedback are clearly in need of improvement, especially in one of the two districts. Supervision has to be seen as a priority, and steps taken so that supervisors can spend more time with staff, with focused goals and objectives. Supervision has to be somewhat reflexive to the needs of staff that want feedback and are willing to identify deficiencies and performance areas they feel they need help with. IDSR activities need to be more fully integrated into the current supervisory system.

5.3   Study Limitations

There were a number of limitations to the study design.

First, as previously described, and depicted in Annex A, the intervention package was implemented within the 12 intervention districts with a staggered design. While four of the intervention districts (Babati, Mbulu, Dodoma Rural, and Mpwapwa) received their training by April 2004 and the minimum standards for analysis and response by September 2004, four of the remaining districts (Igunga, Tabora, Muleba, and Mwanza) did not receive district-level training until September/October 2004, with the minimum standards for analysis and response following in early 2005. Abbreviated facility-level trainings were held in these four districts in January 2005. The remaining four districts (Masasi, Tunduru, Nkasi, and Sumbawanga) received the training and minimum standards for analysis and response between these two time points. The follow-up data collection round was carried out in the period May to June 2005, which only allowed approximately four months between the introduction of all IDSR strengthening tools/job aids and data collection in the last group of four districts. This decision to carry out the follow-up survey so soon after the introduction of the intervention was due to reasons outside of the control of the researchers. The limited time interval is important because the intervention did not have much time to take hold, especially as measured by a survey questionnaire that is intended to measure attitudes and behaviors.

Second, the research design does not capture objective measures of changes key to the performance of the IDSR strategy but rather changes in perceptions of the value of surveillance data, motivation to analyze and interpret data, and perceived self-efficacy. The decision to focus on perceptions and motivation was based on the premise that improvements in how district and health facility staff value information and in their capacity are necessary in order to improve IDSR performance. In a separate study focused on monitoring and evaluation, Gueye, Banke, and Mmbuji

(2006) assessed changes in IDSR reporting, data quality, quality of investigation and response, and system functioning after implementation of the NIMR/PHR*plus* IDSR strengthening intervention package.

Third, the qualitative component of the evaluation relied on reported information, and as such, may have yielded over- or under-reporting of the information sought. It is well documented that there is always a validity issue with methodologies relying on self reports (see, for example, Plummer et al. 2004). Nevertheless, the methodologies used for this evaluation and sampling procedures strove to ensure that data collected were as valid and representative as possible.

6. Conclusions

- Some components of the intervention package, including the training, the IDSR data management database, and the guidance of feedback mechanisms, were successfully implemented in the 12 intervention districts primarily as intended. However, responses from the questionnaire indicate the analysis standards and interpretation guide were implemented only partially.

- Overall, there is limited quantitative evidence that suggests that the IDSR intervention led to improvements in perceived availability of quality data, capacity to perform data analysis, motivation to perform data analysis, motivation to use analyzed data, and perceived value of analyzed data. However, regarding the perceived availability of data, the qualitative analysis provides conflicting evidence, as participants from the two districts that were first exposed to the intervention mentioned improvements in the availability of data through improved timeliness of submitting reports, and in the analysis of data.

- The limited time between the introduction of many components of the intervention and the follow-up survey may have an important explanation for why the expected improvements in perceived capacity and motivation were not evident in the data.

- There exist several barriers that operate at the health systems level that adversely affected the effectiveness of the intervention in influencing the availability of data, analysis, and response. These include: overburdened HFS; poor communication; poor laboratory capacity; poor incentives; poor organizational capacity; and insufficient financial resources.

- Among the suggestions to improve the effectiveness of the IDSR intervention in the future include: enhance the training modules that focus on the analysis of data; continue to conduct the training in Kiswahili as well as English in order to improve comprehension, particularly at the facility level; provide frequent refresher courses; improve capacity to use spreadsheet software (Excel) among district staff responsible for data entry and analysis; ensure that working computers and printers are available; and clarify the understanding of supervisory roles and responsibilities.

Annex A: Timeline of Key IDSR Intervention Activities in Tanzania by District

Activities	Project Districts												Control districts	
	Babati	Mbulu	Dodoma Rural	Mpwapwa	Masasi	Tunduru	Nkasi	Sumbawanga R	Igunga	Tabora U	Muleba	Mwanza U	Ilala	Hanang
Orientation to IDSR	May-03	May-03	May-03	May-03	May-03	May-03	May-03	May-03	May-03	May-03	May-03	May-03		
Epidemic preparedness planning	Aug-03	Aug-03	Aug-03	Aug-03	Aug-03	Aug-03	Aug-03	Aug-03	Aug-03	Aug-03	Aug-03	Aug-03		
M&E baseline	Jan/Feb 2004	Jan/Feb 2004	Jan/Feb 2004	Jan/Feb 2004	Feb/Mar 2004	Feb/Mar 2004	Feb/Mar 2004	Feb/Mar 2004	Feb/Mar 2004	Feb/Mar 2004	Feb/Mar 2004	Feb/Mar 2004		
M&E 2nd round	May-05	May-05	May-05	May-05	May-05	May-05	May-05	May-05	May-05	May-05	May-05	May-05		
District training	Feb-04	Feb-04	Feb-04	Feb-04	Jul-04	Jul-04	Jul-04	Jul-04	Sep-04	Sep-04	Sep-04	Sep-04		
Facility training	Apr-04	Apr-04	Apr-04	Apr-04	Aug-04	Aug-04	Aug-04	Aug-04	Jan-05	Jan-05	Jan-05	Jan-05		
A&R baseline qualitative		Mar-05	Mar-05						Mar-05		Mar-05		Mar-05	Mar-05
A&R baseline quantitative	Feb-Mar 2004	Feb-Mar 2004	Feb-Mar 2004	Feb-Mar 2004	Feb-Mar 2004	Feb-Mar 2004	Feb-Mar 2004	Feb-Mar 2004	Feb-Mar 2004	Feb-Mar 2004	Feb-Mar 2004	Feb-Mar 2004	Aug-04	Aug-04
A&R 2nd round qualitative		May-05	May-05						May-05		May-05		May-05	May-05
A&R 2nd round quantitative		May-05	May-05						May-05		May-05		May-05	May-05
Costing baseline		Aug-04	Aug-04						Aug-04		Aug-04		Aug-04	Aug-04
Costing 2nd round		May-05	May-05						May-05		May-05		May-05	May-05
Community linkages				May-04										

District strengthening activities**														
A&R (min. stds, database, etc.)	Feb-05	Feb-05	Feb-05	Feb-05	Feb-05	Feb-05	Feb-05	Feb-05	Mar-05	Mar-05	Mar-05	Mar-05		
First district quarterly meeting	Jul-04	Jul-04	Jul-04	Jul-04	Feb-05	Feb-05	Feb-05	Feb-05	Jul-05	Jul-05	Jul-05	Jul-05		

*See summary table for district strengthening activities (includes A&R minimum standards, district database/analysis software, interpretation tool, feedback newsletters, supervision checklist, guide to process/development of district quarterly meetings (DQMs), DQM agenda template, documentation on outbreak mgmt/response, and documentation of communications/transport issues).

Please note that NIMR and PHRplus are working to develop more detailed timelines for the District Strengthening activities. Timeframes in this table are an estimate but not final.

Annex B: References

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