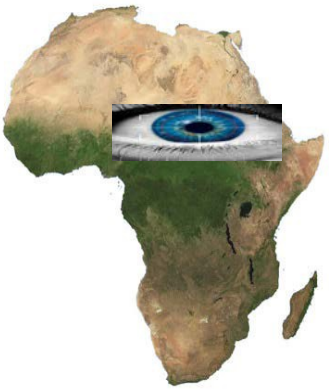
UNIVERSITY OF SOUTHERN DENMARK

PhD Thesis



ASSESSMENT OF COMMUNICABLE DISEASES SURVEILLANCE SYSTEM IN KHARTOUM STATE, SUDAN

2005 - 2007

Dr. NAGLA HASHIM SAHAL Unit

for Health Promotion Research

Faculty of Health Sciences
University of Southern Denmark

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DEDICATION

This thesis would be incomplete without a mention of the support given me by my husband Mohamed who kept my spirits up. Without his lifting me up, I doubt it should ever have been completed.

I dedicate my thesis to my parents and brothers who have supported me all the way since the beginning of my studies as well as to my new baby Ahmed.

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ABSTRACT

Background: Surveillance of infectious diseases is recognized as the cornerstone of public health decision-making and practice. The aim of the evaluation of communicable diseases surveillance systems (CDSS) is to ensuring that these diseases are monitored efficiently and effectively.

Methods:

A descriptive, retrospective and cross-sectional study was conducted to assess the core activities and supportive functions as well as their quality in filling in the World Health Organization (WHO) criteria of the CDSS. The data were gathered in Khartoum state, Sudan, for the period from 2005 to 2007. Data were gathered by quantitative records review as well as qualitative personal and focus group interviews of the CDSS staff from all the epidemiological units (N = 177) at all the levels, the state (n=1), locality (n=7), and health area (n=19), and health facilities (n=150) participating in the CDSS in Khartoum state. In addition, a Delphi consensus process among relevant stakeholders (n=50) in Khartoum state was carried out to study the feasibility of the recommendations made based on the study findings. Further, a literature review of studies published in English in PubMed and data bases of the WHO, and Center of Diseases Control (CDC) from 1981 to 2007 was undertaken to summarize the studies on CDSS both in developed and developing countries.

Results:

The Khartoum CDSS core activities and supportive functions such as the knowledge of the system was found to be 100% at all levels; data reporting was above the recommended standard of 80% at all levels; data analysis, epidemic preparedness and feedback were below the recommended standard. All assigned CDSS staff members were trained, but lower CDSS levels lacked modern technologies for data reporting and data analysis. CDSS system in Khartoum state is centralized; moreover, the system has not been updated, it is poorly documented and has shortage of staff at lower levels**.**

The qualitative focus groups and individual interviews gave explanations for the barriers in delivering high quality CDSS. The quality of CDSS was seen as poor because the system was not

representative: it included neither the private, the military sector nor the important teaching hospitals; it also lacked timeliness due to poor documentation in receiving and sending CDSS reports; it was only partially flexible since it did not rapidly respond to emerging and re-emerging diseases such as SARS and avian flu in its notification lists; and in addition, it did not use the data collected to apply intervention for control and prevention of communicable diseases on a routine basis**.**

In the Delphi study, the stakeholders in Khartoum state agreed with most of the recommendations made based on the study results on the CDSS quality. The existing CDSS in Khartoum state needs to be strengthened with more effective coordination at different levels**.**

The literature review of 32 studies (20 from developed and 12 from developing countries) showed that both developed and developing countries faced difficulties in their CDSS. Studies from the developed countries have been analyzed based on the quality of the system alone. In developing countries, most of the studies have been on the integrated diseases surveillance (IDSR) and have been performed shortly after the adoption of the IDSR. Thus it might be too early to make a fair evaluation of them. Some parts of the system were over-centralized, while some lacked private health sector involvement. Further, parts of the system were affected by conflicts and civil wars which are common problems in developing countries.

Conclusion:

The Ministry of Health in Khartoum state can implement the developed consensus recommendations to improve the CDSS system in the future. Unless a rapid and strong intervention is carried out to improve its quality, the system will not achieve its targeted goals. The sub-studies also showed the usefulness of developing and applying qualitative research methods among the CDSS staff and decision makers to increase understanding of the facilitators and barriers as well as increase ownership in the improvement of the CDSS systems.

Key words: Khartoum, CDSS, core activities, supportive functions, quality, stakeholders

LIST OF ORIGINAL PUBLICATIONS

1. Sahal N, Reintjes R and Aro AR. Communicable diseases surveillance lessons learned from developed and developing countries: Literature review. Scandinavian Journal of Public Health 2009; 37(2):187- 200.

2. Sahal N, Reintjes R, Mahgoub AE, Aro AR. Assessment of core activities and supportive functions of the communicable diseases surveillance system in Khartoum state, Sudan for the years 2005 – 2007. Eastern Mediterranean Journal of Health 2010;16(12):1204-1210.

3. Sahal N, Reintjes R, Mahgoub AE, Aro AR. Staff views about the quality of the communicable diseases surveillance system in Khartoum state, Sudan 2005 – 2007, as an example of developing countries. Eastern Mediterranean Journal of Health. 2011;17(7): 565-569.

4. Sahal N, Reintjes R, Mahgoub AE, Aro AR. Feasibility of implementing recommendations to improve communicable diseases surveillance system in Khartoum state- A modified Delphi study among stakeholders. African Health Sciences Journal 2011 ;11(1): 593-599.

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ABBREVIATIONS

AIDS	Acquired Immuno-Deficiency Syndrome
ARIs	Acute Respiratory Infection
CD	Communicable Diseases
CDC	Center of Diseases Control
CDSS	Communicable Diseases Surveillance Syste m
CIFs	Case Investigation Forms
HMIS	Health Management Information System
IDSR	Integrated Disease Surveillance and Respo nse
NGOs	Non Governmental Organization
PHC	Primary Health Care
SARS	Severe Acute Respiratory Syndrome
STIs	Sexually Transmitted Infections
TB	Tuberculosis
USA	United State of America
WHO	World Health Organization
WHO AFRO	World Health Organization - African Regi onal Office

1. INTRODUCTION

Communicable diseases are the leading cause of morbidity and mortality in Khartoum State, Sudan. Malaria, meningococcal meningitis, acute watery diarrhea, measles, acute respiratory infection (ARIs), tuberculosis (TB), typhoid fever and bloody diarrhea have a huge burden (1). Khartoum State, belonging to the African Meningitis belt, is used to suffer from widespread epidemics that recur every 8-10 years. Moreover, other emerging and re-emerging diseases continue to constitute a real threat in the State such as leishmaniasis, dengue fever and yellow fever (2).

Surveillance of infectious diseases is recognized as the cornerstone of public health decision-making and practice. Surveillance data are crucial for monitoring the health status of the population, detecting diseases and triggering action to prevent further illness, and to contain public health problems. The need to strengthen disease surveillance and response system is recognized globally (3). A well functioning disease surveillance system provides information for planning, implementation, monitoring and evaluation of public health intervention programmes. Early warning of epidemics is essential for effective and rapid control, while information on endemic communicable diseases is essential for monitoring the disease. Many countries have developed surveillance capacities to monitor diseases with a high burden, to detect outbreaks of epidemic-prone diseases and to monitor progress towards national or international control or eradication targets. In this sense, surveillance of communicable diseases is a national function (4).

In many countries, studies have been carried out to assess the communicable diseases surveillance system (5-11). The systems in most African countries are still facing major problems in core and supportive functions. Some of the systems are still over-centralized, especially in data analysis, interpretation and decision-making, while some lack private health sector involvement in

Communicable Diseases Surveillance System (CDSS). On the other hand, also developed countries face some problems regarding their surveillance systems.

In Sudan, Communicable Disease Surveillance in Khartoum State is part of the National Surveillance System which was launched in 1994, with the following objectives:

- To monitor disease trends so that planning can be adjusted to meet new situations;
- To identify, investigate and help to control outbreaks or epidemics;
- To identify specific population groups at high risk of illness or death from priority diseases;
- To evaluate the impact of preventive and curative control activities on the incidence of priority diseases in the community;
- To confirm current priorities among disease control activities.

The Sudanese system placed emphasis only on malaria with weekly notification from all health facilities using radio stations (n = 107). In January 1999 the system was changed to sentinel sites surveillance which started with 76 sentinel sites, and subsequently increased to 100 sentinel sites in 2002; 125 sentinel sites in 2003 and 150 sentinel sites in 2004, which included 24 hospitals, 91 health centers and dispensaries and 35 Non Governmental Organization (NGO) clinics. The system depends on the passive surveillance system for communicable diseases which subsequently changes to active surveillance system during epidemics or outbreaks. Certain communicable diseases such as HIV/ADIS, STDs and tuberculosis, have separate systems for surveillance outside the integrated communicable diseases surveillance system. This leads to overlapping between the systems and waste of recourses.

Diseases under surveillance are those which are relatively important based on criteria such as: incidence, mortality, disability, epidemic potential and International Health Regulations requirements. Diseases under surveillance (**List A)** are diseases for immediate notification (i.e.

Within24 hours). These include cholera (acute watery diarrhea), poliomyelitis (acute flaccid paralysis)**,** plague, epidemic typhus, yellow fever, hemorrhagic fevers, and neonatal tetanus. **List B** includes the diseases for weekly notification, which are: malaria, acute watery diarrhea, acute bloody diarrhea, acute flaccid paralysis, neonatal tetanus, measles, diphtheria, whooping cough (pertussis), pulmonary tuberculosis, meningitis, acute respiratory tract infection (ARI), schistosomiasis, haemorrhagic fever, typhoid, food poisoning, jaundice (infectious hepatitis), rabies, scabies, chickenpox, cutaneous leishmaniasis and eye infections.

Collection of the data for communicable disease surveillance in Khartoum State starts at the health facility level. Data are obtained from the Outpatient register book, Laboratory register book, Admission forms, Death Certificate register and Case investigation sheets for diseases. Then the data are transmitted to the health area and locality, from there to the State Ministry of Health, and finally they are sent to the Federal Ministry of Health. The feedback takes the reverse direction to all levels. From a general point of view it can be seen that some disease trends have changed after the admission of integrated communicable diseases surveillance, e.g. the malaria prevalence has dropped from 15.5 per 1000 population in the year 2000 to 0.3 per 1000 population in the year 2006 (2).

The evaluation of surveillance systems should promote the best use of public health resources by ensuring that only important problems are under surveillance and that surveillance systems operate efficiently. As far as possible, the evaluation of surveillance systems should include recommendations for improving quality and efficiency, e.g., eliminating unnecessary duplication. Most importantly, an evaluation should assess whether a system is serving a useful public health function and is meeting the system's objectives (12).

Each country needs to assess its overall surveillance system periodically so that this continues to reflect the national disease control priorities, remains efficient and takes advantages of opportunities for the integration of activities. New surveillance methods and techniques that improve the

efficiency of the system should be considered and incorporated in the surveillance system strengthening process (13).

To address this issue, in 1998 the World Health Organization Regional Office for Africa, approved the Integrated Disease Surveillance and Response (IDSR) strategy for strengthening infectious disease surveillance and response capacity among its 46 member states and requested that each member state conducts assessments of its own IDSR system (4). The Ministry of Health of Khartoum State established a communicable diseases surveillance system for collection, analysis and dissemination of communicable diseases data and has used these data for planning and monitoring. But since its establishment, the system has never been assessed. Hence to address this issue, there is an urgent need to conduct this study to assess the disease surveillance system and its response capacity to enable the development of a prioritized action plan, based on the assessment findings to improve the system.

Surveillance data are crucial for monitoring the health status of the population, detecting diseases and triggering action to prevent further illness, and to contain public health problems. The need to strengthen disease surveillance and response systems are recognized globally (3).

The current study will help the planners at all levels of the health systems to develop a general framework for a vision, strategies and routine operational plans for strengthening surveillance and response. Involvement of the stakeholders from different levels of the surveillance system in analysing the feasibility and implementation of the improved CDSS in Khartoum State will further enhance the sustainability of the surveillance system.

2. LITERATURE REVIEW

Communicable diseases surveillance concept

Health information – a key ingredient in policy formation and programme planning – has often proven to be a scarce commodity in places where it is needed most (18). Communicable disease surveillance is an important source for health information**.** Communicable disease surveillance dealing with contagious diseases (also called communicable diseases), which are diseases capable of being transmitted from one person or species to another. Contagious diseases are often spread through direct contact with an individual, contact with the bodily fluids of infected individuals, or with objects that the infected individual has contaminated (14).

Surveillance is defined in many ways. According to one interpretation, surveillance means to watch over with great attention, with authority and often with suspicion (15). The commonly used definition for surveillance is a process of watchfulness over health events which may occur in a population. It has been defined as “the ongoing and systematic collection, analysis, interpretation of health data in the process of describing and monitoring a health event” with the objective of supporting the planning, implementation and evaluation of public health interventions and programmes (16). More specifically, communicable disease surveillance is the continuous monitoring of the frequency and the distribution of disease and deaths due to infections that can be transmitted from human to human or from animals, food, water or the environment to humans, and the monitoring of risk factors for those infections (17). This definition means information for a real action. Surveillance systems are networks maintaining their operation at different levels and providing information for disease prevention and control.

Effective communicable disease control needs effective response systems, which basically depend on effective disease surveillance. An effective surveillance system is a corner stone in providing information for action on priority communicable diseases and plays a major role in public health decision-making. Surveillance provides data, which can be used for priority setting, policy decisions, planning, implementation, resource mobilization and allocation, prediction and early detection of epidemics. A surveillance system can also be used for monitoring, evaluation and improvement of disease prevention and control programmes. Communicable diseases surveillance provides essential information for cost-effective health care delivery.

The scope of surveillance

In most communicable disease control programs, disease surveillance is one of the pillars of the effective control tools in any country (19). The scope of surveillance is broad, from early warning systems for rapid response in the case of communicable diseases, to planned response in the case of chronic diseases, which generally have a longer lag time between exposure and disease. Most countries have regulations for mandatory reporting of a list of diseases (19).

Reasons for conducting public health surveillance can include the need to assess the health status of a population, establish public health priorities, and reduce the burden of disease in a population by appropriately targeting effective disease prevention and control activities (20).

Functions of surveillance system (21)

- Guide immediate action for cases of public health importance;
- Measure the burden of a disease including changes in related factors, the identification of populations at high risk, and the identification of new or emerging health concerns;
- Monitor trends in the burden of a disease, including the detection of epidemics (outbreaks) and pandemics;

- Guide the planning, implementation, evaluation of programmes to prevent and control disease, injury, or adverse exposure;
- Evaluate public policy;
- Detect changes in health practices and the effects of these changes;
- Prioritize the allocation of health resources;
- Describe the clinical course of disease; and
- Provide a basis for epidemiologic research.

An important component of surveillance is sharing feedback with health care providers, public health agencies, policy makers, and the general population. The surveillance cycle is not complete until disease information is relayed to those who have responsibilities for the various public health and medical actions (22).

Disease surveillance is to detect diseases through a standardized information collection system that can ensure data quality, analyze and interpret the data, and respond.

Functional communicable diseases surveillance provides data for monitoring and assessing trends of diseases over time, which is important for prevention and control. It is a key for priority setting as it shows the disease burden. In addition, it is a key principle for early detection of outbreaks.

Surveillance Methods

Passive surveillance

The overall purpose of passive surveillance systems is to assess trends in diseases, risk factors for disease prevention and control (23). Communicable disease surveillance is heavily reliant on passive surveillance (24). However, these systems are likely to underestimate the true burden of illness as many people with notifiable conditions may only have mild illness and do not seek care, while others may be incorrectly diagnosed or may not receive laboratory testing to confirm a diagnosis.

Passive surveillance has many weaknesses. Firstly, in many parts of the world there is very limited access to health care facilities, and many people fall ill or die at home without ever visiting a health facility. Thus many cases are not reported. Secondly, there are problems of under-recognition of diseases, particularly those that are new to an area or those with non-specific symptoms. Thirdly, in many parts of the world the level of laboratory support is inadequate. Fourth, there are common logistical problems in reporting in many parts of the world, over-worked and underpaid staff, lack of motivation for reporting when no feedback is provided, and a need for further training. Overall, there is considerable variation in the quality of reporting systems from country to country; reflecting economic, social, cultural and epidemiological differences (25).

The quality of passive surveillance system reporting varies considerably due to under-recognition of disease by primary care providers, omission of cases that never reach a health facility, in poor countries especially, due to inadequate laboratory support for confirmation of cases. Political pressures sometimes intervene to suppress disease notification due to fear of economic consequences, as the recent SARS outbreaks demonstrated. For all these reasons, data from passive systems need to be interpreted with caution (25, 26).

Active surveillance

Active surveillance is defined as special effort to collect data and confirm diagnoses to ensure more complete reports, such as surveys and outbreak (27). This type of surveillance is particularly useful in establishing prevalence rates for conditions, where there may be a lack of data or where cases occur sporadically. Another illustration of active surveillance is the process of case ascertainment during an outbreak investigation (24).

Sentinel surveillance systems

Sentinel surveillance provides an alternative to population-based surveillance for the collection and analysis of individual patient-related information (28). Sentinel surveillance systems are established for the purpose of enabling simple, early detection of disease (24). Sentinel surveillance systems offer advantages over passive surveillance, which is known to have limitations due to incomplete reporting (29).

Sentinel health information system keeps a watchful eye on a sample of the population by supplying regular, standardized reports on specific diseases and procedures in primary health care (19).

Advantages of sentinel surveillance system (28, 30)

- Can easily collect individual patient-related data;
- Less costly and burdensome on resources than traditional surveillance;
- Flexible system design;
- Useful for documenting trends;
- Sentinel sites may provide a more consistent picture of illness in a given area than routine reporting;
- Data collected from sentinel sites may also show whether routine reporting is accurate or not;
- Being chosen to participate in surveillance tends to motivate the staff to do their best to report accurately and on time;
- Sentinel sites are most suitable for diseases, which cluster in selected high-risk populations.

Disadvantages of sentinel surveillance system (28, 31)

- Sentinel sites are often not representative of the entire population at risk;
- The data they generate may not be of sufficient volume to calculate statistically significant rates and ratios important for assessing changes in health status;

- The population served by the sentinel facility may change, making the study of trends invalid;
- Data may have biased or skewed findings.
- Not suitable for rare diseases
- Not suitable for diseases that are reportable according to international regulations**.**

Syndromic surveillance

Syndromic surveillance refers to methods relying on detection of clinical case features, which are noticeable before confirmed diagnoses are made. Prior to the laboratory confirmation of an infectious disease, ill persons may exhibit behavioural patterns, symptoms or signs that are notified by a physician. The surveillance provides a quick (gained time by avoiding laboratory delay) estimate of the disease situation monitored (a notified case *may be* an infected case) and is suitable for e.g., detecting bio terror (32).

Principles of surveillance

A key principle is to include only conditions for which surveillance can effectively lead to prevention. Another important principle is that surveillance systems should reflect the overall disease burden of the community. Other criteria for selecting diseases include (19):

- Incidence and prevalence;
- Indices of severity (case-fatality ratio);
- Mortality rate and premature mortality;
- An index of lost productivity (bed-disability days);
- Medical costs;
- Preventability;
- Epidemic potential;
- Information gaps on new diseases.

Identifying communicable diseases for surveillance

Any communicable diseases surveillance system should cover all diseases of public health importance. As time is passing a new disease emerges and others become of less public health importance so the surveillance systems need to add the former and remove the latter diseases. In order for the surveillance system to perform efficiently it needs to prioritize diseases on the notification list. This prioritization helps surveillance systems to avoid collecting data, which would not result in public health action, and it also helps avoiding missing new threats of great importance. The priorities should be appropriate to the disease epidemiology, infrastructure and resources of the country. The national surveillance systems should reflect national and global goals for communicable disease control as well as the WHO regional surveillance plans (33).

Thus the professionals who run the surveillance system must choose its targeted diseases based on certain criteria as it is impossible for any system to formulate surveillance for every disease. The following criteria are commonly used in choosing the diseases:

- Indices of frequency (e.g., the total number of cases and/or deaths; incidence rates, prevalence, and/or mortality rates); and summary measures of population health status (e.g., quality-adjusted life years [QALYS]); (21)
- Indices of severity (e.g., bed-disability days, case-fatality ratio, and hospitalization rates and/or disability rates); (21)
- Disparities or inequities associated with the health-related event; (21)
- Costs associated with the health-related event; (21)
- The disease can be prevented; (34)
- Potential clinical course in the absence of an intervention (e.g., vaccinations) (35, 36); and
- Public interest.

A multi-disease or integrated approach to disease surveillance

Effective communicable disease control needs effective disease surveillance system, which will provide information for action on priority communicable diseases; it is a basis for public health decision-making in all countries.

Surveillance data are used for priority setting, policy decisions, planning, implementation, resource mobilization and allocation, prediction and early detection of epidemics, monitoring, evaluation and improvement of disease prevention and control programmes; surveillance data also provide information for optimal health care delivery and a cost-effective health strategy (37).

Integrated disease surveillance activities are an effective, efficient and sustainable approach to improve national capacities; integrated disease surveillance visualizes all surveillance activities in a country as a common public service that carries out many functions using similar structures, processes and personnel (38).

Disease surveillance should be based on collecting only the information that is required to achieve the control objectives. The data required may differ from disease to disease. Although surveillance may have very specific information needs, many elements of data collection are very similar and the data source is often the same individual or facility (39).

A multi-disease approach to disease surveillance aims at establishing well co-coordinated action-oriented surveillance systems that seek opportunities for integration of core and support surveillance functions when appropriate, maximize synergies, take advantage of new tools, build on existing resources, and benefit from successful initiatives (40). This integration on disease surveillance leads the system to avoid duplication of efforts and resources, and it also reduces work load. To achieve the integration of the data collection, analysis, interpretation and dissemination of different diseases

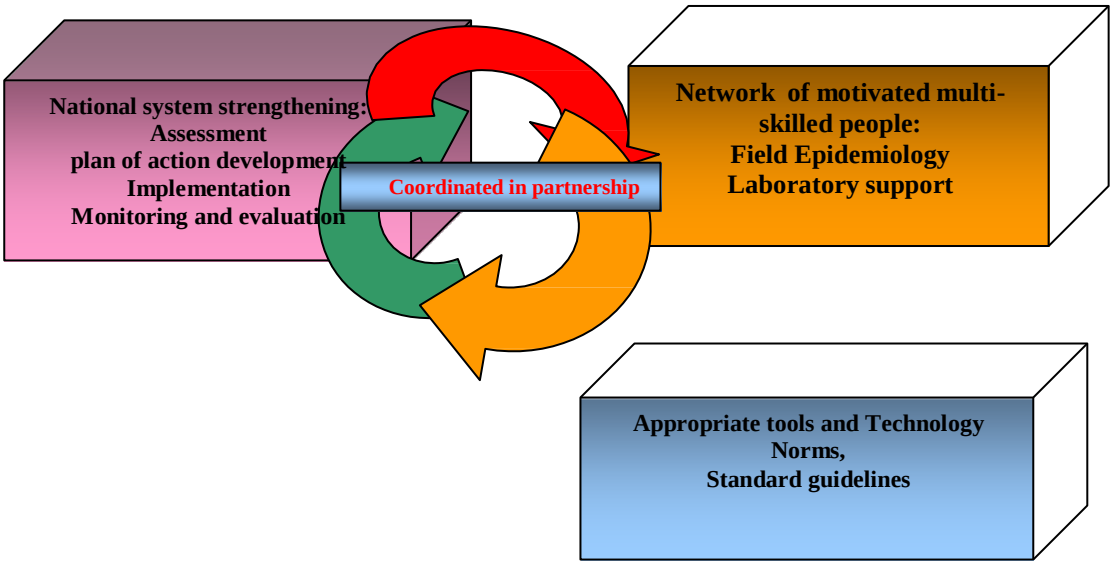
must integrate under one system, which will produce a single report for all priority diseases under surveillance.

Integrated Disease Surveillance and Response (IDSR) is a strategy of the African regional office of the World Health Organization (WHO AFRO), which was adopted in 1998 (Figure 2.1). IDSR aims to improve the availability and use of surveillance and laboratory data to control priority infectious diseases. The specific goals of IDSR are: to strengthen district-level surveillance and response for priority diseases, to integrate surveillance with laboratory support, and to translate surveillance and laboratory data into specific public health actions (41).The main basis of the integrated diseases surveillance system is data collection for action, implying that only the data necessary for taking action is collected and processed. This can be achieved and sustained by complying with overall guiding principles of usefulness, simplicity and flexibility of the system, orientation to a specific action, and integration of actions (42).

The goal of integrated disease surveillance is to ensure that each Member State has the capacity to define, detect and respond to communicable public health threats. To this end, an integrated disease surveillance programme aims to provide (33):

- Timely, complete, regular and high quality information;
- Early detection and prediction of epidemics;
- Objective assessment of interventions during epidemics; and
- Efficient monitoring of intervention programmes.

Figure 2.1: Integrated approach to communicable disease surveillance



Source: WHO. Integrated disease surveillance programme

http://www.who.int/csr/labepidemiology/projects/surveillance/en/index.html

The IDSR system is an element of the overall Health Management Information System. It pools resources at country level to collect, compile, use and report morbidity and mortality data for 19 diseases: seven epidemic-prone diseases, four targeted for elimination, and eight (including malaria) of public health importance. These data are collected on a weekly/monthly basis, depending on the epidemiology of each IDSR disease in a given country. Since IDSR has only recently been introduced into the countries, it is not yet widely implemented in all districts of many countries (43).

The core activities of the communicable disease surveillance system

The core activities of communicable disease surveillance are:

- detection (identifying cases and outbreaks);
- registration;
- confirmation (epidemiological and laboratory confirmation)**;**
- reporting (early warning and routine);
- analysis and interpretation (preparing and periodically updating graphs, tables and charts to describe time, person and place for reported diseases and conditions, identifying unusual trends or patterns or the exceeding of a threshold value, interpreting results, discussing possible public health action)**;**
- response (case management, contact tracing, infection control measures, immunization activities, improvement of preventive and control measures (vector control, environmental control);
- community information and education, alerting nearby areas;
- outbreak investigation (case finding (records, active surveillance);
- collection and transport of specimens, confirmation testing, interpretation of results (epidemiological and laboratory);
- Feedback, evaluation and monitoring (40).

Supportive functions of the communicable disease surveillance system

For good functioning of the core activities of the communicable diseases there is a need for a number of support functions, which lead to better performance. These supportive functions are: setting standards (e.g. case definitions, standard case management guidelines, standard procedures for investigation), training (surveillance, epidemiology, laboratory), supervision, communications systems (e.g. radio, fax, e-mail, phone, health updates), providing resources (human – appropriate

number with adequate skills and competencies; material - vehicles, laboratory equipments, and supplies etc; and financial resources) (44).

Surveillance system evaluation

Beginning from 1978 with the declaration of the Alma Ata Conference on 'Health for All by the Year 2000', international momentum to monitor the performance of health programmes and hold governments accountable for progress in improving health has grown. And there is a need to measure national progress towards achieving the Millennium Development Goals (18). Thus the evaluation of communicable disease surveillance system is necessary.

Surveillance systems vary widely in their methods, scope, and objectives, characteristics and what is important to one system may be less important to another (45). In designing the system, a balance should be sought so that this system can be flexible. The motto should be "*adapt not adopt*." (46)**.** Surveillance for infectious diseases is an important element in providing effective public health disease control and prevention services.

The evaluation of surveillance systems should promote the best use of public health resources by ensuring that only important problems are under surveillance and that surveillance systems operate efficiently. Insofar as possible, the evaluation of surveillance systems should include recommendations for improving quality and efficiency, e.g., eliminating unnecessary duplication. Most importantly, an evaluation should assess whether a system is serving a useful public health function and is meeting the system's objectives (47).

The aim for evaluating CDSS is to ensure that the communicable diseases of public health importance are being monitored efficiently and effectively. This evaluation must be done periodically. The system must focus on how the system should operate to meet its goals. In the

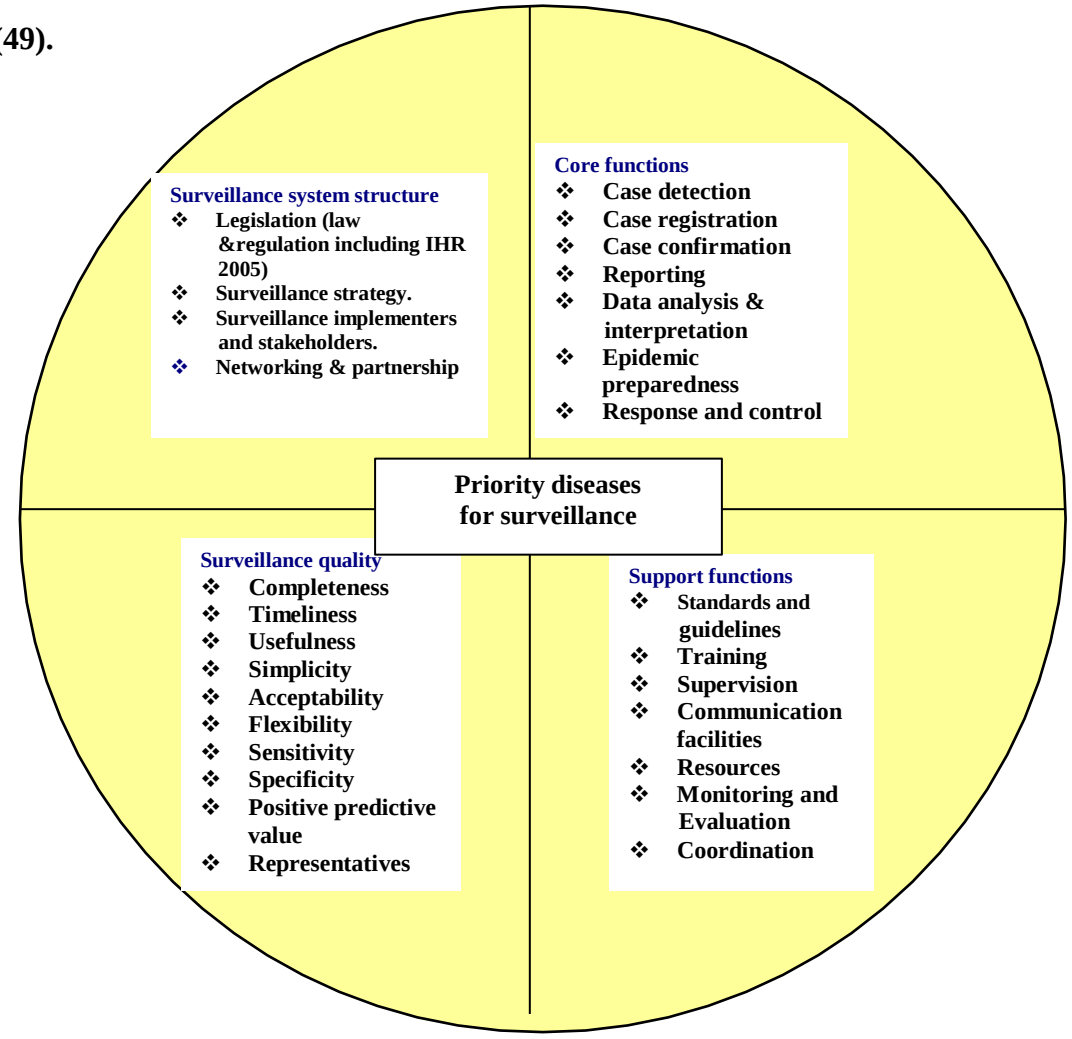
evaluation of the CDSS the assessment is done on the priority diseases, structure, organization, processes, and output of surveillance and response systems as well as on the capacity for core and support functions of the surveillance and response at every level of the health care system (40).

Conceptual framework for CDSS assessment in Khartoum state

Public health surveillance is ongoing systematic collection, analysis, interpretation of outcome-specific data for use in the planning, implementation, and evaluation of public health practice. A surveillance system includes the functional capacity for the data collection and analysis as well as the timely dissemination of these data to persons who can undertake effective prevention and control activities. The core of any surveillance system is the collection, analysis, and dissemination of data (48).

For the assessment of CDSS in Khartoum state the conceptual framework of surveillance and response systems for communicable diseases (as shown in Figure 2.2 below) is used. The three important components of the system (core functions, support functions and surveillance quality) are under focus, and thus the evaluation will cover the major dimensions of communicable diseases surveillance.

Figure 2.2: Conceptual framework of surveillance and response systems for communicable diseases (49).



Source: Overview of the WHO framework for monitoring and evaluating surveillance and response systems for communicable diseases. Weekly epidemiological record. 3 September 2004. **http://www.who.int/wer**

CDSS in Sudan

Communicable diseases constitute a major cause of morbidity and mortality (49). Sudan is exposed to public health risk from a selected number of infectious diseases, which have high impact on the lives and deaths of the vulnerable population. Due to protracted war and conflict, collapsed health system, dilapidated health infrastructure, large scale population displacement enforced by poverty, war and limited access to health care, the country is at risk of the infectious diseases to varying degrees and intensities, mainly, polio, HIV/AIDS, malaria, meningitis, dengue, and cholera (50).

In Sudan, 25 cases of wild **polio** were detected in 2005; most of these were reported from East Gadarif, Kassala, Sennar and Unity State compared to zero cases in 2008. The **HIV** sero-prevalence in the general population is estimated to be between 1.6% and 2.3% 2005 compared to 1.4% in 2008 and the estimated number of people living with AIDS in 2008 was 9200. The number of reported **malaria** cases was 13,2617 in 2005 compared to 11,934 cases in 2008. Since 1988, three major **meningitis** epidemics have occurred in Sudan (1988, 1998, 2005 and 2007); in these epidemics, 128 persons per 100,000 population were affected compared to only 56 reported cases in 2008 (51). Rift Valley Fever outbreak in the States of Gazeera, Kassala, Khartoum, River Nile, Sinnar and White N has been reported in 2007 and 2008 with cumulative total of 698 cases, including 222 deaths. In 2006, Sudan experienced **cholera** outbreak, 2007 cases were reported including 77 deaths in 9 out of 15 states in northern Sudan. Of these cases, 35.3% (CFR=4.9%) have occurred in Khartoum state (52).

Khartoum is at risk of the infectious diseases. The state experienced epidemics of **acute water diarrhea** in 1999, and in 2006 the number of the cases was 17 s per 100,000 population, the case fatality rate was 4.5%, which exceeded the accepted WHO level (1%). There is a decrease in the **measles** incidence rate from 0,15 in the year 1999 to 0,01 in the year 2006. The incidence of the meningitis disease was 26 cases per 100,000 population. The incidence of **malaria** in the year 2008 was 14 cases per 100,000 population, which is a lower rate than in the previous years (53).

In Sudan, the surveillance system was started in the 20th century after the introduction of Sudan Medical Services Regulations in 1951. In 1975, the National Public Health Law was issued. It includes, in the fifth chapter, diseases for notification: group A includes 19 diseases for immediate notification, group B 22 diseases, and group C four diseases. Group B and C can move to be for immediate notification in certain situations (54). The National Health Policy endorses the hitherto policies, including international regulations promulgated for a variety of communicable diseases. It

emphasizes the formulation and adoption of an integrated approach, particularly for setting up a comprehensive surveillance system for early detection and containment of epidemics and disasters (50).

During the first three years after the adoption of integrated CDSS in 1998, a lot of activities were carried out, which resulted in the organization of the programme with regards to guidelines and reporting forms development, printing and distribution, and training. The performance of the programme has deteriorated in the last 8 years due to financial, technical and managerial problems (54).

The final, centrally collected and issued communicable disease surveillance report includes: cases according to age and gender, admission according to age and gender, and deaths according to age and gender. Malaria is presented in form cases, admission, deaths and positive cases rate according to localities**,** comparison of cases, admission and deaths reported in the current week with the last week and the same week last year. Graph presentation issued for situation of malaria in each locality, larval and adult density in the State, average temperature, humidity and rainfall during the week, and larval control activities during the week.

Timing of communicable disease surveillance reports in Khartoum

- Epidemiological week — Saturday to Friday
- Health facilities report to the health area — Saturday
- Health area to localities — Saturday
- Localities report to state Ministry of Health — Saturday/Sunday
- Meteorological / vector survey — Saturday
- Larval control report — Saturday
- State final weekly epidemiological report — Sunday evening
- Distribution to relevant units — Sunday /Monday

Communicable diseases surveillance weekly data collection and simple analysis is performed at the three levels (central, locality, and health area level).

A weekly feedback report (started for the year 2000) following the communicable diseases surveillance report is sent to the lower levels and other related units at the same level such as malaria control department, and vaccination department.

The continuous evaluation of the surveillance system is done based on the weekly reports on timeliness and completeness at central level and supervision visits on the lower levels.

The system generally achieves some success in filling in the accepted WHO performance levels for certain diseases such as malaria, measles, detection of acute watery diarrhea epidemic in 24 hrs, and control of diseases such as meningitis by vaccination (31).

3. AIMS OF THE STUDY

This study sets out to describe and assess the functions and activities of CDSS in Khartoum State, Sudan in period from 2005 to 2007.

The specific research questions of the study based on three of the component of the Conceptual framework for CDSS assessment were as follows:

Q1: To what extent does the integrated CDSS in Khartoum State meet the desirable standard of *core activities and support functions*?

Q2: Does the integrated communicable diseases surveillance system in Khartoum State meet the *standard quality requirements in terms of* completeness, timeliness, usefulness, simplicity, acceptability, flexibility and representativeness of *CDSS in the African region*?

Q3: How does the CDSS staff perceived the gaps, opportunities and resources needed for performing the core and support functions of integrated CDSS in Khartoum State?

Q4: To what extent is it feasible to implement the improved CDSS in Khartoum state based on analysis and feedback from stakeholders?

Q5: What are the differences evaluating CDSS in developed and developing countries?

4. MATERIALS AND METHODS

Setting and design of the study

Khartoum state is one of 26 states in Sudan (Figure 4.1). It has an area of 28,000 km^2. It is located between longitude 15.1-16.3N and latitude 31.4- 34.2E. Khartoum is divided into seven localities (districts) and 19 health areas. Its health facilities include 43 hospitals, 147 health centers, 185 NGO centers, 235 dispensaries, 365 primary health care units (PHC).

The structure of the health care system in Sudan as well as in Khartoum State is based on the primary health care and the "health area" concept which is conceived as a decentralized health care system able to integrate at district level. The existing vertical programmes, including preventive, curative and health promotion activities, has been fully developed but is not yet universally applied (55).

Figure 4.1: Khartoum state – Sudan map

A descriptive cross-sectional and retrospective study design was used. The study population comprised of all epidemiology departments/units (n=177) from the levels of the state (n=1), locality (n=7), and health area (n=19), and health facilities (n=150) participating in the CDSS in Khartoum state. Before the actual data gathering, a pilot study was conducted in Omdurman locality for the purpose of testing feasibility and validity of the survey.

Measures, data gathering and analysis

The WHO framework for monitoring and evaluating surveillance and response systems for communicable diseases was used to assess Khartoum CDSS. The core activities ,supportive functions and quality components of the framework were under focus.

Field work took place in Khartoum, Sudan in the period from April to December 2008. A records review survey was used for data collection for the period of 1 January 2005 to 31 December 2007. At the locality and health area levels, weekly surveillance reports submitted by all health facilities, report tracking tools, case investigation forms (CIFs), outbreak reports, results of data analysis, epidemic preparedness plans, meeting minutes, schedules and reports for health education and other activities were reviewed. At the health facility level, patient registers, copies of weekly reports, results of data analysis, schedules and reports for community outreach activities, CIFs, and standard case definitions were reviewed. At the state level, weekly reports submitted by all localities were included. The survey was conducted for all CDSS levels using four sets of modified generic WHO questionnaires – Appendix 10.4 (16).

The CDSS core activities: case detection, case registration, case confirmation reporting, data analyses and feedback; and CDSS supportive functions: communication, training, supervision and resources, were measured using World Health Organization (WHO) and Centers of Diseases Control (CDC) standards guide for integrated disease surveillance and response indicators in the African Region (16).

A record review at the central level, locality and health area level, was conducted in 2008 by trained medical doctors and health officers, while 14 (seven medical doctors and seven health officers) experts trained in research data gathering did it at the health facilities level. Furthermore, the author, using a sample of the health facilities' questionnaire, randomly checked the quality of the work of the reviewers. The analysis was done using SPSS version 17.0. Eighty percent performance at all CDSS levels was chosen as the standard bench mark for the each indicator based on the WHO and CDC guide for Africa (16).

The CDSS quality: timeliness of reporting, usefulness of the surveillance data and the surveillance system, simplicity and acceptability of the system, flexibility of the surveillance system, sensitivity and specificity in surveillance, positive predictive value and representativeness of the surveillance system were measured using World Health Organization (WHO) and Centers of Diseases Control (CDC) standards guide for integrated disease surveillance and response indicators in the African Region (16)

The focus group discussion and personal interview format were used to assess CDSS activities as a whole. Participants in the personal interviews were representatives of both urban and rural localities (n = 3); health areas (n = 3); and health facilities (n = 3); as well as the state level (n = 4). Three focus group discussions were conducted, each including 8-10 CDSS staff members. Each focus group discussion lasted approximately three hours with a 15 minutes break in between. The first author together with a trained health officer moderated the discussion in Arabic using an interview guide to gather views and experiences about CDSS activities.

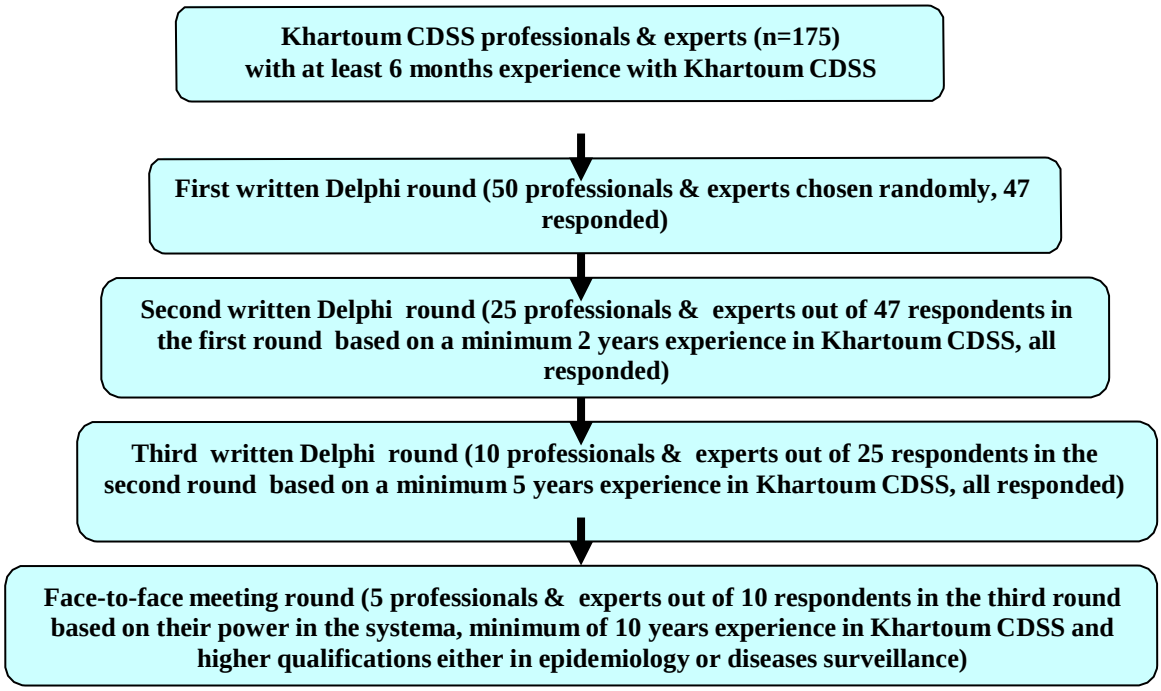
The participation rate in the three focus group discussions was 100%. The qualitative focus group data were analyzed using contents analysis based on themes arising from the data. After each focus group discussion, the recorded tapes were transcribed; discussion notes were summarized, and coded according to the relevance to different issues of the discussion. Further, quotes as examples of the participants' input were translated into English.

No numerical analysis was carried out for the focus group data. Significance in qualitative research, and particularly in a focus group, cannot be determined by the frequency with which a view or opinion is raised, but rather in the manner in which it is raised, discussed, and negotiated by the group (56, 57).

To find out the feasibility of the implementation of an improved CDSS in Khartoum State based on analysis and feedback from stakeholders was measured by using the summary of the findings of the research questions 1-3, and based on them suggested improvements of CDSS statements were used to perform a three round analytic Delphi process,, after which a face-to-face discussion meeting was arranged.

A total of 50 experts in the field of communicable diseases surveillance in Sudan (doctors, health officers from central, locality and health area levels) with at least six months of experience were chosen randomly out of 175 experts based on their direct link to CDSS in Khartoum state to participate in the study in the first written round, 47 replied (94%). In the second analytic round, 25 experts were chosen out of the 47 respondents of the first round based on the years of experience in CDSS in Sudan (minimum 2 years of experience), and the response rate was 100%. In the third analytic round, the top 10 experts (minimum 5 years of experience) were chosen, and the response rate was 100%. In the face-to-face meeting, participants were high level experts and professionals (decision makers for the CDSS in Khartoum, with experience of more than 10 years in the system and with high qualifications either in epidemiology or diseases surveillance) (n = 5) from the participants in the written round. Experts of different levels were involved in the Delphi rounds as in the Khartoum context it is necessary to have acceptance of the highest level of experts to be able to implement the recommendations found in the quantitative and qualitative assessment of the CDSS to improve the system (Figure 4. 2).

Figure 4.2: Selection of professionals & experts for Delphi rounds



The Delphi questionnaire was prepared based on the recommendations of the quantitative (58) and qualitative studies assessing the CDSS in Khartoum (59). The questionnaire was divided into 13 sections about recommended changes or improvements in core activities, supportive functions and quality of the CDSS in Khartoum state (appendix 10.7). In the first written round, the questionnaire consisted of 47 statements; the questionnaire was repeated in the second and third rounds. A five-point Likert scale was used to measure the level of agreement. Consensus was defined as 80 % or higher agreement rate on each statement.

The non-consensus statements from the written rounds were discussed with top experts (n = 5) via individual face-to-face meetings or phone conversations. In this round a further iteration of the non-consensus outcomes of the Delphi study resulted in the endorsement, modification, integration or rejection of individual statements.

To assess the international experiences in evaluating CDSS, the publications found on the assessment of CDSS published in English between 1981 and 2007 were reviewed. The publications were identified by searching the PubMed database, WHO publications, and publications of the CDC. Several term combinations were used of the word “surveillance”, “evaluation”, “communicable”, “diseases”, “infectious”, “assessment”, and “system”. Four review studies (references 60, 61, 62, and 63) from USA and United Kingdom were included. Additional reports were identified by manually reviewing the references of the studies found (snowball approach). It was important to include these different studies as the CDSS dimensions, characteristics, challenges, and importance differ according to the context of implementation.

5. RESULTS

Based on the WHO framework for monitoring and evaluating surveillance and response systems for communicable diseases which was used to assess the core activities, supportive functions and quality components Khartoum CDSS, the main findings can be summarized as follows:

In the assessment of core activities and supportive functions of the CDSS, the study found that the knowledge of the system was found to be 100% at all levels of the CDSS of the Khartoum state. Data reporting was over the recommended standard of 80% at all levels. Data analysis, epidemic preparedness and feedback were below the recommended standard. All assigned CDSS staff members had been trained. Lower levels of the CDSS lacked modern technologies for data reporting and data analysis. The CDSS in Khartoum state is centralized; moreover, the system has not been updated, it is poorly documented and has shortage of staff at the lower levels.

The qualitative study gave explanations for the barriers in delivering high quality CDSS. The quality of CDSS was seen poor as the system was not representative: it included neither the private, the military sector nor the important teaching hospitals; it also lacked timeliness due to poor documentation in receiving and sending CDSS reports; it was partially flexible since it did not rapidly respond to emerging and re-emerging diseases such as SARS and avian flu in its notification lists; and in addition, it did not use the data collected to apply intervention for control and prevention of communicable diseases on a routine basis.

In the Delphi part, the stakeholders in Khartoum state agreed with most of the recommendations made to improve the CDSS core activities, supportive functions and quality in Khartoum State and that the

structure of existing CDSS in Khartoum state needs to be strengthened with more effective coordination at different levels.

In the review study concerning experiences with the CDSS from 20 developed and 12 developing countries, it was found that in developed countries, only one study from Australia (64) was found to assess the whole CDSS, while the other studies assessed parts of the system or a single CDSS. The opposite was observed in developing countries where 11 out of 12 studies assessed the whole CDSS while only a study from Taiwan (65) assessed a single CDSS.

Research Question No 1:

Achievement of Khartoum CDSS in core activities and support functions

The system assessed here by record review and interview was the main system for communicable diseases in the state. It functioned on different CDSS levels, but there were also four parallel, special systems on these levels such as programmes for the prevention and control of tuberculosis, leprosy, AIDS and STIs, and poliomyelitis. These systems were not completely integrated; instead, they e.g. exchanged data with the poliomyelitis surveillance system. The CDSS was found to have clear, specific written objectives at the central level. However, the degree of clarity became less when moving down the levels of the CDSS system.

Case definition is vital for the communicable diseases case detection. A manual of disease-specific case definitions has been distributed to the health facility staff in Khartoum. All staff working at the different CDSS levels knew the diseases under surveillance (Table 5.1). The capacity of transferring communicable disease specimens was 100 % at lower levels. However, there were no standard written

guidelines for specimen collection at any level. Approximately a quarter of the lower levels had evidence of following-up or keeping specimens result (Table 5.1). Central hospitals had capacities to confirm by culture the cases of selected priority diseases. Neither district hospitals nor the selected health centers were able to perform culture for any of the priority diseases.

Almost all health facilities had a functioning laboratory. All functioning laboratories had the ability to collect blood, urine, and stool specimens while less than a quarter of them had the ability to collect sputum specimen, and cerebrospinal fluid specimen. More than half of the health facilities had the capacity to keep specimens, while less than a quarter were able to transfer the specimen to the reference laboratories (Table 5.1).

All health facilities had an outpatient register, and hospitals had an inpatient register for recording of the cases. Data on selected diseases were extracted and reported to the health area level. All CDSS levels had the recommended standard reporting form for the years 2005-2007 (Table 5.1). All CDSS personnel agreed that reporting was easy and was not time consuming - the average time for preparing the weekly reports was one hour at all levels. All CDSS personnel at lower levels were trained in preparing the communicable diseases surveillance weekly reports.

Existence of urgent notification lists for communicable diseases was found at nearly three quarters of the lower levels of the CDSS. However, there was no evidence that these urgent notifications were sent in the recommended time at any level (Table 5.1). Further, there was no evidence of the zero reporting system at lower CDSS levels except in one health area. All levels used standard format for weekly CDSS reports, made by the state level, and all lower levels kept copies of the weekly CDSS reports.

No analysis of communicable diseases surveillance data was done at the health center level, and a little was done at other lower levels. All lower levels except health facilities had computers for data management (Table 5.1). All health facilities recorded and processed their data manually. All localities had an epidemic threshold for the priority diseases such as meningitis, malaria, and measles, while health areas had it only for meningitis, and none of the health facilities had epidemic threshold for priority diseases.

A case investigation sheet was used by almost all levels. However, there was no evidence on all recommended cases having a special investigation sheet, except for one area. None of the lower levels had reports for either the acute watery diarrhea outbreak in 2006 or the rift valley fever outbreak in 2007. The reports for these outbreaks were available at the state level only. None of the lower levels were aware of the number of cases during the outbreaks or of the case fatality rates at their levels.

None of the lower levels had functioning epidemic management committees for the years 2005 –2007 as the outbreaks were managed centrally. There was no standard, regular rapid response team at any level, instead, it was activated when needed (Table 5.1).

At the central CDSS level, all localities and health areas produced a regular feedback report to the lower level (Table 5.1). There was no standard format for the feedback at lower levels, and none of the lower levels had well formulated feedback.

The Khartoum CDSS was found to have standard guidelines in the form of CDSS manuals, and these manuals were found at the central level, and at some of the lower levels (Table 5.2). However, only about a half of the lower levels used these guidelines to direct their surveillance activities. The CDSS

had a regular supervision system at all levels. About half of the lower levels had documentation that all recommended visits during the study years had been performed (Table 5.2). All CDSS levels used standard checklists for the supervision. On the other hand, no supervision feedback system existed at lower levels. The system existed from the central to local level in 2005. However, only in a quarter of the localities there was any evidence of this supervision feedback.

Table 5. 1. Percentage of the performance of CDSS core activities at different levels of CDSS in Khartoum state for the years 2005 - 2007.

Core activity	Locality (*n* = 7)		Health areas (*n* = 19)		Health facility (*n* = 150)		Standard benchmark
	No.	%	No.	%	No.	%	%
Case detection							
Knowledge of diseases under surveillance	7	100.0	19	100.0	150	100.0	80
Case confirmation							
Capacity to transport specimens to higher level	7	100.0	18	94.7	26	17.3	80
Presence of specimen collection guideline	0	0.0	0	0.0	0	0.0	80
Follow-up of specimen results	0	0.0	2	10.5	-	NA	80
Keeps the specimen result	0	0.0	0	0.0	-	NA	80
Data reporting							
Availability of CDSS reporting form	7	100.0	19	100.0	150	100.0	80
Average time to prepare the weekly CDSS report (1 hr)	7	100.0	19	100.0	150	100.0	80
Forward urgent notification for list A diseases	-	**NI**	-	**NI**	-	**NI**	80
Submission of urgent notification within 24 hr	-	**NI**	-	**NI**	-	**NI**	80
Presence of zero reporting system	0	0.0	0	0.0	0	0.0	80
Submission of case-based investigation reports for all recommended cases	-	NE	-	NE	-	**NI**	80
Data analysis							
Performing trend analysis	7	100.0	19	100.0	0	0.0	80
Use of appropriate source of denominators		0.0		0.0		0.0	80
Aggregate case data by demographic category	7	100.0	19	100.0	150	100.0	80
Epidemic preparedness and Response							
Involved in an outbreak investigation	7	100.0	19	100.0	0	0.0	80
Implementation of community prevention and control measures based on local data	0	0.0	0	0.0	0	0.0	80
Presence of written epidemic preparedness and response plan	0	0.0	0	0.0	0	0.0	80
Presence of emergency stocks of drugs and supplies	0	0.0	0	0.0	0	0.0	80
Existence of epidemic management committee	0	0.0	0	0.0	0	0.0	80
Presence of health education material	0	0.0	0	0.0	-	NA	80
Existence of vaccination strategy	7	100.0	19	100.0	-	NA	80
Presence of epidemic rapid response team	0	0.0	0	0.0	-	NA	80
Performance of mass vaccination campaign	7	100.0	19	100.0	-	NA	80
Calculation of vaccination coverage	7	100.0	19	100.0	-	NA	80
Feedback							
Received feedback from a higher level	7	100.0	19	100.0	150	100.0	80
Feedback seen as beneficial	1	14.3	12	63.2	10	10.0	80

NA = not applicable. NI = no information

Professional and well trained staff was available at the central level, whereas at the local level the staff consisted of a medical doctor and a health officer, and at the health area level of one health officer. Further, the staff at these levels took care of the system among other heavy duties for other departments of preventive medicine. At the health facility level, the system had only one trained staff member conducting surveillance among other duties. Almost all CDSS staff at all levels was trained in communicable diseases surveillance (Table 5.2). About 90 % of the health facilities had functioning communication methods (Table 5.2). The weekly epidemiological reports sent from all levels were sent manually/on paper except for one health facility in a remote place, which sent them via phone.

Research Questions No 2 & 3: (Articles No 2 & 3)

CDSS staff perceptions of the gaps, opportunities and resources needed for performing a high quality, integrated communicable diseases surveillance system in Khartoum State

The staff expressed that for them it was difficult to assess the completeness of the CDSS data at health facilities. The following quote by a health officer from the health area level shows why: *"I was not able to tell if the data I received every week were all data that were registered in the health facility as I have no access to the raw data"*. However, checking the completeness of the data was possible during supervision visits: *"I can check the completeness of one or two diseases in the monthly supervision visit"***.** Another reason given was that the surveillance data neither from private health service nor from large hospitals were included: *"We have a very large number of patients using the private sector but their data were not taken into consideration in our system"*. (Health team head). *"The CDSS data from the important largest hospitals in the state were not included"; "Data from Khartoum and Khartoum North teaching hospitals were not included after introduction of paperless hospital policy in those hospitals"* (Preventive medicine coordinator from locality level).

Table 5.2. Percentage of the performance of CDSS supportive functions at different levels of CDSS in Khartoum state for the years 2005 - 2007.

Supportive functions	Locality (*n* = 7)		Health areas (*n* = 19)		Health facility (*n* = 150)		Standard benchmark
	No.	%	No.	%	No.	%	%
CDSS manual							
Presence of the CDSS manual	5	71.4	14	73.7	20	13.3	80
Use of the CDSS manual to guide the surveillance activities	3	60.0	6	46.2	13	65	80
Training							
Training of the rapid response team	-	NA	-	NA	-	NA	80
Basic training on CDSS	7	100.0	19	100.0	131	87.3	80
Post basic training on CDSS	7	100.0	19	100.0		74.5	80
Supervision							
Presence of supervisory visits to the lower level	3	42.9	9	47.4	-	NA	80
Review of CDSS activities during the supervisory visit	2	28.6	3	15.8	-	NE	80
Existence of supervisory visit feedback system	0	0.0	0	0.0	0	0.0	80
Implementation of supervisory visit recommendation	-	NI	-	NI	-	NI	80
Resources							
Presence of office	7	100.0	16	84.2	150	100.0	80
Presence of functioning telephone	7	100.0	19	100.0	134	89.3	80
Presence of functioning means of transportation	7	100.0	14	73.7		NA	80
Availability of functioning computer	7	100.0	19	100.0	22	14.7	80
Availability of functioning photocopier	0	0.0	0	0.0	0	0.0	80
Availability of functioning spray pump	1	14.3	0	0.0	0	0.0	80
Availability of disinfection materials	1	14.3	0	0.0	98	65.3	80
Availability of protection materials	1	14.3	0	0.0	91	60.7	80

NA = not applicable. NI = no information

According to the staff, timeliness functioned well during epidemics, shown by a quote below: *"If we have an epidemic the system works well, for example when we had a hemorrhagic fever outbreak, the daily active surveillance was able to identify all the cases in the recommended time".*

During non-epidemic periods, there were problems especially on the lower levels of the surveillance system though since *"the weekly report (we received) usually on Saturdays but without any kind of documentation of the time of occurrence" and "our health facilities (are) used to notify us but we are not able to find out if that is within the recommended time or not, and we are not able to know if these were all the cases or not".*

The Khartoum CDSS seems to collect some data but is rather passive in using the data e.g. in performing interventions. A focus group of preventive medicine coordinators remarked: *"We collect data for many communicable diseases (CD) but we do not carry out any interventions or prevention measures on a routine basis".*

Neither are the data used for decision making about resource allocation, which was expressed as follows by a health officer at the locality level: *"We keep collecting CDSS data but all the resources have been fixed (unaltered) during the past years".* In line with this, e.g. the CDSS guidelines or case definitions had not been updated for years according to the interviewees on the level of the locality. Although the CDSS in Sudan has worked well in detecting some epidemics and it has done it in the recommended time, it seems that this tends to happen when the epidemic starts from one of the chosen sentinel site for CDSS and there is a risk that especially *"If the outbreak started from a private sector we may not discover it or we can do that very late" (*interviewee(s) at state level).

Moreover, there is serious problem in the notification lists as mentioned by a surveillance coordinator at the central level: *"our notification lists contain some diseases in form of symptoms or signs, which can be related to both communicable and non-communicable diseases such as watery diarrhoea, bloody diarrhoea and jaundice".*

The structure of CDSS in Khartoum is quite simple**.** The data reporting procedures have been traditionally based in Microsoft (MS) Excel. According to some interviewees, it takes only an hour to finish a weekly report, and mostly only simple manual graphs are performed.

The CDSS in Khartoum is based on 150 sentinel sites that were chosen based on e.g. standard criteria such as geographical position and patient load. One of the interviewees told that *"the (CDSS) system started with 76 (facilities) in 1998**,** which were chosen based on certain criteria and then every year 'they' added 25 health facilities until 'they' reached 150 in the year 2003. Then (the increase) stopped and no one knows why they won't (continue to) add 25 health facilities every year".*

As mentioned above in the Completeness paragraph, the representativeness of the CDSS suffers from the lack of inclusion of the private sector data: *"Although a very large portion of the population were treated in private hospitals and clinics we did not collect data from these facilities".* Similarly, military hospitals were not included in the CDSS either. Representativeness is also affected since according to an interviewee 'there are *no diagnostic standard guidelines ".*

One of the main weaknesses of the CDSS in Khartoum is its inability to implement changes rapidly. *"We feel that the list of notifiable diseases needs to be changed but nothing happens".* In line with this, old case definitions seem to persist "*even in doctors dislike using them'.*

Despite the fact that the CDSS in Khartoum state lacks legislation for the compulsory CDSS reporting, the system has a high level of acceptability as mentioned by most of the respondents *"Notification of CD is an important issue (which) we keep doing "*. On the other hand, almost all respondents thought that Khartoum CDSS lacks enough motivational factors for the staff: *"We have done a perfect job for the system for years and we feel that emotional and monetary motivation were declining with years and now seems to be absent completely"*.

Sensitivity is an important parameter measuring the quality of the CDSS system as it determines the true fraction of cases that are notified to CDSS. Unfortunately, Khartoum state has no other parallel system for communicable diseases data and even the laboratory data documentation is considered to be a very poor system in regarding the information of communicable disease cases as mentioned by a surveillance officer from the central level *"our laboratory data documentation of communicable diseases is very poor and no other system collects similar communicable diseases data so we do not know if the cases we have are all what we must have or not "*.

Research Question No 4: (Article No 4)

Feasibility of the recommended improvements in CDSS among relevant stakeholders in Khartoum state

Experts participating in the three written Delphi rounds and individual face-to-face meeting agreed not to change the current sentinel site surveillance system to a whole health facilities surveillance system. The first two Delphi rounds participants agreed that the Khartoum state must formulate a single surveillance system for all communicable diseases, meaning a system that includes all vertical communicable disease systems such as tuberculosis, leprosy, acute immuno-deficiency syndrome,

poliomyelitis and measles. However, the experts in the third round with minimum 5 years of experience were not in favour of a single surveillance system. They preferred the present system without including other vertical programmes.

Experts agreed in the three rounds and individual face-to-face meetings that Khartoum state must formulate updated written clear objectives for the CDSS system and that the central level should not alone take the responsibility for the formulation of these objectives and then disseminating them to the lower levels of the system.

The experts throughout the Delphi process agreed that there should be a list of priority diseases for surveillance; standard specimen guidelines should be formulated and disseminated to all levels of CDSS; and an updated version of case definitions for communicable diseases should be formulated. Experts recommended a computer system for data reporting at health facility level as well as the usage of computer network for sending the CDSS reports from all levels. The experts also agreed that the system needs professional staff such as a statistician to fully implement data analysis at locality level. The experts ruled out the feasibility of implementing monetary incentives for improving the data reporting at health facilities. The inclusion of the military hospitals in the Khartoum CDSS system was an important issue in the three rounds, but no agreement was achieved about the inclusion of private clinics and hospitals in the CDSS either in the three rounds or individual face-to-face interviews.

Khartoum CDSS needs to strengthen its zero reporting system for epidemic prone diseases at all levels of the system. Experts in the first round only agreed that data analysis should start at health facility level. All experts agreed that the system needs formulation of a standard format for the data analysis at all levels as well as upgrading of data analysis from simple rates and ratios to higher levels. It also

needs to use population statistics per area as the appropriate denominator for data analysis for all the diseases at health area, locality and central levels. All the experts in all rounds including the face-to face meeting agreed that the use of geographical information system (GIS) for data analysis at central and local level would improve the system. The system must use the collected and analyzed data for performing real action to prevent and control communicable diseases in Khartoum State. The system should have a new informative standard feedback system for the surveillance data.

Experts in all rounds and individual face-to-face meetings recommended that the epidemic management system needs major changes to achieve its goal such as: standard epidemic management plan at all levels must be updated; a standard, specialized epidemic management committee is needed at the central level; formulation of a rapid response team at central and locality level; existence of ready emergency stocks of drugs, vaccines and supplies at central and locality level all the time; availability of special budget every year for epidemic management at the central level at the time of suspected epidemics; epidemic response must be done at the lower levels supported by central level; establishment of standard epidemic reporting system; updating of protocols for standard management of epidemic prone diseases; and a system for the evaluation of epidemic response after the end of each epidemic.

Experts recommended that the CDSS supervision system should have a new standard check list and feedback system, which would give supervision its vital role in monitoring and evaluating the system. Both locality and health areas need more CDSS staff members and focal personnel are needed in the health facility level. Each hospital must have a public health office to manage notification and reporting of communicable diseases. All experts agreed that the CDSS must have a separate budget for all its activities.

Experts recommended that the CDSS should build a system for keeping the previous years' surveillance reports at all levels. Formulation of standard registry for sending and receiving times of the CDSS reports at all levels would provide a tool to measure the timeliness of the system. Experts agreed that the Khartoum CDSS is partially flexible system in adopting changes. The system was seen to be simple and highly acceptable by stakeholders in the first and second Delphi round but neither in the third round nor in individual face-to-face meetings. The entire three rounds showed that CDSS was considered to be a highly useful system.

Highly experienced experts achieved no consensus about the formulation of local punishment system for delaying the report in the recommended time. However, all agreed about formulation of local legislation that makes urgent notification of serious communicable diseases compulsory.

Research Question No 5: Differences in evaluating CDSS in developed and developing countries (Article No 1)

This review study showed that most studies from developed countries were found considering issues of surveillance quality such as completeness, timeliness, sensitivity, and usefulness of the system. In contrast, studies from developing countries were found considering issues of assessing integrated CDSS and mainly the core and supportive functions and implementation of the system; thus addressing different parts of the evaluation framework of the public health surveillance.

In developed countries, the main quality issues considered in the assessment of CDSS was the completeness of surveillance data. In USA, surveillance data completeness was found to function well for all communicable diseases (60) including meningococcal meningitis (66). Completeness was relatively low in the Netherlands for malaria (67), and tuberculosis (68); legionnaires diseases in France (82) and sexually transmitted diseases STDs in the Netherlands (69). Timeliness was another

quality indicator, which did not function well in USA (6), whereas it was found to function well for vaccine preventable diseases surveillance in Italy (70). The sensitivity of surveillance was found to function quite well in both Sweden (71) and in Japan (72). Germany addressed one of the core components of the surveillance system, which is feedback. The study found that feedback of surveillance data to physicians should be delivered on current issues of local public health importance (73). Australia added the involvement of stakeholders in the system, which is a new area for CDSS assessment (64).

In developing countries, especially in Africa, the main assessment of CDSS is the assessment of the core and supportive functions of integrated systems. Most of the assessments were done shortly after the adoption of integrated diseases surveillance and response (IDSR) strategy (74). In Ethiopia, an assessment of the CDSS was done both in 1999 (11) and in 2002 (75). This allowed Ethiopia to judge the improvement as a result of the implementation of the strategy. Mali and Ghana faced a problem of over-centralization of the system (75). Mali also faced difficulties in including the private health sector in its CDSS (75). Conflicts and civil war affected the performance of CDSS not only in the area directly affected but also in neighbouring countries by exhausting their resources. This was seen in the assessment done for both the conflict (75) and non-conflict parts of Sudan (54). The problems related to data completeness in Taiwan were similar to those found in developed countries. In Taiwan, the data were not sufficient to calculate the prevalence of varicella (62).

6. DISCUSSION

Khartoum CDSS core activities and support functions

Experts pointed out that the current sentinel sites surveillance system for communicable diseases in Khartoum is 'well functioning' (Article No 4). It provides an alternative to the population-based surveillance (76) and can provide a simple, early detection of diseases (24). This system is a suitable structure for Khartoum state whereas the idea of whole health facility surveillance is not likely to be applicable and would also be (more) costly in terms of monetary and human resources needed to run the system. The current system, if improved in its quality and representativeness, will be satisfactory and it might overcome the problem the non-representativeness of the data for the entire population at risk (31). Formulation of single surveillance systems for all communicable diseases, including all vertical communicable disease systems such as tuberculosis, leprosy, acute immuno-deficiency syndrome, poliomyelitis and measles, was not seen a wise idea as it is very hard to combine these vertical, multi-component programmes in a single system. Moreover, by combining these programmes the quality of the single surveillance system would be affected and the system resources would be exhausted. The system would gain the maximum benefits by choosing such type of surveillance system, but it is also possible that the system might miss a large portion of data by not including all the health facilities. Moreover, such type of surveillance could be beneficial and of great value if conducted for one or two diseases but not for a large list of diseases as the situation is in Khartoum state. It also needs a good link with laboratories which was completely absent in Khartoum. The sentinel system was started only for malaria and that was a perfect choice but it was not wise to generalize the idea to all other communicable diseases. Presence of many surveillance systems for disease that have special programme for prevention and control such as TB, measles, polio, AIDS etc

could be considered as a waste of resources in a country like Sudan, where the resources are limited, also this has made the system loose the benefits from being an integrated system.

Looking at Khartoum CDSS based on the pros and cons of sentinel surveillance system, it can be seen in terms of pros that: Khartoum CDSS can easily collect individual patient-related data; less costly flexible system design and sentinel sites are most suitable for diseases, which cluster in selected high-risk populations such as Malaria, and it might provide a more consistent picture of illness in a given area than routine reporting. But, Khartoum CDSS was not useful for documenting trends at lower level as no appropriate dominators were used; also as there was no other similar parallel system for communicable diseases, the system was not able to find out whether routine reporting is accurate, and neither was the data compared to the data collected from sentinel sites. Moreover, being chosen to participate in surveillance did not seem to motivate the staff to report accurately and on time - as was commented by the staff itself.

In terms of cons: Khartoum CDSS shared the sentinel sites surveillance with most of its disadvantages such as: not representative of the entire population at risk, the data they generate may not be of sufficient volume to calculate statistically significant rates and ratios important for assessing changes in health status; the population served by the sentinel facility may change, making the study of trends invalid, its data may have biased or skewed findings and not suitable for rare diseases or diseases that are reportable according to international regulations**.**

CDSS objectives in Khartoum were found to be clear and well documented at the central level only. None of the localities or health areas had written objectives although most of the respondents at these levels were fully aware of them. This shows that the system was well established but missed the documentation at the lower levels. In this respect, the CDSS in Khartoum was functioning better than other systems in the world (65). The clear written objectives at all levels of the CDSS system are an important tool to guide the success of the system. These have helped the CDSS in Khartoum to

function better than many other systems in the developed world (64) though only at the central level. Although in a decentralized system all levels must have their own roles in formulating all system functions, it still can be acceptable that the objectives of the system are formulated at the central level and disseminated to the lower levels. However, in Khartoum only the central level had clear objectives and the staff on the other levels had no written objectives of the system. This could be considered as a very serious defect in the Khartoum CDSS. Without knowing the aim of performing CDSS activities, staff may lose commitment to the system, which can result in poor CDSS quality outcome.

Most of the CDSS personnel in Khartoum at central, locality and health area levels used the standard state guidelines, which were developed in 2001 to direct their activities. However, in Khartoum as well as in some other African countries (77) the CDSS case definition manual has not been updated since 2001. This means that system guidelines do not include new emerging diseases such as SARS and avian influenza. Updated written guidelines are a very vital tool for performing perfect CDSS everywhere and more specifically in developing countries where the turnover of staff is very high and on-the-job training is not available all the time. So the presence of written updated guidelines might serve as a substitute for on-the-job training and may help in performing to keep up a good quality system.

In addition to the lack of updating the manual for disease specific case definitions, most of the studied health facilities had not even the outdated manual available, which implies that the case detection quality faces serious problems. On the other hand, continuous supervision visits, which are regularly conducted at different levels, improve this situation. Khartoum state seems to be behind the other states in Sudan, where the CDSS manual was available in all health facilities (54). Supervision will not solve the problem completely, it may help to some extent as the supervision visit might take few hours

and many issues need to be checked. Moreover, the chance for training on case definition and guidelines during the visit might be low if not absent, and most probably the training consists of oral discussion, which would not have residual effect for longer time. Updating CDSS guidelines and manuals, especially their case definitions and specimen collection, is an important challenge facing the Khartoum CDSS system.

Non-updated communicable diseases notification could be considered as another system quality defect as many new diseases need to be included. Some diseases might change their position from the list of ordinary notification to the immediate notification list, e.g. such as measles due to introduction of measles elimination concept in Sudan as a part of the global and regional policy. The system in Khartoum needs to reset the communicable diseases notification list so that it can include new emerging diseases such as SARS and avian influenza (58). This will improve the effectiveness of the system and make the system more flexible in adopting changes better than other developing countries (74).

Laboratories are a major part of the concept of IDSR which was adopted by Khartoum as the base for communicable diseases surveillance. However, the link with Laboratories network is not functioning all the time, it was regular only during outbreaks and for certain diseases that have a special programme such as malaria, TB, meningitis and AIDS. The notification of many diseases is based either on suspected or probable cases, which might question the benefit of the Khartoum CDSS for certain diseases as it might give wrong estimation of the magnitude of certain diseases. Almost all sentinel sites had well functioning laboratories. However, the laboratories in health centers and peripheral hospitals were capable of confirming only simple cases. The central hospitals were much better in confirming communicable diseases but still viral diseases were out of their capability and were done at

the state referral laboratory. Only half of the health facilities were capable of keeping the specimen, which affects the case confirmation and leads to notification of more suspected cases as well as to overestimation of cases in the state. This was similar to the situation in the other Sudanese states (54). Khartoum state CDSS needs a quick and deep intervention for its laboratories system and its link to CDSS. It should have restricted instruction regarding diagnosis of communicable diseases for notification based on lab investigation and should make that base for confirmation and notification of diseases. It is necessary sometimes, especially in immediate notification diseases list, to notify the cases without waiting for lab result. However, the system must have clear instructions to follow the lab results and come back to classify the cases either to discard or include them. The improvement of the lab services in the health facilities and building of strong collaboration between Khartoum CDSS and public health lab in Khartoum is a top priority intervention to improve the quality of the system. Otherwise the system might lose the basis of adopting the idea of integrated surveillance.

The cornerstone of the surveillance system, registration and reporting of priority diseases, was well built, since all CDSS levels in Khartoum state used the standard data reporting form. However, problems such as no update of the standard form since its establishment, but also manual data reporting, especially at lower levels– similarly to other Sudanese states (54), leading to decreased data accuracy, weaken the system. On the other hand, the CDSS concerned reporting of important communicable diseases only and was not overloaded with unnecessary data as it has been reported from some developed countries (78). Unfortunately, only the central level had access to raw data from different levels, which can be a major defect, since other lower levels were not able to use the data in comparative analysis. Modern technology such as building networks for reporting between localities and health areas would be beneficial and make the raw data more accessible.

In the integrated disease surveillance strategy, the data collected should be analyzed and used for action, especially at the health facility level (37). Decreasing amount of data analysis towards lower levels of the health system in Khartoum indicates actually a centralized system, which leads to the absence of proper scientific interpretation of the collected data. Continuous, systematic and more detailed analysis of all data reported at lower levels should be done to keep track of the disease situation in the area and to maximize and strengthen the CDSS effectiveness at lower levels. Without special attention to the lower levels, they simply become a channel for data collection instead of surveillance. In this perspective, lower levels in the Khartoum CDSS have lost the concept of surveillance as they function purely as data collectors without using data for action.

Another failure of the CDSS data analysis in Khartoum, the lack of appropriate denominator for the data analysis such as population per area in lower levels (Article No 2), means that none of the localities or health areas had a clear idea about the true magnitude of the communicable diseases in their area (except for meningitis due to the special programme). This affects the use of surveillance data to perform the recommended actions in time negatively, and it might also affect early detection of epidemics. Similarly, proper and early action for epidemics is hindered by the fact that neither health areas nor health facilities had any epidemic threshold. The absence of an appropriate dominator was another vital issue needing immediate intervention. Without knowing the true magnitude of the disease, there will be no proper action and the end result will be wrong resources allocation.

Introduction of advanced technology for the CDSS data reporting in Khartoum state at the first level – health facility level- introduction of a computer system, usage of network for sending the CDSS reports as well as provision of professional personnel or data reporting at locality level are likely to lead to increased data accuracy, strengthening the CDSS system to the levels comparable to other countries

(71, 80). Advanced technology is urgently needed; however, it might face many obstacles especially in a developing country such as Sudan in terms of available resources, manpower and its continuity.

CDSS in Khartoum state needs to improve its representativeness by inclusion of the military hospitals in the system. This would give the data the sufficient volume to calculate statistically significant rates and ratios, which are important for assessing changes in the population health status (31). The experts disagreed to include the private sector in the system. They justified this by claiming that the poor data registry in the private sector would affect the quality of the system negatively. This inclusion can be done later on if the data registry in the private sector improves. In the integrated disease surveillance strategy the data collected should be analyzed and used for action, especially at the health facility level (37). The inclusion of the private sector is of top priority for the representativeness of the system as a large portion of Khartoum population seeks health services in this sector. So the system must build a basis for surveillance in this sector as well as in the military sector. Their inclusion might face challenges in the beginning due to complicated organizational structure of these sectors and poor commitment as experts commented. However, in the course of time inclusion of these sectors might improve the quality of the whole CDSS system.

It is important that the surveillance data analysis at the first point of its collection is used for action. However, Khartoum state health facilities are not yet well prepared to perform CDSS data analysis (Article No 2); thus the analysis should be done at higher levels of the system. This would make the Khartoum system superior compared to other African countries (79, 75). Standardized, continuous, systematic and more detailed analysis of all data reported should be done by upgrading the data analysis and using appropriate dominators such as population per area to keep track of the disease situation in the area and to maximize and strengthen the CDSS effectiveness. CDSS system is useful if it contributes to the prevention and control of adverse health-related events (74). Proper data collection

but with poor data analysis, poor interpretation and absence of intervention most of the time, affects the quality of the Khartoum CDSS negatively.

Functioning epidemic management systems are a major challenge for any CDSS system (Article No 2) mainly in developing countries (54, 77, 74). The system in Khartoum needs urgent and major changes in the epidemic management system to provide the desired functions in controlling epidemics in a standard way in the state; these changes include epidemic plan, epidemic committee, rapid response team financing and epidemic reporting system. Khartoum state has experienced outbreaks of cholera and hemorrhagic fever in the period from 2005 to 2007. However, neither regular epidemic management committees nor rapid response teams were found at any level as only during epidemics meetings and teams were arranged and in most cases there were no records of the meetings. Further, lower levels of CDSS had no written epidemic management plan, which affects the effectiveness of organized response to outbreaks. In this respect, the Khartoum system is similar to some African countries (54, 41, 77). Khartoum alert and response system for epidemics is a centralized system, thus it does not function in the lower levels. This is a major problem as outbreaks must be handled immediately due to the importance of time factor in performing intervention measure all the time. Absence of basic ingredients of epidemic management at lower levels might hinder the usefulness of the Khartoum CDSS.

Monitoring and evaluation of the actions taken suffers from the absence of epidemic management documentation at lower levels of the CDSS system. Further, not knowing the defects of the epidemic response system means that the defects cannot be corrected. In addition, the central, state level stock piling of drugs and vaccines might delay a quick response to epidemics at other levels. This seems to be a common problem in most African countries (41). Further, stopping of the regular vaccination

campaign for communicable diseases such as meningitis in 2005 breaks the disease prevention chain and will lead to outbreaks in the coming years. This shows that the CDSS (in African countries) lacks proper planning as the cost of epidemics will be much more than the cost of campaigns.

It looks as if the absence of standardization and regularity of feedback in the CDSS in Khartoum makes half of the CDSS personnel rating it as non-beneficial, as extra workload and waste of time. In the absence of feedback, regular standardized supervision provides quality checks and job training, but it hampers achieving the recommended goals and is also a waste of resources within CDSS. Defective feedback system made Khartoum CDSS miss one of the major core activities. This defect might induce a problem in the commitment of the staff at lower levels as they have lost their link to higher levels. A step towards a better future of the surveillance system in Khartoum needs an updated standard regular feedback system.

The CDSS system in Khartoum has well trained and professional staff at the state level. However, in Khartoum the system is facing shortages of staff at lower levels where the staff conduct surveillance activities next to other preventive medicine activities. High work overload at those levels affects the quality of the CDSS activities. It has been pointed out that participants in the surveillance system should be properly trained for their surveillance tasks; through both initial and ongoing in-service training (81).

The CDSS system in Khartoum as well as elsewhere in Sudan has well trained and professional staff (Article No 2) at the state level (58). Both local and health area need more CDSS staff, which will increase the quality of the system as it will decrease work load, and there will be more time to make use of the collected data in performing the necessary actions. Highly experienced experts thought that no special incentives for staff are needed at the moment as there are many CDSS priority areas needing

money and because the surveillance is part of the job description of the staff. CDSS work is challenging everywhere and might be even harder in developing countries. In this respect incentives might be considered. If the staff feels that their basic needs are taken into account, they will put more time and effort in improving the system, which will then reflect positively on the quality of the system output.

Khartoum CDSS quality

The completeness of CDSS in Khartoum is facing a real problem (Article No 3). Although all health facilities had standard patient registries - in line with eight other states of Sudan (54), in Khartoum it was not possible to check whether all cases were registered, since no system for double checking of the registration was in place. Also, there was no method for continuous checking the completeness of the data received from the health facilities. The data from both private and military sectors, where a large portion of population was treated (about quarter or more of the Khartoum population), were not included in the CDSS data and neither were the CDSS data from two large teaching hospitals in the state due to complications in their organizational system. Incompleteness of the CDSS in Khartoum decreases the value of the system and it gives misleading estimation of the magnitude of CD. This affects all plans for communicable diseases prevention and control negatively as well as their recourse allocation in the state as it will be built on wrong estimations due to deficient data and that might lead to serious CD outbreaks.

Another problematic issue hindering the usefulness of the CDSS, mentioned in the expert interviews, was that the CDSS system remained passive except during epidemics when surveillance was activated and daily notification was mandated. One solution might be that the passive system would function

perfectly with high quality; it would serve as a substitute for the active surveillance, especially if it had the capability to discover epidemics on their first appearance. In this scenario, the active surveillance could be used as a tool to testing the quality of passive surveillance system. Like this many resources related to active surveillance could be saved.

The main reason for the lacking timeliness was the primitive non-electronic method of reporting. The importance of electronic reporting on timeliness has been documented (71, 83). This issue is a hard task for any developing country. Potentially the system in Khartoum might benefit more by developing a register for documentation of report trimming while trying to have simple electronic reporting at least between central level and locality and health area levels.

A public health surveillance system is useful if it contributes to the prevention and control of adverse health-related events (21). Unfortunately, the CDSS in Khartoum has to be considered as being a system of limited use as no prevention and control measures were applied to the cases reported by the system and interventions were only initiated during outbreaks. Moreover, the disease list contained symptoms, which could also be symptoms of non-communicable diseases such as watery diarrhea, bloody diarrhea and jaundice. This leads to over notification because these data are converted into a state report on the federal level of diseases such as dysentery and viral hepatitis. Incompleteness, absence of timeliness and the non-representativeness of the system were leading causes for the limited usefulness of the CDSS. Unless the CDSS uses its collected data for performing a proper action in prevention and control for any notifiable diseases, the system is hardly of any value, and further, large proportion of resources are spent for nothing. Moreover, improvement of other CDSS quality components will improve the usefulness of the system further.

The experts in the Delphi study (Article No 4) considered the CDSS to be a highly useful system as it is able to monitor communicable diseases in Khartoum state. This view is different from the opinions of the CDSS staff in our qualitative assessment of the system (article No 3). The highly experienced experts in the Delphi argued that the CDSS system despite its limited resources was able to detect and manage all epidemics in the previous year on the acceptable level of performance and that was proofed by the revision of the system records in that period (article No 2). However, this is not enough for the system to function well when epidemics occur–the system should alert and prevent the occurrence of epidemics by directing the efforts for early prevention and control.

Surveillance systems should be as simple as possible in their structure and easy to operate while still meeting their objectives (21). However, The Khartoum CDSS can be considered being too simple in its structure and operation at all levels as it used non-complicated data reporting and analysis system. However, the experts considered Khartoum CDSS to be too simple in its structure and operations at all levels as it used simple data reporting and analysis system simulating some developed countries (64). That could be considered a good point in the direction of improving its quality as well as increasing the staff commitment.

Flexible public health surveillance systems can adapt to changing information needs or operating conditions with little additional time, personnel, or allocated funds (76). The Khartoum CDSS can be classified as a partially flexible system due to the failure to adopt changes for emerging diseases such as SARS and Avian flu in its notification list. However, this flexibility is not well combined in the existing system and it mostly produces separate systems for its data management outside of the original system. Interventions need to be performed to make all changes adopting within the original system

otherwise the system will be fragmented, which affect the quality of CDSS in Khartoum State negatively.

The CDSS of Khartoum state is based on sentinel surveillance system, which provides an alternative to the population-based surveillance (76) and can provide a simple, early detection of diseases (24). However, this might mean that the data are not representative for the entire population at risk (31) and that the data generated may not be of sufficient volume to calculate statistically significant rates and ratios, which are important for assessing changes in the population health status (31). In addition, lacking data from the private and military sectors means that the CDSS in Khartoum is not a representative system. The data collected will not be beneficial for allocation of resources and for decision making, which means that the system has lost its establishment objectives.

Unfortunately, there was no other acting system to perform a capture-recapture method for assessing the sensitivity and specificity of the CDSS in Khartoum. However, since the system did not cover all health facilities we could say that the system was neither sensitive nor specific. This was due to the deficient reporting system of the laboratories, which was the only comparative system.

The major strength of Khartoum CDSS lies in its universal acceptability by the staff and it is accepted as primary source of communicable disease data in the State. The Khartoum CDSS staff is committed to the participation in the system, but the staff suffered from poor emotional and monetary motivation despite their hard work within the system; in the long run this might affect their performance and commitment for the system.

Although the high expert opinion in the Delphi study was negative towards financial incentives, these could be considered in a form or another, since they could provide a rational and fair system to encourage high quality performance for the whole CDSS. Also psychological incentives such as attractive certificates attesting well performing staff members could be considered.

Very probably also bureaucracy and funding (issues not studied in the thesis) create a major challenge in developing and implementing changes for communicable disease surveillance and response, especially in developing countries. Greater inter-agency of all system activities would probably help to overcome these problems. Fortunately, the CDSS in Khartoum is a highly supported system by the local government and has a high priority; further it receives financial support and help from many organizations including WHO and UN as well as other non-governmental organizations. Moreover, this assessment was a part of the Ministry of Health in Khartoum plan to improve the CDSS system. The Ministry agreed on all assessment steps with a promise to use the results of the assessment to improve the CDSS system. This increases the chances to succeed in implementing the recommendations developed based on the assessment.

International comparison by a review

The CDSS is an important tool in communicable diseases prevention and control. In addition, its dimensions, characteristics, challenges, and importance differ according to the context of implementation. The studies from developed countries (6, 60, 64, 66 -73) were analyzed based on the quality of the systems alone and it was not possible to judge if the core and supportive functions were working to their optimum capacity. The systems in most African countries (9-11, 54, 74, 75) are still facing major problems in core and supportive functions. Some of the systems are still over-centralized, while some lack private health sector involvement in CDSS. None of the countries mentioned in the studies reviewed had an ideal system. The strategy of integrated communicable diseases surveillance

seems to be functioning well especially in Africa, but a new evaluation may need to take place as the available one was done immediately after its implementation in most of the countries. A well functioning CDSS is a global target to achieve the goal of prevention and control of communicable diseases.

Methodological considerations

The strengths of the study

The study provided baseline information, which will help Khartoum state to strengthen the communicable disease surveillance system, which had not been assessed before.

The study provides new knowledge from all CDSS levels. Further, it provides perceptions and views of the CDSS staff, which is important as staff have a central role in delivering high quality services in health care.

Practical recommendations were suggested based on the results. However, for any recommendations to be adopted in practice, those responsible as stakeholders need to support them. This was attained in the study by carrying out a Delphi study among stakeholders to ascertain feasibility of the recommendations made. Lastly, to get a general overview, the review study done provided insight into differences in evaluating CDSS in developed and developing countries.

Further, the strengths include standard, generic WHO assessment instruments developed for the African region CDSS performance, which were also pre-tested. The instruments were also based on a WHO conceptual framework of surveillance and response systems for communicable diseases. The instruments were simple and easily understood. A high response rate gives further strength to the study.

In the focus group discussion, the participants were chosen to represent the different levels of CDSS in order to overcome selection bias. The Delphi technique, which we used was inexpensive, it

allowed the participants to feel free of pressure, and it allowed sharing of information among the participants. The Delphi technique provided a practical and acceptable way of testing the feasibility of applying the suggested recommendations. Moreover, it enabled CDSS experts to freely give their opinions about the suggested recommendations made based on the previous studies in Khartoum, to improve the CDSS system. The Delphi process supported the suggested policy recommendations but it also helped to clarify and justify many issues in the recommendations. Having different levels of experts based on the years of experience and professional expertise in the CDSS system gave more strength to our Delphi technique especially in the Sudanese context, where those in higher professional positions are the key persons for implementing the changes.

Limitations of the study

The record review study depended on secondary data, which may induce information bias. Information gathered might be incomplete due to unavailability of the documents needed for the assessment, due to inexperienced health staff in the surveillance system, and due to high turnover of health staff working in CDSS in the state. All these factors caused difficulties in conducting the assessment at this point. Further, in the focus group discussion respondents could have felt peer pressure to give similar answers, which might have affected the data obtained from the discussion. Also the focus group discussions were run in Arabic language and then translated into English, which to some extent might also have affected the data quality.

The study was conducted in Khartoum state, so the results cannot be generalized to other states in Sudan. But due to similarities in the systems, other states might benefit from certain points in the discussion of the Delphi results. Some of the experts in the Delphi study were part of the running CDSS in Khartoum; they brought into the Delphi their contextualized views, which are crucial to r the

implementation of changes in practice, but on the other hand, having no external experts probably means that some of the opinions were self-serving. Judgments from our Delphi were those of a selected group of people and may not be representative of all staff members in the CDSS. Further, translation of the instruments and Delphi questions from English to Arabic and back to English might have affected the meaning of certain statements and experts' comments. The limitations in the review study are related to different objectives and methodology in the studies making comparisons difficult; also very few studies were found in developing countries.

7. RECOMMENDATIONS

Based on the results of this study, the CDSS in Khartoum state needs to strengthen the quality, core activities and supportive functions of the surveillance (Articles No 2, 3& 4) at all levels of the health system. Formulation of clear written objectives for CDSS at all levels should be the first priority. Forming a network for reporting between localities and health areas would be beneficial and make the raw surveillance data more accessible .CDSS data are often inadequately analyzed or used to evaluate the effectiveness of intervention programmes. Thus an urgent intervention is needed to build a system of updated, advanced data analysis both for the routine surveillance and for outbreaks to make use of the large amount of data collected by the system at different levels. Furthermore, the system should build a strong collaborative link with the laboratories network. The system should implement proper documentation methods for all the CDSS data collected mainly for the urgent notification of communicable diseases and outbreaks data as well as for zero reporting. In addition, the surveillance system needs to develop a standard, regular and effective feedback system. The challenge is to respond quickly and properly to epidemics, thus formulation of standard rapid response team at all levels is the very first step in building effective epidemic preparedness in Khartoum state.

Further, strengthening of CDSS support functions in Khartoum state is needed. Adequate human resources at lower levels of the surveillance system as well as creation of incentives system, which would maintain committed personnel in the CDSS, are needed. Provision of supported, documented supervisory visits to the different levels and timely feedback might create additional support to sustain an effective CDSS that guides the public health decision making in Khartoum state.

8. CONCLUSION

In conclusion, well functioning CDSS is the basis to achieve its aim in communicable diseases prevention and control (84). The core activities and support functions components of the system (Article No 2) seem to be functioning well as the system has clear objectives and guidelines on the state level, however, it still has many defects especially on the lower levels and it is facing many challenges. Although the system looks decentralized it has a lot of issues such as data analysis and epidemic management which are centralized. The Khartoum system was poorly documented at lower levels, the system was not updated, and it lacked proper feedback system for both data reporting and supervision. The system was also facing a problem of staff shortage at lower levels. In addition, the epidemic preparedness was centrally organized and it was poorly functioning at lower levels. Further, the system had poor laboratory capacity at lower levels. Overall, the existing CDSS in Khartoum state needs to be strengthened with more effective coordination at different levels so that it can work to its optimum capacity to achieve the global goal of prevention and control of communicable diseases.

The study provided useful information about the quality of CDSS in Khartoum (Article No 3) from the point of view of the professionals and managers acting at the different levels of the CDSS. It was found that the Khartoum CDSS is in a need to implement interventions to improve the quality of the system. The CDSS staff in Khartoum recommended expansion and revision of the existing sentinel surveillance system by including private and military sectors in the reporting of CDSS; introducing an electronic reporting system either by telefax or internet at all levels of CDSS in Khartoum state; updating the CD case definition; modifying and updating the communicable disease notification list; applying intervention measures for CD; and strengthening the laboratory data documentation system.

The Khartoum CDSS staff considered the quality of CDSS (Article No 3) as poor because the system was not representative, it was incomplete, it lacked timeliness, it was partially flexible, and it had poor incentives among the staff, which led the system to be not very useful. Unless rapid and strong intervention is carried out to improve its quality, the system will not achieve its targeted goals. These challenges call for proper administrative and financial support, which need to be agreed upon locally in Khartoum state.

The results of the Delphi study (Article No 4) added strength to the recommendations based on the sub studies assessing the CDSS in Khartoum state. The Delphi panels agreed with most of the recommendations to improve the CDSS core activities, supportive functions and quality in Khartoum State. The Ministry of Health in Khartoum state can implement the produced consensus recommendations to improve the CDSS system in the future in order to achieve its targeted goals. This assessment was a part of the Ministry of Health in Khartoum plan to improve the CDSS system, This increases the chances to succeed in implementing the recommendations developed based on the assessment.

9. REFERENCES

1. Ministry of Health (Sudan). Epidemiology Department. A report of strategic plan for National Communicable Disease Surveillance in Sudan. Khartoum. 1996.
2. Preventive Medicine Department Ministry of Health Khartoum state, Sudan. Yearly integrated analysis report for year 2006. February 2007.
3. WHO. Communicable disease surveillance and response systems, a guide to planning, 2006. [Accessed February 2009]. Available from: URL http://www.who.int/csr/resources/publications/surveillance/WHO_CDS_EPR_LYO_2006_1.pdf
4. WHO. Protocol for the Assessment of National Communicable Disease Surveillance and Response Systems. Guidelines for Assessment Team. World Health Organization. Department of Communicable Disease Surveillance and Response 2001. [Accessed February 2008]. Available from:URLhttp://www.who.int/csr/resources/publications/surveillance/WHO_CDS_CSR_ISR_2001_2_EN/en/
5. WuhibT, Chorba LT, Davidiants V, Kenzie W and McNabb S. Assessment of the infectious diseases surveillance system of the Republic of Armenia: an example of surveillance in the Republics of the former Soviet Union. BMCPublic Health 2002;3(2).
6. Jajosky AR, Groseclose LS. Evaluation of reporting timeliness of public health surveillance system for infectious diseases, Bio Medical Central- Public Health 2004;4:29.
7. Coker R, Mounier J. Pandemic influenza preparedness in the Asia–Pacific region. Lancet 2006;368:886–89.
8. ounier J, Coker R. How prepared is Europe for pandemic influenza? Analysis of national plans. Lancet 2006;367:1405–11.
9. Nsubuga P, Eseko N, Wuhib T, Ndayimirije N, Chungong S, & McNabb S. Structure and performance of infectious disease surveillance and response. United Republic of Tanzania, 1998. Bulletin of the World Health Organization 2002;80(3):196-203.
10. CDC. Assessment of Infectious Disease Surveillance Uganda. 2000; 49(30):687-91.
11. WHO. Assessment of the national communicable disease surveillance and response system, Ethiopia, Weekly epidemiological record, Bulletin of the World Health Organization, 2001;76: 9–16.
12. Klaucke D, Buehler J, Thacker S, Parrish G, Trowbridge F and Berkelman R. Guidelines for Evaluating Surveillance Systems. CDC.1988;37(5):1-18.
13. WHO. Regional office for Africa. A Regional Strategy for Communicable Diseases (1999-2003). Tenth Meeting. 1998. Available from: URL http://whqlibdoc.who.int/afro/2001/AFR_RC_48_8.pdf
14. James Chin. Control of communicable diseases manual. 17th Edition .Washington : The American Public Health Association Press, Inc; 2000.:15.
15. Ghag S, Role of infection control nurse in the surveillance of nosocomial infections. Nursing Journal of India 2002;93(3):57-8.
16. WHO. Protocol for the Evaluation of Epidemiological Surveillance Systems 1997. Available from: URL http://whqlibdoc.who.int/hq/1997/WHO_EMC_DIS_97.2.pdf
17. Health Protection Agency. What is communicable diseases surveillance 2006. Available from: URL http://www.hpa.org.uk/infections/about/surveillance/surveillance_menu.htm

18. David P and Haberlen S.10 best resources for measuring population health. Health Policy and Planning Journal 2005;20(4):260-263
19. Bonita R, Beaglehole R, and Kjellstrom T. Basic epidemiology. 2nd edition. WHO. 2006.
20. Thacker SB. In Principles and Practice of Public Health Surveillance. New York: Oxford University Press, Inc; 2000. pp. 1–16.
21. CDC. Updated Guidelines for Evaluating Public Health Surveillance Systems 2001. Available from: URL http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5013a1.htm
22. South Dakota department of health. Infectious Disease Surveillance 2005. Available from: URL http://doh.sd.gov/ID/Default.aspx.
23. Losos J. Routine and sentinel surveillance methods. Eastern Mediterranean Journal of Health 1996;2(1):46-50.
24. Cameron S. Public Health surveillance for Communicable Diseases in South Australia. Public Health Bulletin, South Australia 2006;(4):2-6.
25. WHO. Report on Global Surveillance of Epidemic-prone Infectious Diseases Available from: URL http://www.who.int/csr/resources/publications/introduction/en/index4.html
26. Murray C, Lopez A, Wibulpolprasert S. Monitoring global health: time for new solutions. British Medical Journal 2004;329:1096–100. Available from: URL http://www.bmj.com/cgi/content/full/329/7474/1096
27. Anderson S, Seng C. Communicable Disease Control surveillance. NHS. April 2002 Available from: URL www.healthknowledge.org.uk
28. CDC. Sentinel surveillance method 2001. Available from: URL www.cdc.gov/drspsurveillancetoolkit/docs/SENTINELMETHOD.pdf
29. Gauci C, Fenech T, Gilles H, O'Brien S, Mamo J, Stabile I, Calleja N, Rugger F, Cuschieri L. Sentinel Surveillance: an option for surveillance of infectious intestinal disease. Eurosurveillance monthly release 2007;12(4).
30. Khartoum state Ministry of Health. Communicable disease surveillance system documentation notes. Department of Epidemiology, Ministry of Health Khartoum state 2001.
31. Khartoum state Ministry of Health .Disadvantages of sentential communicable disease surveillance system. Department of Epidemiology, Ministry of Health Khartoum state, Sudan 2001.
32. Mandl D, Overhage M, Wagner ., Lober W, Sebastiani P, Mostashari F, Pavlin JA, Gesteland H, Treadwell T, Koski E, Hutwagner L, Buckeridge L, Aller D, Grannis S. Implementing Syndromic Surveillance: A Practical Guide Informed by the Early Experience. Journal of American Medical Informatics Association 2004;(2):141-50.
33. Sultanate of Oman Ministry of Health, Priority Communicable Diseases. Community Health & Disease Surveillance Newsletter 2005;14. Available from: URL http://www.emro.who.int/emrinfo/OMA-MOH/Newsletter14-1.pdf
34. CDC. An ounce of prevention: what are the returns? (2nd ed). Atlanta, GA: Department of Health and Human Services 1999. Available from: URL www.cdc.gov/mmwr/PDF/other/ozprev.pdf
35. CDC. Impact of vaccines universally recommended for children-United States, 1990-1998. CDC 1999;48:243-8.
36. Hinman AR, Koplan JP. Pertussis and pertussis vaccine: reanalysis of benefits, risks, and costs. Journal of American Medical Informatics Association 1984;251:3109-13.
37. Pan American Health Organization. An integrated Approach to Communicable Disease Surveillance. Epidemiological Bulletin. 2000;21(1).
38. WHO. East African IDS & PHLS & EPI review meeting and data management training. 2004. Available from: URL http://www.who.int/countries/eth/news/speeches/210604/en/index.html

39. WHO. Assessment of national communicable disease surveillance and response system. WHO Mediterranean zoonoses control center information circular. 2001;52:1020-378.
40. WHO. Protocol for the Assessment of National Communicable Disease Surveillance and Response Systems, Guidelines for Assessment Teams 2001. Available from: URL http://www.who.int/csr/resources/publications/surveillance/whocdscsrisr20012.pdf
41. CDC. Integrated Disease Surveillance and Response. IDSR Update Bulletin 2003(3). Available from: URL http://www.cdc.gov/idsr/files/IDSR-Update-Bulletin/Issue3-Summer2003.pdf
42. WHO. Integrated diseases surveillance in the African region. A Regional Strategy for Communicable Diseases 1999-2003. Zimbabwe 2001. Available from: URLhttp://whqlibdoc.who.int/searo/2003/SEA_CD_130.pdf
43. WHO/AFRO. Disease Surveillance, Epidemic Preparedness and Response Progress Report on Implementation of the Plan of Action of the Abuja Declaration, December 2004. Available
44. WHO. 47th regional committee for Eastern Mediterranean. Development of communicable disease surveillance in the Region (*Technical discussions*) Cairo 2000. Available from: URL http://www.emro.who.int/RC47/AnnotatedAgenda-Item10-6.htm
45. Canadian Health Surveillance Coordinating Committee .Framework and Tools for Evaluating Health Surveillance Systems 2004. Available from: URL http://www.phac-aspc.gc.ca/csc-ccs/pdf/i_Surveillance_Evaluation_Framework_v1.pdf
46. WHO. Human and animal brucellosis epidemiological surveillance in the MZCP Countries. Report of a WHO/MZCP Workshop Damascus, Syrian Arab Republic 1998. Avaialble
47. CDC. Guidelines for evaluating surveillance systems 1988;37.
48. Teutsch S, Thacker S. Planning a Public Health Surveillance System. Epidemiological Bulletin 1995;16(1);1-6.
49. WHO. Overview of the WHO framework for monitoring and evaluating surveillance and response systems for communicable diseases. Weekly epidemiological record. 2004;79(36): 321-328. Available from: URL http://www.who.int/wer/2004/wer7936/en/index.html
50. Republic of Sudan Federal Ministry of Health, Sudan National Health Policy, 2006 Available from: URL http://www.fmoh.gov.sd/nhpcbw/Nationa%20Health%20Policy.pdf
51. WHO. Infectious Disease Risk Profile for Sudan, April 2006. Available from: URL http://62.193.78.3/sudan/media/pdf/Infectious%20Disease%20Risk%20Profile%20for%20Sudan.pdf
52. WHO. Global Alert and Response (GAR)-Sudan.2011. Available from: URL http://www.who.int/csr/don/archive/country/sdn/en/
53. Preventive Medicine Department, Ministry of Health Khartoum state, Sudan yearly integrated analysis report for year 2008. February 2009.
54. Mahdi, T F. An Interventional Study to: Strengthen the National Communicable Disease Surveillance and Response Systems in Sudan. 2003. Available from Khartoum state Ministry of Health research documents.
55. WHO. A report on country profile for world health day. Available from: URL http://www.emro.who.int/MNH/WHD/CountryProfile-SUD.htm
56. Richie J, Lewis J (Eds). Focus Groups. In Qualitative Research Practice: A guide for Social Science Students and Researchers Sage; London; 2005.
57. Bowling A: Research Methods in Health: Investigating health and health services. (2nd ed) Oxford University Press, Maidenhead. 2004.
58. Sahal N, Reintjes R, Mahgoub AE, Aro AR. Assessment of core activities and supportive functions of the communicable diseases surveillance system in Khartoum state, Sudan for the years 2005 – 2007. Eastern Mediterranean Journal of Health (in print).

59. Sahal N, Reintjes R, Mahgoub AE, Aro AR. Staff views about the quality of the communicable diseases surveillance system in Khartoum state, Sudan 2005 – 2007, as an example of developing countries. Eastern Mediterranean Journal of Health (in print).
60. Doyle T, Glynn M, and Groseclose S. Completeness of Notifiable Infectious Disease Reporting in the United States: An Analytical Literature Review. American Journal of Epidemiology 2002;155(9). [cited 2007 July]. Available from: URL http://aje.oxfordjournals.org/cgi/reprint/155/9/866.pdf
61. Jajosky A R, Groseclose L S. Evaluation of reporting timeliness of public health surveillance system for infectious diseases. BMC Public Health 2004;4:29.
62. Pillaye J, and Clarke A. An evaluation of completeness of tuberculosis notification in the United Kingdom. BMC Public Health 2003;3:31. Available from: URL http://www.biomedcentral.com/1471-2458/3/31.
63. Harpaz R. Completeness of Measles Case Reporting: Review of Estimates for the United States. Journal of Infectious Diseases 2004; 189 (Suppl 1):185–90
64. Miller, M., Roche, P., Spencer, J., and Deeble, M. Evaluation of Australia's National Notifiable Disease Surveillance System. Communicable Diseases International 2004;28:311–23.
65. Tan H, Chang C, Tseng, H, and Lin W. Evaluation of the National Notifiable Disease Surveillance System in Taiwan: An example of varicella reporting. The Journal of Vaccine 200;25(14):2630-3
66. Ackman D, Birkhead G, and Flynn M. Assessment of Surveillance for Meningococcal Disease in New York State, 1991. American Journal of Epidemiology 1996;144:78-82.
67. Klein S, and Bosman A. Completeness of malaria notification in the Netherlands 1995-2003 assessed by capture-recapture method. Euro Surveillance 2005;10:244-6.
68. Van Hest N A H, Smit F, Baars HW M, De Vries G, De Haas PEW, Westenend P.J, Nagelkerke NJD, Richardus JH. Completeness of notification of tuberculosis in The Netherlands: how reliable is record-linkage and capture recapture analysis. Epidemiology 2006;7:1-9.
69. Reintjes R, Termorshuizen F, Van De Laar MJW. Assessing the sensitivity of STD surveillance in the Netherlands: an application of the capture-recapture method. Epidemiology and Infection 1999;122:97–102.
70. Atti ML, Bella A, Arigliani R, Gangemi M, Chiamenti G, Brusoni G, and Tozzi AE. Pediatric sentinel surveillance of vaccine-preventable diseases in Italy. Pediatric Infectious Diseases Journal 2002;21:763–8.
71. Jansson A, Arneborn M, and Ekdahl K. Sensitivity of the Swedish statutory surveillance system for communicable diseases (1998–2002), assessed by the capture–recapture method. Epidemiology and Infection 2005;133:401–7.
72. Hashimoto S, Murakami Y, Taniguchi K, and Nagai M. Detection of epidemics in their early stage through infectious disease surveillance. International Journal of Epidemiology 2000;29:905-10.
73. Krause G, Ropers G, and Stark K. Notifiable Disease Surveillance and Practicing Physicians. Emerging Infectious Diseases 2005;11:442-5.
74. CDC. Integrated Disease Surveillance and Response. Integrated Disease Surveillance and Response Update Bulletin 2003. [cited 2007 September]. Available from: URL http://www.cdc.gov/idsr/
75. CDC. Integrated Disease Surveillance and Response 2005. [cited 2007 September]. Available from: URL http://www.cdc.gov/idsr/focus/advocacy/policy_briefsENG.pdf

76. Jernigan DB, Kargacin L, Poole A, Kobayashi J. Sentinel surveillance as an alternative approach for monitoring antibiotic-resistant invasive pneumococcal disease in Washington State. American Journal of Public Health 2001;91:142-5.
77. WHO. Guide for the Use of Core Integrated Disease Surveillance and Response Indicators in the African Region. 2005. [Cited 2008 September]. Available from: URL http://www.cdc.gov/idsr/files/guide.pdf
78. Tadesse W, Terence C, Vladimir D, William M and Scott M. Assessment of the infectious diseases surveillance system of the Republic of Armenia: an example of surveillance in the Republics of the former Soviet Union. Biomedical Center Public Health 2002; 2(1). [Cited 2009 January]. Available from: URL http://www.biomedcentral.com/1471-2458/2/3.
79. Weber IB.Matjila M J,Harris BN. Evaluation of the notifiable disease surveillance system in Gauteng Province, South Africa. The Afrihealth post-conference information. 2007. [Cited 2007 November 10]. Available from: URL http://upetd.up.ac.za/thesis/available/etd-07302008-141155/unrestricted/dissertation.pdf
80. Reintjes R, Thelen M, Reiche R and Csohán A. Benchmarking national surveillance systems: a new tool for the comparison of communicable disease surveillance and control in Europe. The European Journal of Public Health 2007;17(4):375-80.
81. Public Health Agency Canada. Integrated approach to communicable disease surveillance 2000. [cited 2009 January 18]. Available from: URL http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/00vol26/dr2607eb.html.
82. Nardone A, Decludt B, Jarraud S, Etienne J, Hubert B, Infuso A, and Gallay A. Repeat capture–recapture studies as part of the evaluation of the surveillance of Legionnaires' disease in France. Epidemiology and Infection 2003;131:647–54.
83. Effler P, Ching-Lee M, Bogard A, Ieong M-C, Nekomoto T, Jernigan D. Statewide system of electronic notifiable disease reporting from clinical laboratories. The Journal of the American Medical Association 1999; 282:1845–50.
84. Sahal N, Reintjes R and Aro AR. Communicable diseases surveillance lessons learned from developed and developing countries: Literature review. Scandinavian Journal of Public Health 2009; 37(2):187- 200.

APPENDICES 10.2 – 10.11

10.2. Objectives of the Khartoum CDSS:

- Guide immediate action for communicable diseases cases of public health importance.
- Measure the burden of communicable diseases including changes in related factors.
- Identification of populations at high risk.
- Identification of new or emerging infectious diseases.
- Monitoring trends of communicable diseases.
- Detection of infectious diseases epidemics.
- Guide the planning, implementation, evaluation of communicable diseases prevention and control programmes.
- Evaluation of different communicable diseases policy.
- Prioritize the allocation of resources.
- Provide a basis for epidemiologic research.

10.3: Table (1): Consensus results from written Delphi rounds

Rounds	Consensus statements (> 80%)		Non-consensus statements (<80%)	
	No of consensus statements	%	No of non consensus statements	%
First analytical round	44	93.6%	3	6.4%
Second analytical round	43	91.5%	4	8.5%
Third analytical round	39	82.9%	8	17%

10.4 SURVEILLANCE DEFINITIONS

These definitions are standardized by the WHO and as such are referred to in the guidance below.

ACCEPTABILITY: Acceptability is measured by the willingness of persons conducting surveillance and those providing data to generate accurate, consistent and timely data.

ACTIVE CASE FINDING: The process of seeking out cases or health events under surveillance (e.g. house visits by community workers to identify cases of tuberculosis, active searching of medical records to identify cases of acute hemorrhagic fever).

ATTACK RATE: The cumulative incidence of infection in a group observed over a period during an epidemic. This "rate" can be determined empirically by identifying clinical cases and/or by means of sero epidemiology. Because its time dimension is uncertain or arbitrarily decided, it should probably not be described as a rate. *(Last JM, A Dictionary of Epidemiology, 2001).*

CASE: A person who has the particular disease, health disorder, or condition which meets the case definitions for surveillance and outbreak investigation purposes. The definition of a case for surveillance and outbreak investigation purpose is not necessarily the same as the ordinary clinical definition. *(Adaptedfrom Last JM, A Dictionary of Epidemiology, 2001).*

CASE CLASSIFICATION: Gradations in the likelihood of being a case (e.g. suspected / probable / confirmed). This is particularly useful where early reporting of cases is important (e.g. Ebola hemorrhagic fever) and where there are difficulties in making definite diagnoses (e.g. specialized laboratory tests required).

CASE DEFINITION A set of diagnostic criteria that must be fulfilled for an individual to be regarded as a case of a particular disease for surveillance and outbreak investigation purposes. Case definitions can be based on clinical criteria, laboratory criteria or a combination of the two with the elements of time, place and person.

CASE-FATALITY RATE The proportion of cases of a specified condition which are fatal within a specified time. *(Adapted from Last JM, A Dictionary of Epidemiology, 2001).*

COMMUNICABLE DISEASE (SYNONYM: INFECTIOUS DISEASE): An illness due to a specific infectious agent or its toxic products that arises through transmission of that agent or its products from an infected person, animal, or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector, or the inanimate environment. (*Last JM, ed. A Dictionary of Epidemiology, 2001*).

CONTACT (OF AN INFECTION): A person or animal that has been in such association with an infected person or animal or a contaminated environment as to have had opportunity to acquire the infection. *(Last JM, A Dictionary of Epidemiology, 2001).*

EARLY WARNING SYSTEM: In disease surveillance, a specific procedure to detect as early as possible any abnormal occurrence or any departure from usual or normally observed frequency of phenomena (e.g. one case of Ebola fever). An early warning system is only useful if linked to mechanisms for early response. *(Adapted from Last JM, A Dictionary of Epidemiology, 2001).*

ELIMINATION: Reduction of case transmission to a predetermined very low level; e.g., elimination of tuberculosis as a public health problem was defined by the WHO (1991) as a reduction of prevalence to a level below one case per million population. (*Last JM, A Dictionary of Epidemiology, 2001).*

EMERGING INFECTIONS: A collective name for infectious diseases that have been identified and taxonomically classified recently. In the final quarter of the twentieth century, more than 30 such conditions, many of them capable of causing dangerous epidemics, were recognized. They include human immuno-deficiency virus (HIV) infection, Ebola virus disease, hantavirus pulmonary syndrome and other viral hemorrhagic fevers, campylobacter infection, transmissible spongiform encephalopathies, legionnaires' disease, and Lyme disease. Some appear to be "new" diseases of humans, others may have existed for many centuries and have been recognized only recently because ecological or other environmental changes have increased the risk of human infection. Re-emerging infections are certain "old" diseases, such as tuberculosis and syphilis that have experienced resurgence because of changed host-agent-environment conditions. *(Adapted from Last JM, A Dictionary of Epidemiology, 2001*).

ENDEMIC: The constant presence of a disease or infectious agent within a given geographic area or population group; may also refer to the usual prevalence of a given disease within such area or group. The expression "endemic disease" has a similar meaning. *(Adapted from Last JM, A Dictionary of Epidemiology, 2001).*

EPIDEMIC: The occurrence in a community or region of cases of an illness, specific health-related behavior, or other health-related events clearly in excess of normal expectancy. The community or region and the period in which the cases occur are specified precisely. The number of cases indicating the presence of an epidemic varies according to the agent, size, and type of population exposed, previous experience or lack of exposure to the disease, and time and place of occurrence. *(Adapted from Last JM, A Dictionary of Epidemiology, 2001).*

EPIDEMIC THRESHOLD: The number or density of susceptible persons required for an epidemic to occur (e.g. meningococcal meningitis: see exception flagging system). *(Adapted from Last JM, A Dictionary of Epidemiology, 2001).*

FEEDBACK: The regular process of sending analyses and reports about the surveillance data back through all levels of the surveillance system so that all participants can be informed of trends and performance.

FLEXIBILITY: Flexibility is a measure of the ability of the surveillance system to be easily adapted to new reporting needs in response to changes in the nature or the importance of the health event, the population monitored, or the resources available.

GENERALIZABILITY/VALIDITY/REPRESENTATIVENESS: The degree to which inference can be drawn from the information gathered by the surveillance system to the target population.

GEOGRAPHIC INFROMATION SYSTEM (GIS): An organized collection of computer hardware, software, geographical data and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information. It is first and foremost an information system with a geographical variable, which enables users to easily process, visualize and analyze data or information spatially. GIS can be used to prepare models showing trends in time and space. Satellite imaging and remote sensing have expanded its scope (e.g. to identify regions prone to malaria).

INCIDENCE: The number of instances of illness commencing, or of persons falling ill, during a given period in a specified population. *(Prevalence and Incidence. WHO Bulletin, 1966, **35**: 783-784).*

INCIDENCE RATE: The rate at which new events occur in a population. The numerator is the number of new events that occur in a defined period; the denominator is the population at risk of experiencing the event during this period, sometimes expressed as person-time. *(Adapted from Last JM, ed. A Dictionary of Epidemiology, 2001).*

NOTIFIABLE DISEASE: A disease that, by statutory/legal requirements, must be reported to the public health or other authority in the pertinent jurisdiction when the diagnosis is made. (*Adapted from Last JM, ed. A Dictionary of Epidemiology, 2000).*

NOTIFICATION: The processes by which cases or outbreaks are brought to the knowledge of the health authorities. In the context of the *International Health Regulations*, notification is the official communication of a disease/health event to the World Health Organization by the health administration of the Member State affected by the disease/health event.

OUTBREAK: An epidemic limited to localized increase in the incidence of a disease, e.g. in a village, town, or closed institution. (*Adapted from Last JM, ed. A Dictionary of Epidemiology, 2001).*

PERFORMANCE INDICATORS: Specific agreed measurements of how participants are functioning within the surveillance or reporting system. These indicators may measure both the process of reporting (e.g. completeness, timeliness) and the action taken in response to surveillance information (e.g. the percentage of cases investigated or surveyed) and the impact of surveillance and control measures on the disease or syndrome in question (e.g. the percentage of outbreaks detected by the system, the drop in the number of cases over a specified time period).

PREVALENCE: The number of instances of illness or of persons ill, or of any other event such as accidents, in a specified population, without any distinction between new and old cases. Prevalence may be recorded at a stated moment (point prevalence) or during a given period of time (period prevalence).

(Prevalence and Incidence. WHO Bulletin, 1966; 35:783-784).

PREVALENCE RATE: The total number of all individuals who have an attribute or disease at a particular time (or during a particular period) divided by the population at risk of having the attribute or disease at this point in time or midway through the period. *(Last JM, A Dictionary of Epidemiology, 2001).*

REPORTING COMPLETENESS: Proportion of all expected reports that were actually received. It is usually stated as "% completeness as of a certain date" (e.g. if of 30 administrative units in a reporting system 15 submit reports, the reporting completeness is 50%; if of 50 cases of diarrhea 40 are reported, the reporting completeness is 80%).

REPORTING SYSTEM: The specific process by which diseases or health events are reported. This will depend on the importance of the disease and the type of surveillance.

REPORTING TIMELINESS: Proportion of all expected reports in a reporting system received by a given date (due date).

SEROSURVEILLANCE: The surveillance of an infectious disease through immunological markers of the disease in a population or sub-population (e.g. measuring the presence of HIV antibodies in pregnant women coming for antenatal care).

SENSITIVITY IN SURVEILLANCE: The ability of a surveillance or reporting system to detect true health events i.e. the ratio of the total number of health events detected by the system over the total number of true health events as determined by an independent and more complete means of ascertainment.

SPECIFICITY IN SURVEILLANCE: A measure of how infrequently a system detects false positive health events, i.e. the number of individuals identified by the system as not being diseased or not having a risk factor, divided by the total number of all persons who do not have the disease or risk factor of interest.

SURVEILLANCE: The process of systematic collection, orderly consolidation and evaluation of pertinent data with prompt dissemination of the results to those who need to know, particularly those who are in a position to take action *(Adapted from Report of the Technical Discussions at the twenty-first World Health Assembly on National and Global Surveillance of Communicable Diseases, 18 May 1968 — A21/Technical Discussion/5*).

SURVEILLANCE, ACTIVE: Surveillance where public health officers seek reports from participants in the surveillance system on a regular basis, rather than waiting for the reports (e.g. telephoning each participant monthly).

SURVEILLANCE, CASE-BASED: Surveillance of a disease by collecting specific data on each case (e.g. collecting details on each case of acute flaccid paralysis in poliomyelitis surveillance).

SURVEILLANCE, COMMUNITY: Surveillance where the starting point for the notification is from community level, normally reported by a community worker. It can be active (looking for cases) or passive (reporting cases). This may be particularly useful during an outbreak and where syndromic case definitions can be used (the active identification of community cases of Ebola virus infection in Kikwit was an example of active community surveillance).

SURVEILLANCE, ENHANCED: The collection of additional data about cases reported under routine surveillance. Routine surveillance is a starting point for more specific data collection on a given health event. This information may be sought from the reporter, the case, and the laboratory or from another surveillance data set.

SURVEILLANCE, HOSPITAL-BASED: (Synonym: Hospital surveillance) Surveillance where the starting point for notification is the identification by a hospital of a patient with a particular disease or syndrome.

SURVEILLANCE, LABORATORY: Surveillance where the starting point is the identification or isolation of a particular organism in a laboratory (e.g. surveillance of salmonellosis).

SURVEILLANCE, PASSIVE: Surveillance where reports are awaited and no attempts are made to seek reports actively from the participants in the system.

SURVEILLANCE, ROUTINE: The regular systematic collection of specified data in order to monitor a disease or health event.

SURVEILLANCE, SENTINEL: Sentinel surveillance is surveillance based on the collection of data from a sample (random or non-random) of collecting sites as indicator data for the rest of the population, in order to identify cases of a disease early or to obtain indicative data about trends of a disease or health event. Examples are the use of a few hospitals to monitor the composition of influenza virus and check that the vaccine includes the right components, or the use of a network of general practitioners to monitor diseases or health events (e.g. attempted suicide, requests for HIV testing). One instance of sentinel surveillance is the use of a particular population group (e.g. monitoring the serology of syphilisor HIV infection among pregnant women as an indicator of trends in the general population). Sentinel surveillance is inappropriate for those situations where every case requires public health action, e.g,poliomyelitis. In sentinel surveillance standard case definitions and protocols must be used to ensure validity of comparisons across time and sites despite lack of statistically valid sampling. Sentinel surveillance may include the use of animal sentinels to detect circulation of arboviruses.

SURVEILLANCE REPORT: A regular publication with specific information on the disease under surveillance. It should contain updates of standard tables and graphs as well as information on outbreaks etc. In addition it may contain information on the performance of participants using agreed performance indicators.

SURVEY: An investigation in which information is systematically collected and usually carried out in a sample of a defined population group, within a defined time period. Unlike surveillance it is not ongoing; however, if repeated regularly, surveys can form the basis of a surveillance system.

SYNDROME: A symptom complex in which the symptoms and/or signs coexist more frequently than would be expected by chance on the assumption of independence. *(Last JM, ed. A Dictionary of Epidemiology, 2001).*

SYNDROMIC REPORT: The notification of a health event under surveillance for which the case definition is based on a syndrome, not on a specified disease (e.g. acute hemorrhagic fever syndrome, acute respiratory syndrome).

ZERO REPORTING: The reporting of “zero case” when no cases have been detected by the reporting unit. This allows the next level of the reporting system to be sure that the participant has not sent data that have been lost, or that the participant has not forgotten to report.

10.5 Questionnaires

MODIFIED GENERIC QUESTIONNAIRES

Assessment of communicable diseases surveillance system in Khartoum state 2005 and 2006

CENTRAL LEVEL QUESTIONNAIRE

Identifiers

Assessment team: Date:

Interviewer: Respondent:

State:

OVERVIEW QUESTIONS

1. How many surveillance systems exist at your site? _____
_____

2. What are the objectives of surveillance? _____
_____.
_____

3. What are the strengths of your surveillance systems? _____
_____
_____

4. What are the weaknesses of your surveillance systems? _____
_____
_____

General:

5. Availability of legal mechanism to enforce surveillance

5.1 Is there a mandatory surveillance for any diseases? Yes ☐ No ☐
Unknown ☐ Not applicable ☐

5.2 List diseases, ***if yes***:

……

……

……

6. Availability of a surveillance manual

6.1 Is there a manual for surveillance? Yes ☐ No ☐
Unknown ☐ Not applicable ☐

6.2 ***If yes*** describe (last update, diseases included, case definitions, surveillance and control, integrated or different for each disease): ***and registration***

……

……

Case detection and registration:

7. Existence of standardized case definitions for the state's priority diseases

7.1 Do you have standard case definitions for the state's priority diseases?

NO	Disease	Yes	No	Unknown	Not applicable
1	cholera (acute watery diarrhea)				
2	poliomyelitis (acute flaccid paralysis)				
3	plague				
4	epidemic typhus				
5	yellow fever				
6	hemorrhagic fevers				
7	neonatal tetanus				
8	malaria				
9	watery diarrhea				
10	bloody diarrhea				
11	measles				
12	diphtheria				
13	whooping cough (pertussis)				
14	pulmonary tuberculosis				
15	meningitis				
16	acute respiratory tract infection (ARI)				
17	schistosomiasis				
18	typhoid				
19	food poisoning				
20	jaundice (infectious hepatitis				
21	rabies				
22	scabies				
23	chicken box				
24	cutaneous leishmaniasis				
25	eye infections				

Data reporting:

8. Presence of recommended reporting forms in the state at all times over the past 24 months

8.1. Is the central level responsible for providing surveillance forms to the health facilities?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

8.2 ***If yes***, have you lacked appropriate surveillance forms at any time during the last 24 months?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

8.3 If "yes," please describe the reasons why?

……

……

8. 4 Who prepares the reports? Title…….

8.5 Is (are) the reporting form(s) easy to use? Yes ☐ No ☐
Unknown ☐ Not applicable ☐

8.6 If "NO," please describe the reasons why?

……

……

8.7 Is (are) the form(s) you use for reporting time consuming to complete?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

8.8 How long does it take to prepare the (weekly/monthly/quarterly) report (time period) to the higher level?

Weekly ……hrs

Monthly ……hrs

Quarterly ……hrs

9. Is there "zero reporting" (Do you submit a report even if there are no reportable cases)?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

11. Percentage of localities reports (either directly or through an intermediate level) received each reporting period at the central level during the past 24 months:

11.1 Number of reports in the last 24 months compared to expected number

N = ……/ 728 reports

11.2 If not "100% reporting," ask what the reasons for not receiving reports from lower levels: 1. Transportation not available ☐ 2. Forms not available ☐

3. Other ☐ _____

12. On time (use national deadlines)

12.1 Number of weekly reports received on time :

N = ……/ 728 reports

13. Reporting to Federal Ministry of Health

13.1. Does the Ministry of Health share surveillance data with the Federal Ministry of Health?

[Observe reports at Federal Ministry of Health's office] Yes ☐ No ☐

Unknown ☐ Not applicable ☐

14. Capacity to report to next level by e-mail, telephone, fax or radio

14.1 How do you report?

Mail ☐ Fax ☐ Telephone ☐ Radio ☐ Electronic ☐ Other ☐

15 Accuracy and completeness of the reports

15.1 Can you comment on the accuracy of reports you receive from the lower levels?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

15.2 Can you comment on the completeness of reports you receive from the lower levels?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

16. Keeping of the surveillance reports?

16.1 Does the central level keep copies of reports for the last 24 months?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

16.2 Are the numbers of previous reports for the last 24 months complete?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

16.3 Does the central level keep copies of previous reports for the last 24 months in good condition?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

Data analysis:

17. Does the central level describe data?

17.1 By person age? Yes ☐ No ☐ Unknown ☐ Not applicable ☐

17.2 By person sex? Yes ☐ No ☐ Unknown ☐ Not applicable ☐

17.3 By place?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

C17.3 By time?

Observed description of data by time Yes ☐ No ☐ Unknown ☐ Not applicable ☐

18.1 Does the central level perform trend analysis?

Observed line graph of cases by time Yes ☐ No ☐ Unknown ☐ Not applicable ☐

C18.2 List disease(s) for which line graph is observed

……

……

……..

……

19.1 Do you have an action threshold defined for any of the state priority diseases?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

19.2 If yes, list please?

……

……

20. Have you appropriate denominators?

Observed presence of demographic data (E.g. population by locality and hard to reach groups)

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

21. Use appropriate denominators?

Observed rates derived from demographic data Yes ☐ No ☐

Unknown ☐ Not applica ☐

22. Use appropriate source of denominators?

What is the source of your denominator?

……

……

Outbreak investigation:

23. Percentage of suspected outbreaks that were investigated in the past 2 years

23.1 Number of outbreaks suspected in the past 2 years

23. 2 List the diseases

……

……

Observe reports and take copies if possible

24. Investigated outbreaks in the past 2 years, percentage in which risk factors were looked for

24.1 Number of outbreaks in which risk factors were looked for

25. Investigated outbreaks in the past 2 years, percentage in which findings were used for action

25.1 Number of outbreaks in which findings were used for action

Epidemic preparedness (relevant for epidemic prone diseases):

26. Existence of a state plan for epidemic preparedness and response

26.1 Observed a written plan of epidemic preparedness and response?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

26.2.Does the plan of epidemic preparedness and response define the priority group for intervention?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

26.3 List diseases with epidemic preparedness and response plan

……

……

27. Existence of emergency stocks of drugs, vaccines, and supplies at all times in past 2 years

27.1 Has the state had emergency stocks of drugs, vaccines, and supplies at all times in past 2years?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

27.2 Observed the adequacy of stocks of drugs, vaccines and supplies at time of assessment?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

28. Experience of a shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)

28.1 Did the state experience shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

29. Existence of a standard case management protocol for epidemic prone diseases

29.1 Observed the existence of a written case management protocol for at least 1 priority disease?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

29.2 ***If yes***, list

:……..……

……

……

30. Presence of a budget line for epidemic response

30.1 Is there a budget line for epidemic response?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

30.2 If no, what activities were not performed as a result of this?

……

……

31. Does the state have a plan for maintenance of non- health essential services such as food?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

32.1. Does the state have public education materials ready for epidemic prone diseases?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

32.2 If yes list diseases

……

……

33. Does the state have community public health measures (travel, mass gathering, school closure,etc) ?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

34. Does the state have pandemic vaccination strategy?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

35. Does the state have communication strategy?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

36. Does the state have a joint work plan for epidemic prone diseases with neighbouring states?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

37. Does the state regularly and systematically test epidemic control plans at all levels?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

38. Existence of a central epidemic management committee

38.1 Observed minutes (or report) of meetings of epidemic management committee?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

39. Existence of a central rapid response team for epidemics

39.1 Does the state have a rapid response team for epidemic?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

39.2 Does the rapid response team for epidemic receive any training?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

Response to epidemics

40. Ability of the central level to respond within 48 hours of notification of most recently reported outbreak?

Observed that the central level responded within 48 hours of notification of most recently reported outbreak (from written reports with trend and intervention)

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

41. Ability of the central level to monitor mass vaccination (meningitis and yellow fever) campaign coverage evaluations

41.1 Does the central level monitor mass vaccination? Campaign coverage evaluations (Observe report to confirm; check for coverage by age group, logistics and costing)

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

41.2 If "no," please describe the reasons why not?

……

……

42. Ability of the state epidemic management committee to evaluate its preparedness and response activities

42.1 Has epidemic management committee evaluated its preparedness and response activities during the past 2 years (Observe written report to confirm)?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

Feedback

43.1 Do you produce a surveillance report or summary routinely at central level?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

43.2 Do you distribute copies to staff at this level?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

43.3 Do you distribute copies to higher levels?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

43.4 Do you distribute copies to lower levels?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

44.1 Have you received a surveillance report from a higher level?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

45. Existence of a report that is regularly produced to disseminate surveillance data

45.1 How many feedback reports has the central level produced in the last 2 years?

Observe the presence of a report that is regularly produced to disseminate surveillance data

N = ……

Supervision

46. Percentage of supervisors that made the required number of supervisory visits in the past 2 years

46.1N How many supervisory visits have you made in the last 2 years out of the recommended number?

Localities N = ……

Health area N = ……

Health facility N = …….

47. The most usual reasons for not making all required supervisory visits? (Text)

……

……

48. Do you use a guide by which you evaluate the surveillance-related activities?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

49. Is there any routine feedback system for supervision visit to lower levels?

Observe the presence of feedback reports for the last 2 years

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

Training

50. Percentage of health personnel trained in disease surveillance

What percentage of your subordinate personnel has been trained in surveillance?

N = ……..%

51. Percentage of health personnel that have received post-basic training in disease surveillance

What percentage of your subordinate personnel has received post-basic training in disease surveillance?

N = ……..%

52. Percentage of health personnel that have received basic training in epidemic management

What percentage of your subordinate personnel has received basic training in epidemic management?

N = ……..%

53. Percentage of health personnel that have received post-basic training in epidemic management

What percentage of your subordinate personnel has received post-basic training in epidemic management? N = ……..%

54. Percentage of health personnel that have received basic training in epidemic prone diseases management protocols

54.1 Percentage of health personnel that have received basic training in acute watery diarrhea management protocols? N = ……..%

54.2 Percentage of health personnel that have received training in meningitis management protocols? N = ……..%

55. Percentage of health personnel that have received basic training in epidemic prone diseases management protocols

55.1 Percentage of health personnel that have received basic training in acute watery diarrhea management protocols? N = ……..%

55.2 Percentage of health personnel that have received training in meningitis management protocols? N = ……..%

56. DISEASE-SPECIFIC SURVEILLANCE ACTIVITIES

NO	Disease	Standard case definition (Y/N) {1}	Confirm using case definition (Y/N) {2}	Confirm using laboratory (Y/N) {3}	Case investigation (Y/N) {4}	Contact tracing (Y/N) {5}	Standard reporting form (Y/N) If yes, indicate source of form {6}	Frequency of reporting {7}	Have action threshold (Y/N) {8}
1	cholera (acute watery diarrhea)								
2	poliomyelitis (acute flaccid paralysis)								
3	plague								
4	epidemic typhus								
5	yellow fever								
6	hemorrhagic fevers								
7	neonatal tetanus								
8	malaria								
9	watery diarrhea								
10	bloody diarrhea								
11	measles								
12	diphtheria								
13	whooping cough (pertussis)								
14	pulmonary tuberculosis								
15	meningitis								

NO	Disease	Standard case definition (Y/N) {1}	Confirm using case definition (Y/N) {2}	Confirm using laboratory (Y/N) {3}	Case investigation (Y/N) {4}	Contact tracing (Y/N) {5}	Standard reporting form (Y/N) If yes, indicate source of Form {6}	Frequency of reporting {7}	Have action threshold (Y/N) {8}
16	acute respiratory tract Infection (ARI)								
17	schistosomiasis								
18	typhoid								
19	food poisoning								
20	jaundice (infectious hepatitis								
21	rabies								
22	scabies								
23	chicken box								
24	cutaneous leishmaniasis								
25	eye infections.								

(1). Do you have a **standard** case definition (Y/N)? **Interviewer must verify the presence of standard case definitions from MoH, WHO**
(2). Is there someone (you or somebody else) at this site who reviews all or a sample of reported cases to see if they meet the standard case definition (Y/N)?
(3). Do you use the laboratory to confirm cases (Y/N)?
(4). Do you perform community-based investigation of individual cases?
(5). Do you perform community-based tracing of contacts of reported cases (Y/N)?
(6) Do you have MOH-designed standard reporting form (Y/N)? If "YES," indicate the source of the form
(7). How often do you report to the higher level?

(8). Do you have an action threshold (how many cases are required to initiate an action or investigation)

57. Resources

Resources	Avialable at site (Y/N)	Functioning at present (Y/N)	Use for surveillance (Y/N)	Do you experience shortages (Y/N)
Office				
Computer				
Printer				
Statistical package				
Stationery {paper, pen}				
Photocopier				
Calculator				
Telephone service				
Vehicle (type)				
Fuel for vehicle				
Motorcycle				
Public transport				

Surveillance

58. Functional computerized surveillance network

58.1 Do you have a computerized surveillance network at this level?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

58.2 Links with other levels (list)

59. Budget for surveillance

59.1 Is there a budget line for surveillance in the MoH budget?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

59.2 ***If yes***, what is the proportion: %

Surveillance co-ordination

60. Existence of a surveillance co-ordination body at MoH central level

60.1 Is there a surveillance co-ordination body at MoH central level?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

60.2*If yes*, describe its composition, function and links to various sectors including the laboratory

[Observe minutes/reports of the co-ordination committee to confirm]

60. Existence of focal unit for surveillance at MoH central level

[Observe organogramme of MoH to confirm]?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

Assessment of communicable diseases surveillance system in Khartoum state

LOCALITY QUESTIONNAIRE

The questions are preceded by suggested variable names e.g., L1.1.

Identifiers:

Assessment team: Date:

Interviewer: Respondent:

Locality: State:

OVERVIEW QUESTIONS

1. How many surveillance systems exist at your site?

_____

2. What are the objectives of your surveillance?

_____

_____

3. What are the strengths of your surveillance systems?

_____

_____

4. What are the weaknesses of your surveillance systems?

_____

_____

Percentage of localities with available surveillance manual

5.1 Is there a manual for surveillance at this site?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

5.2 ***If yes***, describe (last update, diseases included, case definitions, surveillance and Control, integrated or different for each disease): ***and registration***

……

……

……

5.3 If the manual is present is the manual easy to use?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

5.4 If the manual is present, do you guide your surveillance activity by this manual?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

5.5 If no, why not?

……

Case confirmation

6. Percentage of localities that have the capacity to transport specimens to a higher level lab

6.1 Does your locality have the capacity to transport specimens to a higher level lab?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

7. Percentage of localities with guideline for specimen collection, handling and transportation to next level

7.1 Does the locality have guidelines for specimen collection, handling and transportation to the next level?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

7.2 What are the problems and challenges facing specimens collection and transportation?……

……

7.3. Does the locality follow the specimen's results? (Watch the reports for the previous years)?

1. 2005
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

2. 2006
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

3 .2007
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

7.4. Does the locality keep the specimen's results reports? (Watch the reports for the previous years)?

1. 2005
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

2. 2006
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

3. 2007
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

7.5. Are the specimen's results reports complete?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

Data reporting

8. Percentage of sites that have recommended surveillance forms all times

8.1 Have you lacked recommended surveillance forms at any time during the last years?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

8.2 If "yes," please describe the reasons why? _____

8.3 Is (are) the reporting form(s) easy to use? Yes ☐ No ☐ Unknown ☐ Not applicable ☐

8.4 If "no," please describe the reasons why not? _____

8.5 Is (are) the form(s) you use for reporting time consuming to complete?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

8.6 How long does it take to prepare the (weekly/monthly/quarterly) report (time period) to the higher level?

Weekly ……hrs

Monthly (meningitis) ……hrs

9. 1 Who prepares the reports? Title ……

9.2 Is he trained in preparing the reports?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10.1 Has this locality always forwarded urgent notifications about notifiable diseases?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10.2 Has submission of an urgent notification ever been delayed for more than 24 hours??

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10. 3 Is there "zero reporting" (Do you submit a report even if there are no reportable cases)?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10.4 Does the locality use case investigation sheet for the recommended notifiable diseases?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10.5 Have case-based investigation reports been submitted for all cases that require submission of such reports?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10.6 Have the investigation reports always been submitted prior to the established deadline?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

11. Percentage of health areas that reported to the locality level during the past years

Number of reports received in the last years compared to expected number

1. 2005 N of weekly reports: /52 times the number of health areas

1. 2006 N of weekly reports: /52 times the number of health areas

1. 2007 N of weekly reports: /52 times the number of health areas

12. On time (use deadlines)

1. 2005 N of weekly reports submitted on time: /52 times the number of health areas

1. 2006 N of weekly reports submitted on time: /52 times the number of health areas

1. 2007 N of weekly reports submitted on time: /52 times the number of health areas

13. Percentage of localities that have means for reporting to next level

13.1 How do you report? Hand ☐ Telephone ☐ Other ☐

14. Accuracy and completeness of the reports

14.1 Can you comment on the accuracy of reports you receive from the lower levels?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

14.2 Can you comment on the completeness of reports you receive from the lower levels?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

14.4 Does the locality producing the reports use standard format from the central level?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

14.5 Does the locality keep copies of the surveillance reports?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

14.6 If yes, are the report copies complete?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

14.7 Are the reports copies kept in good condition?

1. 2005 Yes No ☐ Unknown Not applica ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

Data analysis

15. Percentage of sites that describe data by

15.1 age? Yes ☐ No ☐ Unknown ☐ Not applicable ☐

15.2 sex? Yes ☐ No ☐ Unknown ☐ Not applicable ☐

15.3 place? Yes ☐ No ☐ Unknown ☐ Not applicable ☐

16.1 Does the locality perform trend analysis?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3. 2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

16.2 List:……..

17.1 Percentage of sites that compare current with previous incidence for detection of epidemics

Observed visible line graph of cases by time for epidemic prone diseases compared with previous years

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐		☐
	Unknown	☐	Not applicable	☐
3. 2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

18. Use appropriate source of denominators

18.1 What is the source of your denominator?

.....

Outbreak investigation

19. Percentage of suspected outbreaks that were investigated in the past years

19.1 Number of outbreaks suspected in the past years

1. 2005……..

2.2006……...

3.2007……

19.2 List them

1. 2005……..

2.2006……...

3.2007……

19.3. How were the epidemic discovered?

1. 2005……..

2.2006……...

3.2007……

19.4 Has your locality ever investigated an outbreak in the past years?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

19.5 If yes when did the locality respond to the epidemic?

1. 2005

1st epidemic in …….hrs

2nd epidemic in …….hrs

2. 2006

1st epidemic in …….hrs

2nd epidemic in …….hrs

3. 2007

1st epidemic in …….hrs

2nd epidemic in …….hrs

20. Localities that investigated an outbreak, percentage that looked for risk factors

20.1 Has your locality looked for risk factors [observe in reports]

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

21 Localities that investigated an outbreak, percentage that used the data for action

21.1 Has your locality used the data for action?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3. 2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

Epidemic preparedness

22. Percentage of localities that have a plan for epidemic preparedness and response

22.1 Does the locality have a written plan of epidemic preparedness and response?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

23. Percentage of localities that have emergency stocks of drugs and supplies at all times in past years

23.1 Has the locality had emergency stocks of drugs and supplies at all times in past year?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

23.2 If no, why not?

.....

23. Observed the stocks of drugs and supplies at time of assessment List what is available:

……

24. Percentage of localities that experienced a shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)

24.1 Has the **locality** experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

25. Presence of a budget line for epidemic response or access to funds for epidemic response

25.1 Is there a budget line or access to funds for epidemic response?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

26. Percentage of localities that have an epidemic management committee

26.1 Observed minutes (or report) of meetings of epidemic management committee

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

27. Does the locality have a plan for maintenance of non-health essential services such as food?

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

28.1. Does the locality have a public education materials ready for epidemic prone diseases?

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

29. Does the locality have a plan for community public health measures?

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

30. Does the locality have epidemic vaccination strategy?

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

31. Does the locality have communication strategy?

	Yes	☐	No	☐
	Unknown	☐	Not applicab	☐

32. Does the locality have a joint work plan for epidemic with other neighboring localities?

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

33. Does the locality regularly and systematically test epidemic control plan?

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

34. Percentage of localities that have rapid response team for epidemics

34.1 Does the locality have a rapid response team for epidemics?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

34.2 Does the rapid response team for epidemics have on job training?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

Epidemic Responses

35. Percentage of sites that implemented prevention and control measures based on local data for at least one reportable disease

35.1. Has the locality implemented prevention and control measures based on local data for at least one reportable disease?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

36. Percentage of localities that achieved acceptable case fatality rates (e.g. 10% for meningococcal CSM 1% for cholera) during the most recent outbreak

36.1. Observe that the locality achieved an acceptable case fatality rate for most recent outbreak (Observe from outbreak report)

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

36.2 List diseases and case fatality rates

2005 ……

2006 ……

2007…….

37. Percentage of localities that have performed mass vaccination (meningitis) campaign

37.1. Has the locality ever performed mass vaccination campaigns?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

37.2. ***If yes***, has the locality ever calculated vaccination coverage? (Observe report to confirm)

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

38. Percentage of epidemic management committees that have evaluated their preparedness and response activities during the past year

38.1. Has epidemic management committee evaluated their preparedness and response activities during the past years? (Observe written report to confirm)

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

Feedback

39. Percentage of sites that have written report that is regularly produced to disseminate surveillance data

39.1. Do you produce a surveillance report feedback or summary routinely at locality level?

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
39.2 Do you distribute copies to staff at this level?	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

39.3 Do you distribute copies to higher levels? Yes ☐ No ☐ Unknown ☐ Not applicable ☐

39.4 Do you distribute copies to lower levels? Yes ☐ No ☐ Unknown ☐ Not applicable ☐

40.1 How many written feedback reports has the locality produced in the last years?

Observed the presence of a written report that is regularly produced to disseminate surveillance data

1.2005 ……/total number of suspected reports

2.2006 ……/total number of suspected reports

3.2007 ……/total number of suspected reports

40.2 Do you produce feedback according to state standard guidelines?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

40.3 Comment on feedback (layout, accuracy, information)

41. Percentage of sites that have received a report from a higher level during the past years on the data they have provided

41.1. How many feedback reports has the locality received in the last years?

1.2005 ……/total number of suspected reports

2.2006 ……/total number of suspected reports

3.2007 ……/total number of suspected reports

Observed at least 1 report at locality from a higher level during the past years on the data they have provided

41.2. Do you receive a report from a higher level during the past years on regular basis?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

41.3 Do you think that a feedback report from higher level is beneficial?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

41.4 If no, why not…….

Supervision

42.1 Do you have regular supervision visits from the higher levels?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

42.2 Do you have regular supervision visits to the lower levels?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

43.1 How many times have you been supervised in the last years?

1.2005 N ……./ recommended number of visits

2.2006 N ……./ recommended number of visits

3.2007 N ……./ recommended number of visits

43.2 During any of the visits, did the supervisor review your surveillance activities?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

43.3 During any of the visits did the supervisor review or discuss surveillance data with you?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐
3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

43.4 During any of the visits, did the supervisor provide feedback on your performance of surveillance?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

43.5 During any follow-up visit, did the supervisor check on implementation of previous recommendations?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

45. Of those supervised in the previous years, percentage of individuals for which the supervisor from the next higher level reviewed surveillance practices appropriate to their level

Observed supervision report or any evidence for appropriate review of surveillance practices

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

46. Percentage of supervisors that made the required number of supervisory visits

46.1. How many supervisory visits have you made in the last years to health areas?

1.2005 N ……./ recommended number of visits

2.2006 N ……./ recommended number of visits

3.2007 N ……./ recommended number of visits

46.2 How many supervisory visits have you made in the last years to health facilities?

1.2005 N ……./ recommended number of visits

2.2006 N ……./ recommended number of visits

3.2007 N ……./ recommended number of visits

46.3. The most usual reasons for not making all required supervisory visits. (Text)

Reason ……

Training

47. Percentage of health personnel (in position of responsibility) trained in disease surveillance

47.1 Have you been trained in disease surveillance? Yes ☐ No ☐ Unknown ☐ Not applicable ☐

47.2. T *If yes,* specify when, where, how long, by whom

……

48. Proportion of localities with staff trained in surveillance and epidemic management

48.1. What percentage of your personnel in the locality has been trained in surveillance and epidemic management? ……..%

49. Percentage of health personnel (in position of responsibility) that has received post basic training in disease surveillance

49.1 Have you received any post-basic training in disease surveillance?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

49.2. *If yes,* specify when, where, how long, by whom?

……

50. DISEASE-SPECIFIC SURVEILLANCE ACTIVITIES

NO	Disease	Standard case definition (Y/N) {1}	Case investigation (Y/N) {4}	Contact tracing (Y/N) {5}	Have action threshold (Y/N) {8}
1	cholera (acute watery diarrhea)				
2	poliomyelitis (acute flaccid paralysis)				
3	plague				
4	epidemic typhus				
5	yellow fever				
6	hemorrhagic fevers				
7	neonatal tetanus				
8	malaria				
9	watery diarrhea				
10	bloody diarrhea				
11	measles				
12	diphtheria				
13	whooping cough (pertussis)				
14	pulmonary tuberculosis				
15	meningitis				
16	acute respiratory tract infection (ARI)				
17	schistosomiasis				
18	typhoid				
19	food poisoning,				
20	jaundice (infectious hepatitis)				
21	rabies				
22	scabies				
23	chicken box				
24	cutaneous leishmaniasis				
25	eye infections				

51. Resources

Resources	Available at site (Y/N)	Functioning at present (Y/N)	Use for surveillance (Y/N)	Do you experience shortages? (Y/N)
Office				
Computer				
Printer				
Stationery (paper, pen)				
Photocopier				
Calculator				
Telephone service				
Fuel for vehicle				
Motorcycle				
Information Education and Communication Materials				
Spray pump				
Disinfectant				
Protection Materials				

Assessment of communicable diseases surveillance system in Khartoum state

HEALTH AREA QUESTIONNAIRE

The questions are preceded by suggested variable names e.g., L1.1.

Identifiers:

Assessment team: Date:

Interviewer: Respondent:

Health area Locality: State:

OVERVIEW QUESTIONS

1. How many surveillance systems exist at your site?

_____

2. What are the objectives of your surveillance?

_____

3. What are the strengths of your surveillance systems?

_____

_____

4. What are the weaknesses of your surveillance systems?

_____

Percentage of health areas with available surveillance manual

5.1 Is there a manual for surveillance at this site?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

5.2 ***If yes***, describe (last update, diseases included, case definitions, surveillance and Control, integrated or different for each disease): ***and registration***

……

5.3 If the manual is present is it easy to use?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

5.4 If the manual is present do you guide your surveillance activity by this manual?

Yes ☐ No ☐

Unknown ☐ Not applicable ☐

5.5 If no, why not?

……

Case confirmation

6. Percentage of health areas that have the capacity to transport specimens to a higher level lab

6.1 Does your health area have the capacity to transport specimens to a higher level lab?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

7. Percentage of health areas with guideline for specimen collection, handling and transportation to next level

7.1 Does the health area have guidelines for specimen collection, handling and transportation to the next level?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

7.2 What is the problem and challenges facing specimens collection and transportation

……

7.3. Does the health area follow the specimen's results? (Watch the reports for the previous years)

1. 2005
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

2. 2006
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

3 .2007
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

7.4. Does the health area keep the specimen's results reports? (Watch the reports for the previous years)

1. 2005
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

2. 2006
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

3 .2007
Yes No ☐
Unknown Not applica ☐

7.5. Does the specimen's results reports complete?

1. 2005
Yes No ☐
Unknown Not applica ☐

2. 2006
Yes No ☐
Unknown Not applica ☐

3 .2007
Yes No ☐
Unknown Not applica ☐

Data reporting

8. Percentage of sites that have recommended surveillance forms all times

8.1 Have you lacked recommended surveillance forms at any time during the last years?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

8.2 If "yes," please describe the reasons why? _____

8.3 Is (are) the reporting form(s) easy to use? Yes ☐ No ☐ Unknown ☐ Not applicable ☐

8.4 If "no," please describe the reasons why not? _____

8.5 Is (are) the form(s) you use for reporting time consuming to complete?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

8.6 How long does it take to prepare the (weekly/monthly/quarterly) report (time period) to the higher level?

Weekly ……hrs

Monthly (meningitis) ……hrs

9. 1 Who prepares the reports? Title ……

9.2 Is he trained in preparing the reports?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10.1 Was this health area always forwarded urgent notifications about notifiable diseases?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10.2 Has submission of an urgent notification been ever delayed for more than 24 hours?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10. 3 Is there "zero reporting" (Do you submit a report even if there are no reportable cases)?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10.4 Does the health area use case investigation sheet for the recommended notifiable diseases?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10.5 Have case-based investigation reports been submitted for all cases that require submission of such reports?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

10.6 Have the investigation reports been always submitted prior to the established deadlin ☐

1. 2005 Yes ☐ No ☐ Unknown Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

11. Percentage of health facility that reported each reporting period to the health area level during the past years

Number of reports received in the last years compared to expected number

1. 2005 N of weekly reports: /52 times the number of health facility

1. 2006 N of weekly reports: /52 times the number of health facility

1. 2007 N of weekly reports: /52 times the number of health facility

12. On time (use deadlines)

1. 2005 N of weekly reports submitted on time: /52 times the number of health facility

1. 2006 N of weekly reports submitted on time: /52 times the number of health facility

1. 2007 N of weekly reports submitted on time: /52 times the number of health facility

13. Percentage of health area that have means for reporting to next level

13.1 How do you report?

Hand ☐ Telephone ☐ Other ☐

14. Accuracy and completeness of the reports

14.1 Can you comment on the accuracy of reports you receive from the lower levels?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

Unknown Not applicable

14.2. If no, why not ……

14.3 Can you comment on the completeness of reports you receive from the lower levels?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

14.4. If no why not……

14.5 Does the health area produce the reports using standard format from the central level?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

14.6 Do the health areas keep copies of the surveillance reports?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

14.7 If yes are the report copies complete?

1. 2005 Yes ☐ No ☐
Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐
Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐
Unknown ☐ Not applicable ☐

14.8 Are the report copies kept in good condition?

1. 2005 Yes ☐ No ☐
Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐
Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐
Unknown ☐ Not applicable ☐

Data analysis

15. Percentage of sites that describe data by

15.1 age? Yes ☐ No ☐
Unknown ☐ Not applicable ☐

15.2 sex ?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

15.3 place?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

16.1 Does the health area perform trend analysis?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

16.2 List……..

……

17.1 Percentage of sites that compare current with previous incidence for early detection of epidemics

Observe visible line graph of cases by time for epidemic prone diseases compared with previous years.

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

21.2 List:……

……

18. Use appropriate source of denominators

18.1 What is the source of your denominator?

.....

Outbreak investigation

19. Percentage of suspected outbreaks that were investigated in the past years

19.1 Number of outbreaks suspected in the past years

1. 2005……..

2.2006……..

3.2007……

19.2 List them

1. 2005……..

2.2006……..

3.2007……

19.3. How were/was the epidemic discovered?

1. 2005……..

2.2006……..

3.2007……

19.4 Has your health area ever investigated an outbreak in the past years?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

19.5 If yes when did the health area respond to the epidemic?

1.2005

1st epidemic in …….hrs

2nd epidemic in …….hrs

3rd epidemic in …….hrs

2. 2006

1st epidemic in …….hrs

2nd epidemic in …….hrs

3rd epidemic in …….hrs

3.2007

1st epidemic in …….hrs

2nd epidemic in …….hrs

3rd epidemic in …….hrs

20. Health areas that investigated an outbreak, percentage that looked for risk factors

20.1 Has your health area looked for risk factors? [observe in reports]

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

21. Health area that investigated an outbreak, percentage that used the data for action (action include containing outbreak, improving surveillance, community actions)

21.1 Has your health area used the data for action? [observe in final report]

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

Epidemic preparedness

22. Percentage of health areas that have a plan for epidemic preparedness and response

22.1 Does the health area have a written plan of epidemic preparedness and response?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

23. Percentage of health area that have emergency stocks of drugs and supplies at all times in past years

23.1 Has the health area had emergency stocks of drugs and supplies at all times in past year?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

23.2 If no, why not?

.....

……..

23. Observe the stocks of drugs and supplies at the time of assessment. List what is available:

……

……

24. Percentage of health areas that experienced a shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)

24.1 Has the **health area** experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

25. Presence of a budget line for epidemic response or access to funds for epidemic response

25.1 Is there a budget line or access to funds for epidemic response?

1. 2005 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

2. 2006 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

3 .2007 Yes ☐ No ☐ Unknown ☐ Not applicable ☐

25.2 If no, why not?.....

26. Percentage of health areas that have an epidemic management committee

26.1 Observe minutes (or report) of meetings of epidemic management committee.

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

27. Does the health area have a plan for maintenance of nonhealth essential services such as food?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

28.1. Does the health area have public education materials ready for epidemic prone diseases?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

28.2 If yes list diseases

29. Does the health area have plan for community public health measures?

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

30. Does the health area have an epidemic vaccination strategy?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

31. Does the health area have a communication strategy?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

32. Does the health area have a joint work plan for epidemic prone disease with other neighboring health areas?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

33. Does the health area regularly and systematically test the epidemic control plan?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

34. Percentage of health area that have rapid response team for epidemics

34.1 Does the health area have a rapid response team for epidemics?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

34.2 Does the rapid response team for epidemic have on-job training?

Yes ☐ No ☐
Unknown ☐ Not applicable ☐

Epidemic responses

35. Percentage of sites that implemented prevention and control measures based on local data for at least one reportable disease

35.1. Has the health area implemented prevention and control measures based on local data for at least

1. 2005
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

2. 2006
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

3 .2007
Yes ☐ No ☐
Unknown ☐ Not applicable ☐

36. Percentage of health areas that achieved acceptable case fatality rates (e.g. 10% for meningococcal & 1% for cholera) during the most recent outbreak

36.1. Observe that the health area achieved an acceptable case fatality rate for most recent outbreak (Observe from outbreak report)

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

36.2 List diseases and case fatality rates

2005 ……

2006 ……

2007…….

37. Percentage of health areas that have performed mass vaccination (meningitis) campaign

37.1. Has the health area ever performed mass vaccination campaigns?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

37.2. ***If yes***, has the health area ever calculated vaccination coverage? (Observe report to confirm)

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

38. Percentage of epidemic management committees that have evaluated their preparedness and response activities during the past years

38.1. Has epidemic management committee evaluated their preparedness and response activities during the past years? (Observe written report to confirm)

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

Feedback

39. Percentage of sites that have written report that is regularly produced to disseminate surveillance data

39.1. Do you produce a surveillance report feedback or summary routinely at health area level?

	Yes		No	☐
	Unknown		Not applica	☐
39.2 Do you distribute copies to staff at this level?	Yes		No	☐
	Unknown		Not applica	☐
39.3 Do you distribute copies to higher levels?	Yes		No	☐
	Unknown		Not applica	☐
39.4 Do you distribute copies to lower levels?	Yes		No	☐
	Unknown		Not applica	☐

40.1 How many written feedback reports have the health area produced in the last years?

Observe the presence of a written report that is regularly produced to disseminate surveillance data

1.2005 ……/total number of suspected reports

2.2006 ……/total number of suspected reports

3.2007 ……/total number of suspected reports

40.2 Do you produce feedback according to state standard guidelines?

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

40.3 Comment on feedback (layout, accuracy, information)

……

……...

41. Percentage of sites that have received a report from a higher level during the past years on the data they have provided

41.1. How many feedback reports has the health area received in the last years?

1.2005 ……/total number of suspected reports

2.2006 ……/total number of suspected reports

3.2007 ……/total number of suspected reports

41.2. Have you received a report from a higher level during the past years on regular basis?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

41.3 Do you think that a feedback report from higher level is beneficial?

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

Supervision

42. Regularity of supervision

42.1 Do you have regular supervision visits from the higher levels?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

42.2 Do you have regular supervision visits to the lower levels?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

43. Supervision from higher levels in the past years

43.1N How many times have you been supervised in the last years? Observed supervision report or any evidence of supervision in last years

1.2005 N ……./ recommended number of visits

2.2006 N ……./ recommended number of visits

3.2007 N ……./ recommended number of visits

43.2 During any of the visits, did the supervisor review your surveillance activities?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

43.3 During any of the visits, did the supervisor review or discuss surveillance data with you?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

43.4 During any of the visits, did the supervisor provide feedback on your performance related to your surveillance activities?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

43.5 During any follow-up visit, did the supervisor check on implementation of previous recommendations?

1. 2005	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
2. 2006	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐
3 .2007	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

45. Of those supervised in the previous years: percentage of individuals for which the supervisor from the next higher level reviewed surveillance practices appropriate to their level

Observed supervision report or any evidence for appropriate review of surveillance practices

	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

46. Percentage of supervisors that made the required number of supervisory visits in the past years

46.1 How many supervisory visits have you made in the last years to health facilities?

1.2005 N ……./ recommended number of visits

2.2006 N ……./ recommended number of visits

3.2007 N ……./ recommended number of visits

46.2. The most usual reasons for not making all required supervisory visits. (Text)

Reason 1……

Reason 2……

Training

47. Percentage of health personnel (in position of responsibility) trained in disease surveillance

47.1 Have you been trained in disease surveillance?	Yes	☐	No	☐
	Unknown	☐	Not applicable	☐

47.2. T *If yes,* specify when, where, how long, by whom

……

48. Proportion of health area with staff trained in surveillance and epidemic management

48.1. What percentage of your personnel in the health area has been trained in surveillance and epidemic management?

……..%

49. Percentage of health personnel (in position of responsibility) that have received post-basic training in disease surveillance

49.1 Have you received any post-basic training in disease surveillance?

Yes	☐	No	☐
Unknown	☐	Not applicable	☐

49.2. ***If yes,*** specify when, where, how long, by whom?

……

……

50. DISEASE-SPECIFIC SURVEILLANCE ACTIVITIES

NO	Disease	Standard case definition (Y/N)	Case investigation (Y/N)	Contact tracing (Y/N)	Have action threshold (Y/N)
1	cholera (acute watery diarrhea)				
2	poliomyelitis (acute flaccid paralysis)				
3	plague				
4	epidemic typhus				
5	yellow fever				
6	hemorrhagic fevers				
7	neonatal tetanus				
8	malaria				
9	watery diarrhea				
10	bloody diarrhea				
11	measles				
12	diphtheria				
13	whooping cough (pertussis)				
14	pulmonary tuberculosis				
15	meningitis				
16	acute respiratory tract infection				
17	schistosomiasis				
18	typhoid				
19	food poisoning, .				
20	jaundice (infectious hepatitis)				
21	rabies				
22	scabies				
23	chicken box				
24	cutaneous leishmaniasis				
25	eye infections				

51. Resources

Resources	Available at site (Y/N)	Functioning at present (Y/N)	Use for surveillance (Y/N)	Do you experience shortages (Y/N)
Office				
Computer				
Printer				
Stationery {paper, pen}				
Photocopier				
Calculator				
Telephone service				
Fuel for vehicle				
Motorcycle				
Information education and communication materials				
Spray pump				
Disinfectant				
Protection materials				

بسم الله الرحمن الرحيم
الرحيم
وزارة الصحة ولاية الخرطوم
الإدارة العامة للطب الوقائي
بحث تقييم نظـــــــــــــــام الترصد المرضى والإبلاغ بولاية الخرطوم
إستبيان وحدات التبليغ

التاريخ :..... المتحرى :.....المستجيب .....
إسم وحدة التبليغ ..... نوع وحدة التبليغ ..... الفريق الصحى..... المحلية:.....

(1) الكـــــوادر العاملة :

عدد الكوادر	نوع الكادر	الكوادر العاملة
		المدير الطبى
		الكادر المعالج
		قسم الإحصاء
		المعمل

دليل الرصد المرضى :

(1) هل يوجد دليل الرصد المرضى ؟

(ملاحظة وجود دليل الرصد)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(2) هل الدليل الموجود مواكب ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(3) اذا كانت الاجابة بنعم أوصف الدليل الموجود من حيث تاريخ الإصدار, الامراض التي يحتويها,وجود وإكتمال تعريف الامراض القياسى:.....

(4) هل الدليل الموجود سهل الإستخدام؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(5) إذا كانت الإجابة بلا لماذا.؟

.....

(6) إذا كان الدليل موجود هل يتم إستخدامه لانشطة الرصد المرضي والابلاغ (يتم السؤال عن كيفية الإستخدام وخاصة تعريف الامراض القياسي)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(7) إذا كانت الإجابة بلا لماذا؟.....

إكتشاف وتسجيل الحالات :

(8) هل يوجد كادر مخصص لإعداد تقرير الرصد المرضى للأمراض الوبائية ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(9) نوع الكادر؟

فني إحصاء ☐ مساعد طبي ☐ أخري ☐ لا ينطبق ☐

(10) هل توجد سجلات لتسجيل المرضى ؟(ملاحظة وجود السجلات للاعوام 2005 -2006 و 2007)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(11) هل السجلات مكتملة؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(12)هل السجلات سهلة الإستخدام؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(12) هل يتم التسجيل بصورة صحيحة(ملاحظة كل وجود كل بند في المكان المخصص له) ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(14)هل يتم إعداد التقرير بطريقة صحيحة(يتم مراجعة مرضي الملاريا والتيفويد بعدد 3 تقارير إسبوعية بواقع تقرير للأعوام 2005, 2006و 2007 مع السجلات)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(13) هل يوجد تعريف قياسى للأمراض الوبائية تحت التبليغ ؟

(ملاحظة وجود تعريف قياسى مكتوب لكل الأمراض بالقائمة (أو ب)

التعريف القياسي				المرض	الرقم
لا ينطبق	غير معروف	لا	نعم		
				الإسهال المائي الحاد	
				الشلل الخو الحاد	
				الطاعون	
				حمي التايفوس الوبائي	
				الحمي الصفراء	
				الحمي النزفية	
				تتانوس حديثي الولادة	
				الملاريا	
				الاسهال المائي	
				الاسهال الدموي	
				الحصبة	
				الدفتريا	
				السعال الديكي	
				السل الرئوي	
				السحائي	
				التهاب الجهاز التنفسي	
				البلهارسيا	
				التيفويد	
				تسمم الطعام	
				اليرقان	
				السعر	
				الجرب	
				الجدري الكاذب	
				اللشمانيا الجلدية	
				الرمد	

(14) يتم تشخيص الحالات وفقاً للتعريف القياسى للأمراض الوبائية؟
هل

(يتم إختيار أحدى الأمراض الوبائية (الأسهال المائي الحاد أو السحائي) وسؤال الكادر المعالج عن كيفية تشخيصه)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

إثبات تشخيص الحالات :

(15) هل يوجد معمل عامل بالوحدة ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(16) هل للوحدة المقدرة على جمع العينات التالية :

أ/ التفاف : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

ب / البراز : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

ج/ الدم : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

د/ البول : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

ل/ سائل النخاع الشوكى : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(17) هل توجد إحتياجات جمع العينات ؟

أ/ التفاف : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

ب / البراز : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

ج/ الدم : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

د/ البول : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

ل/ سائل النخاع الشوكى : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(18) هل توجد مقدرة لحفظ العينات حتى يتم ترحيلها للمعمل المرجعى ؟

(ملاحظة وجود حاويات حفظ العينات , سلسلة تبريد بالوحدة الصحية)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(19) هل توجد بالوحدة الصحية المقدرة على ترحيل العينات للمعامل المرجعية ؟

(ملاحظة وجود وسط ناقل على مستوى الوحدة الصحية ووجود مواد التغليف التى تحتاجها العينات)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

إعـــــداد التقـــرير :

(20) هل توجد فورمات خاصة لإعداد التقرير (ملاحظة وجود الفورمات) :

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(21) هل حصل نقص فى فورمات اعداد التقرير خلال ال (6) اشهر السابقة ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

إذاكانت الإجابة بنعم لماذا .....

(22) هل تقوم الوحدة بإعداد تقرير دقيق ومطابق للسجلات ؟ (يتم ملاحظة لمرض (1) فى كل من المجموعات التالية) :

أ/ الإستئصال (الشلل الرخو الحاد) نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

ب/ التحجيم(الحصبة) نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

ج / ذا صفة وبائية (السحائي) نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

د/ ذا أهمية قصوى على الصحة العامة(الملاريا) نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(23) هل تقوم الوحدة بإرسال التقرير للمستوى الأعلى (المنطقة الصحية) بصورة منتظمة

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

عدد التقارير التى تمَّ إرسالها خلال الأعوام 2005, 2006 و 2007م من جملة المستهدف ...../.....156.

(24) هل تقوم الوحدة بإرسال التقرير للمستوى الأعلى (المنطقة الصحية) فى الوقت المحدد(مراجعة تواريخ إرسال التقارير للأعوام 2005، 2006 و 2007) ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

عدد التقارير التى تمَّ إرسالها فى الوقت المحدد خلال العامين الأعوام 2005, 2006 و 2007م من جملة المستهدف ...../.....156

(25) كيف يتم إرسال التقرير للمستوى الأعلى ؟

اليد ☐ التلفون ☐ أخرى ☐

حدد .....

(26)هل تقوم الوحدة بحفظ صور من التقرير الوبائي الأسبوعي الأعوام السابقة (2005, 2006, 2007)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(27) هل صور التقرير الأسبوع الوبائي المحفوظة للأعوام 2005, 2006و 2007 مكتملة؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(28) هل صور التقرير الأسبوع الوبائي للأعوام 2005, 2006و 2007 محفوظة بصورة جيدة؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(29) هل هنالك مشاكل فى إعداد التقرير الوبائية ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(30) أ1ذا كانت الإجابة بنعم ماهي؟.....

(31) كيف يتم تجويد إعداد التقرير الوبائى ؟

.....

تحـــــــليل المعـــــــلومات :

(32) هل يتم تصنيف الحالات حسب ؟(يتم بمراجعة دفاتر التسجيل)

أ/ العمر: نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

ب/ الجنس : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

د/ السكـن : نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(33) هل توجد عتبة للوباء للأمراض ذات الصفة الوبائية ؟

(يتم ملاحظة وجود عتبة الوباء لكل الأمراض تحت طائلة الأسبوع الوبائى)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(34) إذا كانت الإجابة بنعم إذكر الأمراض.....

(35) هل توجد معلومات أساسية تساعد على حساب نسب ومعدلات الإصابة والوفاة ؟

(سكان أقل من خمسة سنوات ، السكان حسب الموقع السكنى ، عدد السكان الكلى للمنطقة)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

الإستعداد المبكر لإحتواء الأوبئة :

(36) هل توجد لستة مكتوب بأمراض القائمة (أ)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(37) هل الوحدة تعرف أهمية امراض القائمة (أ) ؟

يتم بالسؤال عن أمراض القائمة (أ) بالتفصيل

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(38) هل تقوم الوحدة بالإبلاغ عن أمراض القائمة (أ) ؟

(يتم بمراجعة السجلات للعامين السابقين)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(39) هل الوحدة تعمل بنظام التقريرالصفري لإمراض القائمة (أ)؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(40) أذا كانت الإجابة بنعم ماهي الأمراض المبلغ عنها)

.....

(41) هل يوجد بروتوكول قياسى لعلاج الحالات مكتوب للأمراض ذات الصفة الوبائية(ملاحظة وجود البرتكولات) ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

إذا كانت الإجابة بنعم ماهي البروتوكولات الموجودة

.....

الإستجابة للأوبئـــــة :

(42) هل وصلت الوحدة للحد المقبول لمعدل الوفيات خلال آخر وباء (1% للإسهال المائى الحاد) ؟ (مراجعة تقرير آخر وباء)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

التغذية الراجعة :

(43) هل تصل الوحدة الصحية تقارير تغذية راجعة من المستويات العليا (المنطقة الصحية) ؟

(يتم ملاحظة وجود تقارير تغذية راجعة)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

عدد التقارير المستلم خلال الاعوام السابقة من جملة المستهدف ...../156

(44) هل تقوم الوحدة الصحية بحفظ تقارير التغذية الراجعة

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(45) هل صور تقارير التغذية الراجعة مكتملة؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

عدد التقارير المحفوظة من جملة المستهدف ...../156

(46) هل تقارير التغذية الراجعة محفوظة بصورة جيدة؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

الإشـــــــــــراف :

(47) هل هنالك زيارات إشرافية دورية من المستويات العليا ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(48) عدد الزيارات الإشرافية من المستويات العليا من جملة المستهدف خلال الاعوام 2005, 2006 و 2008

الرئاسة .....

المحلية .....

الفريق الصحى .....

(49) هل يقوم ا لمشرف بمراجعة نظام الرصد المرضى والإبلاغ ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(50) هل يوجد نظام إفادة راجعة للزيارات الإشرافية (ملاحظة وجود إفادة راجعة من المستويات العليا لنتائج الإشراف ؟)

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

(51) هل يقوم المشرف بمراجعة تنفيذ تكاليف الإشراف السابق؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

التـــــدريب :

(52) هل الكوادر بالوحدة الصحية مدربة تدريباً أساسياً على نظام الرصد المرضى والإبلاغ ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

عدد الكوادر المدربة من جملة المستهدف .....

(53) هل الكوادر بالوحدة الصحية مدربة تدريباً تنشيطى على نظام الرصد المرضى والإبلاغ ؟

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

عدد الكوادر المدربة من جملة المستهدف .....

(54) هل الكوادر بالوحدة الصحية مدربة على بروتوكول علاج الحالات القياسى للأمراض ذات الصفة الوبائية ؟

أ/ سحـــــائى :

نعم ☐ لا ☐ غير معروف ☐ لا ينطبق ☐

ب/ اسهال مائى حاد :

نعم ☐ **لا** ☐ **غير معروف** ☐ **لا ينطبق** ☐

عدد الكوادر المدربة من جملة المستهدف .....

موارد ومعينات العمل :

(55) هل توجد بالوحدة الصحية موارد ومعينات العمل التالية :

الرقم	نوع المورد	نعم	لا	غير معروف	لاينطبق
.1	كهرباء				
.2	وسيلة حركة				
.3	تلفون				
.4	آلة حاسبة				
.5	جهاز كمبيوتر				
.6	طابعة				
.7	بوسترات تثقفية				
.8	طلمبة رش				
.9	مواد مطهرة				
.10	وسائل حماية				

نظـــام الرصد المرضى :

(56) هل أنت راضى عن نظام الرصد المرضى والإبلاغ ؟

نعم ☐ **لا** ☐ **غير معروف** ☐ **لا ينطبق** ☐

إذا كانت الإجابة بلا لماذا ؟ .....

(57) ما هى مشاكل نظام الرصد المرضى والإبلاغ ؟

.....

.....

(58) كيف يتم تجويد النظام الرصد المرضى والإبلاغ ليقوم بمهامه على الوجه الأكمل ؟

.....

.....

(59) هل أنت راضي عن عملك كشخص محوري لنظام الرصد المرضي والابلاغ(Job satisfaction):

نعم ☐ **لا** ☐ **غير معروف** ☐ **لا ينطبق** ☐

(60) إذا كانت الاجابة بلا لماذا؟

.....

....

10.6 In-depth interview guide

Assessment of communicable diseases surveillance system in Khartoum state research

Interview

\Project Title: Assessment of communicable diseases surveillance system in Khartoum state
Project Dates: 2005-2007
Method: interview
Topic: communicable diseases surveillance system
Principal Investigator(s): Dr. Sahal N H, MBBS, MPH, University of Southern Denmark .

Total interview time: 1 hour

OVERALL QUESTIONS TO ANSWER IN THE INTERVIEW:

The purpose of the study is to describe and assess the functions and activities of communicable diseases surveillance system in Khartoum State in 2005- 2006.
Specifically, the study aims to answer the following questions:
Q1: To what extent does the integrated communicable diseases surveillance system in Khartoum State achieve its core and support activities?
Q2: Did the standard quality requirements fit in the integrated communicable diseases surveillance system in Khartoum State?
Q3: What are the gaps, opportunities and resources needed for performing the core and support functions of integrated communicable diseases surveillance system in Khartoum State?
Q4: To what extent is it feasible to implement the improved communicable diseases surveillance system in Khartoum state based on analysis and feedback from stakeholders?

I am Dr.Nagla Hashim Sahal, a PhD student in the University of Southern Denmark, and this research (assessment of communicable diseases surveillance system in Khartoum state) is a part of PhD progamme.

As you are one of the influencal stakeholders for the communicable diseases surveillance in Khartoum state, I would be grateful for your valuable comments by answering the following interview questions:

Date……. Respondent……

Position……..

Address……

Interview questions:

1. Is the communicable diseases surveillance system in Khartoum state a decentralized system?

2. Does the communicable diseases surveillance in Khartoum state system fulfill its objectives?

3. What do you think about the objectives of the surveillance system, do they have a clear objective?

4. Do you think the communicable disease surveillance is a well-organized system?

5. Does the communicable diseases surveillance system in Khartoum state have clear and informative guidelines?

6. Is the communicable diseases system in Khartoum state well documented?

7. Is the communicable diseases surveillance system in Khartoum state an updated system?

8. Is the communicable diseases surveillance system in Khartoum state a flexible system?

9. Are the collected communicable diseases surveillance data in Khartoum state well analyzed?

10. Is the communicable diseases surveillance system feedback in Khartoum state, as it is now, beneficial?

11. Do we have a well functioning notification system for epidemic prone diseases in Khartoum state?

12. Do we respond well to the epidemics in Khartoum state?

13. Do we have a well-organized epidemic response system in Khartoum state?

14. Does the communicable diseases system in Khartoum state use a well functioning financing system?

15. What are the strong points of the communicable diseases surveillance system in Khartoum state?

16. What are the weak points in the communicable diseases surveillance system in Khartoum state ?

Thanks for your cooperation

10.7 Focus group discussion guide

Assessment of communicable diseases surveillance system in Khartoum state research
Focus group discussion guide

Project Title: Assessment of communicable diseases surveillance system in Khartoum state
Project Dates: 2005-2007
Method: Focus group
Topic: Communicable diseases surveillance system
Target Audience:

1. Directors of PHC, preventive medicine, and communicable diseases surveillance system at locality level.
2. Head of health area and preventive medicine coordinator at the level of health area

Principal Investigator(s): Dr. Sahal N H, MBBS, MPH, University of Southern Denmark.
Instrument Title: Discussion Guide: Focus Group I: Topic Generation

Total focus group time:	2 hours and 45minutes
Break:	15 minutes

OVERALL QUESTIONS TO BE ANSWERED IN THE FOCUS GROUP DISCUSSIONS:

The purpose of the study is to describe and assess the functions and activities of communicable diseases surveillance system in Khartoum State in 2005- 2006.
Specifically the study has the following questions to be answered:
Q1: To what extent does the integrated communicable diseases surveillance system in Khartoum State achieve its core and support activities?
Q2: Did the standard quality requirements fit in the integrated communicable diseases surveillance system in Khartoum State?
Q3: What are the gaps, opportunities and resources needed for performing the core and support functions of integrated communicable diseases surveillance system in Khartoum State?
Q4: To what extent is it feasible to implement the improved communicable diseases surveillance system in Khartoum state based on analysis and feedback from stakeholders?

Below is a general guide for leading our focus groups. We may modify this guide as needed as each focus group will inform the subsequent groups.

Introduction (10 minutes)

- Welcome the participants and introduce yourself.
- Explain the general purpose of the discussion and why the participants were chosen.
- Discuss the purpose and process of focus groups
- Explain the presence and purpose of recording equipment and introduce observers.
- Outline general ground rules and discussion guidelines such as the importance of everyone speaking up, talking one at a time, and being prepared for the moderator to interrupt to assure that all the topics can be covered.

- Review breaks schedule and where the restrooms are.
- Address the issue of confidentiality.
- Inform the group that information discussed is going to be analyzed as a whole and that participants' names will not be used in any analysis of the discussion.
- Read a protocol summary to the participants.

Discussion Guidelines:

We would like the discussion to be informal, so there's no need to wait for us to call on you to respond. In fact, we encourage you to respond directly to the comments other people make. If you don't understand a question, please let us know. We are here to ask questions, listen, and make sure everyone has a chance to share.

If we seem to be stuck on a topic, we may interrupt you and if you aren't saying much, we may call on you directly. If we do this, please don't feel bad about it; it's just our way of making sure we obtain everyone's perspective and opinion is included.

We do ask that we all keep each other's identities, participation and remarks private. We hope you'll feel free to speak openly and honestly.

As discussed, we will be tape recording the discussion, because we don't want to miss any of your comments. No one outside of this room will have access to these tapes and they will be destroyed after our report is written.

(If assistants present) Helping are my assistants _____ and _____. They will be taking notes and be here to assist me if I need any help.

Issues for focus group exploration:

1. Communicable diseases surveillance general overview:
    - objectives
    - organization
    - guidelines
    - documentation
    - update
    - sentinel site
    - strengths
    - weakness
2. Communicable diseases surveillance data reporting analysis:
    - method of data collection
    - timing
    - frequency
    - distribution
    - accuracy and completeness
    - method of data analysis (feedback)
    - graphic presentation

3. Epidemic preparedness and response:
    - notification system
    - case confirmation
    - planning
    - case management

4. Supervision system
    - methods
    - frequency
    - analysis
    - feedback
    - benefits
5. Training:
    - type
    - timing
6. Logistics:
    - financing
    - communication
    - transportation
    - health education material
    - IT services
    - programme materials and guidelines (availability, simplicity, and quality)
7. Human resources
    - staffing
    - adequacy
    - training
    - motivation
    - relations

Focus group discussion questions:

1. Communicable diseases surveillance general overview:

    - Is the system really decentralized
    - Does the system fulfil its objectives
    - What do you think about the objectives of the surveillance system, do they have a clear objective?
    - Do you think the communicable disease surveillance is well organized?
    - Does the system have clear and informative guidelines?
    - Is the system well documented?
    - Is the system updated?
    - Are the sentinel sites well chosen?
    - What are the system's strong points?
    - What are the system's weak points?
2. Communicable diseases surveillance data reporting analysis:
    - What do you think about the method of data collection?

- What do you think about the role of the locality and health area in following the reports?
- Are the collected communicable diseases surveillance data well analyzed?
- Is the feedback as it is now beneficial?
- How can we improve the feedback?
- Is the collected data used for action?

5. Epidemic preparedness and response:
    - Do we have a well functioning notification system for epidemic prone diseases?
    - Do we respond well to the epidemic?
    - Do we have a well organized epidemic response system
6. Supervision system
    - What do you think about the communicable diseases surveillance supervision system (frequency, benefits, feedback)?
7. Training:
    - Does the communicable diseases surveillance system have a suitable well functioning training system?
8. Logistics:
    - Does the system have a good financing system?
    - Does the system have well functioning communication method
    - What about the transportation method?
    - Does the system have the recommended health education material?

9.Human resources

- Does the system have enough staff at all the levels?
- Is the staff well trained at all the level?
- Do you think the staff is well motivated?
- What about presence of the system at the locality and health area levels (sense of teamwork)?

Closing (5 minutes)

- Closing remarks
- Thank the participants.

10.8 Delphi instrument

University of Southern Denmark

Faculty of Health Sciences

Unit For Health Promotion Research

&

Khartoum State Ministry of Health, Sudan

Assessment of communicable diseases surveillance system In Khartoum State, Sudan

Delphi questionnaire

Name:.....

Occupation:.....

Contact information

Address……

Phone number……

E-mail:……

Dear respondent:

The present study is part of the of the assessment of communicable diseases surveillance system in Khartoum state, Sudan, aiming to identify to what extent it is feasible to implement the improved communicable diseases surveillance system in Khartoum state based on analysis and feedback from stakeholders. This study builds upon the results of the assessment of the CDSS conducted in Khartoum state in the period from 2005 to 2007.

Our objective is to help the Ministry of Health in Khartoum state to implement the changes required to strengthen the CDSS based on the feedback from stakeholders. This Delphi survey is sent to you as one of the stakeholders. We kindly ask you, as a member of the Delphi panel, to help us by giving your opinion on the different issues presented in the questionnaire.

Instructions:

1. Please provide an answer to each statement and make comments on any issue you wish.
2. If you are not informed about the specific issue in one or more of the below questions, please state this in the comments.
3. If you agree with any statement but it cannot be implemented, please state that in the comments parts.
4. We use a 5-point scale for rating the answers; please choose only one score for each question.
5. The structure of the questionnaire is based on the recommendations of the assessment of the CDSS.
6. For further information please contact Dr. Nagla Hashim Sahal; E-mail: nhsahal@health.sdu.dk

   Please note that your identity will remain concealed – only I as the main researcher have access to your personal information. The results from the survey will be summarized and sent back to you on aggregate level meaning proportions of different reply categories. Thus there will be three written rounds and later one, smaller face-to-face round.

- We will send you a summary report of our Delphi study when the study is ready.

Please state to what extent you agree with the following statement:

1. Type of communicable diseases surveillance system:

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
1.1	Changing the system from sentinel to whole health facilities surveillance system should be mandatory	☐	☐	☐	☐	☐
1.2	Khartoum state must formulate a single surveillance system for the whole communicable diseases, meaning including all vertical communicable diseases system such as TB, leprosy, HIV, STIs polio, measles	☐	☐	☐	☐	☐

Comments:

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2. Communicable diseases surveillance system (CDSS) objectives:

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
2.1	Khartoum CDSS must formulate an updated written clear objectives	☐	☐	☐	☐	☐
2.2	The objectives must be formulated centrally and disseminated to the lower levels	☐	☐	☐	☐	☐

Comments:

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3. Priority communicable diseases for surveillance in Khartoum state:

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
3.1	Re-setting the list of priority diseases for surveillance should be mandatory	☐	☐	☐	☐	☐

Comments:

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4. CDSS standard guidelines:

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
4.1	A newly updated standard guideline of CDSS surveillance is needed	☐	☐	☐	☐	☐
4.2	There is an urgent need to update the diseases notification list	☐	☐	☐	☐	☐
4.3	Formulation and dissemination of standard specimen guidelines to all levels of CDSS is needed	☐	☐	☐	☐	☐
4.4	An updated version of the case definition of communicable diseases is needed	☐	☐	☐	☐	☐

Comments:

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5. Data reporting

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
5.1	Introduction of computer system for data reporting at health facility level is needed	☐	☐	☐	☐	☐
5.2	Using a network for sending of the report at different levels is needed	☐	☐	☐	☐	☐
5.3	Provision of statisticians for data reporting at locality levels is needed	☐	☐	☐	☐	☐
5.4	Provision of monetary incentive for data reporter at health facility level is needed	☐	☐	☐	☐	☐
5.5	Inclusion of all military health facilities in the CDSS in Khartoum state is needed	☐	☐	☐	☐	☐
5.6	Inclusion of all private clinic and hospitals in the system is needed	☐	☐	☐	☐	☐
5.7	Strengthening the zero reporting system should be mandatory	☐	☐	☐	☐	☐
5.8	Formulation of standard archive system of CDSS reports at all levels for proper keeping of the previous reports is needed	☐	☐	☐	☐	☐
5.9	Formulation of a standard registry for sending and receiving times of the CDSS reports at all levels should be mandatory	☐	☐	☐	☐	☐
5.10	Formulation of local punishment regulatory system for delaying of the report at the recommended time is needed	☐	☐	☐	☐	☐

Comments:

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6. Urgent notification

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
6.1	Urgent notification of serious communicable diseases should be compulsory by local legislation at all levels.	☐	☐	☐	☐	☐

Comments:

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7. Data Analysis

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
7.1	Introduction of communicable diseases data analysis at health facility level should be mandatory	☐	☐	☐	☐	☐
7.2	Formulation of standard data analysis at all the levels of CDSS should be mandatory	☐	☐	☐	☐	☐
7.3	Upgrading the data analysis from simple rates and ratioS to higher levels is needed	☐	☐	☐	☐	☐
7.4	Using Geographical information system (GIS) for data analysis at the central and locality levels would improve the system	☐	☐	☐	☐	☐
7.5	Using the collected data for performing real action to prevent and control of communicable diseases should be mandatory	☐	☐	☐	☐	☐
7.6	Using population per area as the appropriate denominator for data analysis for all diseases at health area, locality and central level should be mandatory	☐	☐	☐	☐	☐

Comments:

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8. Epidemic preparedness

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
8.1	Updated standard epidemic management plan at all levels is needed	☐	☐	☐	☐	☐
8.2	Specialized epidemic management committee is needed at central level	☐	☐	☐	☐	☐
8.3	Formulation of standard trained rapid response team at central and locality level should be mandatory	☐	☐	☐	☐	☐
8.4	Existence of emergency stocks of drugs, vaccines, and supplies at all central and locality levels ready all times should be mandatory	☐	☐	☐	☐	☐
8.5	Special separate budget should be available every year for epidemic management at the central level at the time of suspecting epidemics	☐	☐	☐	☐	☐

Comments:

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9. Epidemic response

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
9.1	Epidemic response must be done at lower levels supported by the central level	☐	☐	☐	☐	☐
9.2	Standard epidemic reporting system must be established at all levels	☐	☐	☐	☐	☐
9.3	Formulation of standard trained rapid response team at central and locality level is needed	☐	☐	☐	☐	☐
9.4	Updated protocol for standard management of epidemic prone diseases such as meningitis and cholera hemorrhagic fever is needed	☐	☐	☐	☐	☐
9.5	Evaluation of epidemic response after the end of each epidemic is needed	☐	☐	☐	☐	☐

Comments:

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10. Feedback

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
10.1	New informative standard feedback system at all levels is needed	☐	☐	☐	☐	☐

Comments:

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11. Supervision

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
11.1	New standard supervision check list is needed at all levels	☐	☐	☐	☐	☐
11.2	Supervision feedback system is needed at all levels	☐	☐	☐	☐	☐

Comments:

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12. Human recourses

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
12.1	The number of staff at both locality and health area must be increased					
12.2	Focal CDSS personnel at health facilities is needed					
12.3	Public health office must be formulated at each hospital to manage the notification and reporting of communicable diseases					
12.4	Special incentives for all CDSS personnel would influence positively the quality of the CDSS					

Comments:

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13. General issues:

		Completely agree	Agree	Neither agree nor disagree	Disagree	Completely disagree
13.1	The CDSS must have a budget					
13.2	CDSS of Khartoum state needs to be more flexible in adopting changes					
13.3	CDSS of Khartoum state is a highly acceptable system by stakeholders					
13.4	CDSS of Khartoum state is a too simple system					
13.4	CDSS of Khartoum state is a highly useful system					

Comments:

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14.1 Which are the strongest points of Khartoum CDSS? Please provide a list and give the strongest point number one, the second strongest number 2 etc.

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15.1Which are the weakest points of CDSS in Khartoum state? Please provide a list and give the weakest point number one, the second weakest number 2 etc.

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16.1 In case there is lack of resources, which actions would you prioritize, please provide a list in the order of importance: the most important number one, etc

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Thanks for your consideration, time and great help.

Communicable diseases case definitions

10.9 COMMUNICABLE DISEASE TOOLKIT

SUDAN

1. ACUTE LOWER RESPIRATORY INFECTIONS (ALRI) CHILDREN AGED UNDER 5 YEARS

Case definition Clinical case definition

"Pneumonia" is used at government health facilities as an action-oriented classification for management purposes according to both the ALRI and IMCI guidelines. It is therefore likely to include lower ARI clinically presenting with similar signs and symptoms, such as pneumonia, bronchiolitis and bronchopneumonia.

The classification of cases aged under 5 years according to the national IMCI guidelines, which differ slightly from the ALRI guidelines, is as indicated below.

Children aged 2 months up to 5 years:

- **Pneumonia**
  Symptoms: Cough or difficult breathing; **and**
  Signs: 50 or more breaths per minute for infants aged 2 months up to 1 year, *or*
  40 or more breaths per minute for children aged 1 up to 5 years old;
  and
  No general danger signs, chest indrawing or stridor in a calm child.
- **Severe pneumonia or very severe disease**
  Symptoms: Cough or difficult breathing **and** any general danger signs or chest indrawing or stridor in a calm child.
  General danger signs *:* unable to drink **or** breastfeed; vomits everything; convulsions; lethargic or unconscious.

Infants aged under 2 months:

Severe cases in young infants are classified broadly as " **Possible serious bacterial infection** ", based on the presence of any of 16 signs or symptoms, among which are also respiratory signs such as fast breathing (60 or more breaths per minute), severe chest indrawing, nasal flaring, grunting and wheezing. Other signs include also fever or low body temperature, typical signs of infection (ear and skin), danger signs and feeding problems.

General danger signs*:* unable to drink or breastfeed; vomits everything; convulsions; lethargic or unconscious.

Source: *National guidelines on Integrated Management of Childhood Illness – IMCI* (revised in 2001).

BACILLARY DYSENTRY (SHIGELLOSIS)

Case definition Case classification

Suspected: Diarrhoea with visible blood in the stools.

Confirmed: A case corresponding to the clinical case definition with isolation of *Shigella* from stools.

CHOLERA

Case definition A cholera outbreak should be suspected if:

A person aged older than 5 years develops severe dehydration or dies from ac ute watery diarrhoea (clinical case definition);

or

There is a sudden increase in the daily number of patients with acute watery diarrhoea, especially patients who pass the "rice water" stools typical of cholera.

Confirmed case:

Isolation of *Vibrio cholerae* O1 or O139 from stools in any patient with diarrhoea.

DIARRHOEAL DISEASES (OTHERS)

Infectious agent Bacteria: such as *Salmonellae* (commonly S. *enteritidis, S. typhimurium)* and *Escherichia coli.* The bacteria that cause the most severe outbreaks are *Shigella dysenteriae* type 1 and *Vibrio cholerae (* see *Bacillary dysentery* and *Cholera).*

Protozoa: such as *Entamoeba histolytica, Giardia lamblia* and *Cryptosporidium parvum.*

Viruses: such as Rotavirus and Norwalk virus.

DIPHTHERIA

Infectious agent

Bacterium: *Corynebacterium diphtheriae*

Case definition Clinical description

Upper respiratory tract illness with laryngitis or pharyngitis or tonsillitis
plus
adherent membranes of tonsils or nasopharynx.
Laboratory confirmation: isolation of C. *diphtheriae* from a clinical specimen.
Case classification
Suspected case: not applicable.
Probable case: a case that meets the clinical description.
Confirmed case: a probable case confirmed by laboratory or epidemiologically linked to a laboratory-confirmed case.
Carrier: presence of C. *diphtheriae* in nasopharynx, no symptoms.
***Note** : Persons with positive* C. diphtheriae *identification who do not meet the clinical description (e .g . asymptomatic carriers) should not be reported as probable or confirmed cases.*

EBOLA HAEMORRHAGIC FEVER

Case definition Clinical description

Presentation may be very nonspecific. Initial symptoms include acute fever, diarrhoea that can be bloody (referred to as *diarrhee rouge* in francophone Africa) and vomiting. Headache, nausea and abdominal pain are common. Conjunctival injection, dysphagia and haemorrhagic symptoms (nosebleeds, bleeding gums, vomiting of blood, blood in stools, purpura) may further develop. Some patients may show a maculopapular rash on the trunk. Dehydration and significant wasting occur as the disease progresses. At a later stage, frequent involvement of the central nervous system occurs, manifested by somnolence, delirium or coma. The case-fatality rate ranges from 50% to 90%.

Laboratory criteria:

Confirmation

Positive ELISA antigen detection or IgM capture, or
Positive virus isolation (only in a laboratory of Biosafety Level 4), **or**
Positive skin biopsy (immunohistochemistry), **or**
Positive PCR with sequence confirmation.

Case classification*:

Suspected: a case that is compatible with the clinical description.

Probable (in epidemic situation):

Any person having had contact with a clinical case and presenting with acute fever, **or**
Any person presenting with acute fever and three of the following symptoms: headache, vomiting/nausea, loss of appetite, diarrhoea, intense fatigue, abdominal pain, general or articular pain, difficulty in swallowing, difficulty in breathing, hiccups, **or**
Any unexplained death.

Confirmed: Any suspected or probable case that is laboratory-confirmed.
Contact (in epidemic situation): An asymptomatic person having had physical contact within the past 21 days with a confirmed or probable case or his/her body fluids (e.g. care for patient, participation in a burial ceremony, handling of potentially infected laboratory specimens).
** Case classification should be tailored according to circumstances locally identified in the field (e.g. including contact with sick animals or animals with abnormal behaviour).*

Mode of transmission Person-to-person transmission by direct contact (spread of droplets onto mucous

HIV/AIDS

Infectious agent Human immunodeficiency virus (HIV). Two types have been identified: HIV-1 and HIV-2; both have similar epidemiological characteristics. HIV-2 is less pathogenic than HIV-1.

Case definition AIDS case definition

Acquired immunodeficiency syndrome (AIDS) is the late clinical stage of HIV infection, defined as an illness characterized by one or more indicator diseases.

WHO staging system for HIV infection and disease in adults and adolescents

Stage 1
1. Asymptomatic.
2. Persistent generalized lymphadenopathy (PGL).
Performance Scale 1: *asymptomatic, normal activity.*

Stage 2
3. Weight loss, <10% of body weight.
4. Minor mucocutaneous manifestations (seborrheic dermatitis, prurigo, fungal nail infections, recurrent oral ulcerations, angular cheilitis).
5. Herpes zoster within the past 5 years.
6. Recurrent upper respiratory tract infections (e.g. bacterial sinusiti s),
And/or Performance Scale 2: *symptomatic, normal activity.*
Stage 3
7. Weight loss, >10% of body weight.
8. Unexplained chronic diarrhoea, >1 month.
9. Unexplained prolonged fever (intermittent or constant), >1 month.
10. Oral candidiasis (thrush).
11. Oral hairy leukoplakia.
12. Pulmonary tuberculosis within the past year.
13. Severe bacterial infections (i.e. pneumonia, pyomyositis),
And/or Performance Scale 3: *bedridden, <50% of the day during the past month.*
Stage 4
14. HIV wasting syndrome, as defined by the US Centers for Disease Control and Prevention (CDC). [a]
15. *Pneumocystis carinii* pneumonia.
16. Toxoplasmosis of the brain.
17. Cryptosporidiosis with diarrhoea >1 month.
18. Cryptococcosis, extrapulmonary.
19. Cytomegalovirus (CMV) disease of an organ other than liver, spleen or lymph nodes.
20. Herpes simplex virus (HSV) infection, mucocutaneous >1 month, or visceral any duration.
21. Progressive multifocal leukoencephalopathy (PML).
22. Any disseminated endemic mycosis (e.g. histoplasmosis, coccidiomycosis).
23. Candidiasis of the oesophagus, trachea, bronchi or lungs.
24. Atypical mycobacteriosis, disseminated.
25. Non-typhoid *Salmonella* septicaemia.
26. Extrapulmonary tuberculosis.
27. Lymphoma.
28. Kaposi sarcoma.
29. HIV encephalopathy, as defined by CDC. [b]

LEISHMANIASIS (CUTANEOUS AND MUCOSAL)

Infectious agent Protozoan, belonging to the genus *Leishmania:*

- *L. major* , agent of cutaneous leishmaniasis (and, less frequently, of mucosal leishmaniasis)
- *L. donovani* , agent of mucosal leishmaniasis (see *Visceral leishmaniasis*).

Case definition Clinical description

Cutaneous leishmaniasis is characterized by the appearance of one or more skin lesions, typically on uncovered parts of the body; the face, neck, arms and legs are the most common sites. A nodule may appear at the site of inoculation and may enlarge to become an indolent ulcer. The sore may remain at this stage for a variable time before healing, typically leaving a depressed scar. Other atypical forms may occur. In some individuals, certain strains can disseminate and cause mucosal lesions. These sequelae inv olv e nasopharyngeal tissues and can be very disfiguring with major psychological consequences (see below).

Sudanese mucosal leishmaniasis is a chronic infection of the upper respiratory tract and/or oral mucosa caused mainly by *L.donovani* or, less frequently, by *L.major* . The disease occurs in areas of the country endemic for visceral leishmaniasis. The condition may develop during or after an attack of visceral leishmaniasis, but in most cases it is a primary mucosal disease. It is not preceded or accompanied by a cutaneous lesion. The duration of the disease can vary between a few months and several years.

Laboratory criteria

- Positive parasitology (stained smear or culture from the lesion)

Positive serology (immunofluorescent assay, ELISA, Direct Agglutination Test) for mucosal leishmaniasis only.

WHO operational definitions

- A case of cutaneous leishmaniasis can be defined as a person showing clinical si gns (skin lesions) with parasitological confirmation of the diagnosis (positive smear or

culture).

- A case of mucosal leishmaniasis can be defined as a person showing clinical signs (mucosal lesions) with parasitological confirmation of the diagnosis and/or

VISCERAL LEISHMANIASIS (KALA AZAR)

Infectious agent

Protozoan: *Leishmania donovani*

Case definition Clinical description

An illness with prolonged irregular fever, splenomegaly and weight loss as its main symptoms.

- Post–kala-azar dermal leishmaniasis (PKDL) is increasingly recognized in Sudan as a complication of visceral leishmaniasis, occurring in about 55% of patients during treatment or within 0–6 months after treatment. It is characterized by a rash that may be macular, maculopapular, nodular or plaque-like.
- Sudanese mucosal leishmaniasis is a chronic infection of the upper respiratory tract and/or oral mucosa caused mainly by *L. donovani* (see *Cutaneous leishmaniasis).* The disease occurs in areas of the country endemic for visceral leishmaniasis. In most cases it is a primary mucosal disease, not preceded or accompanied by a cutaneous lesion, but less frequently the condition may develop during or after an attack of visceral leishmaniasis. In this case the disease represents a phenomenon similar to PKDL.

Laboratory criteria

- Positive parasitology.
  stained smears from bone marrow, spleen, liver, lymph node, blood or, culture of the organism from a biopsy or aspirated material.
- Positive serology (immunofluorescent assay, ELISA, Direct Agglutination Test).

WHO operational definition

- A case of visceral leishmaniasis (VL) is a person showing clinical signs (prolonged irregular fever, splenomegaly and weight loss) with serological (at peripheral geographical level) and/or (when feasible at central level) parasitological confirmation of the diagnosis. The main differential diagnosis is malaria. In endemic malarious areas, VL must be suspected when fever lasts for more than 2 weeks and no response has been achieved with antimalarial drugs

LEPROSY

Infectious agent Ba terium: *Mycobacterium leprae.*

Case definition WHO operational definition:

A case of leprosy is defined as a person showing hypopigmented or reddish skin lesion(s) with definite loss of sensation.

The operational case-definition includes:

- Retrieved defaulters with signs of active disease.
- Relapsed cases who have previously completed a full course of treatment.

Case classification (clinical):

Paucibacillary leprosy: 1–5 patches or lesions on the skin.

Multibacillary leprosy: more than 5 patches or lesions on the skin.

Laboratory criteria for confirmation:

In practice, laboratories are not essential for the diagnosis of leprosy .

MALARIA

Infectious agent In Sudan, about 90% of all malaria cases are caused by the protozoan parasite *Plasmodium falciparum.* This causes the most life-threatening form of the disease. *P. vivax* and *P. ovale* are responsible for the remaining malaria burden.

Case definition Clinical case definition:

Uncomplicated malaria

A patient with fever or history of fever within the past 48 hours (with or without other symptoms such as nausea, vomiting and diarrhoea, headache, back pain, chills, myalgia) in whom other obvious causes of fever have been excluded.

Severe malaria

A patient with symptoms as for uncomplicated malaria, plus drowsiness with extreme weakness and associated signs and symptoms related to organ failure (e.g. disorientation, loss of consciousness, convulsions, severe anaemia, jaundice, haemoglobinuria, spontaneous bleeding, pulmonary oedema and shock).

Confirmed case

Demonstration of malaria parasites in blood film by examining thick or thin smears, or by rapid diagnostic test for *P. falciparum.*

MEASLES

Infectious agent Measles virus (genus *Morbillivirus* , family Paramyxoviridae)

Case definition Clinical case definition:

Any person with:
Fever **and**
Maculopapular (i.e. non-vesicular) rash, **and**
Cough **or** coryza (i.e. runny nose) **or** conjunctivitis (i.e. red eyes);
or
Any person in whom a clinical health worker suspects measles infection.

Laboratory criteria:

Presence of measles-specific IgM antibodies.

Case classification:

Clinically confirmed: A case that meets the clinical case definition.
Laboratory-confirmed (only for outbreak confirmation and during the outbreak prevention/elimination phase):
A case that meets the clinical case definition and is laboratory-confirmed.
or
A case meeting clinical definition and epidemiologically linked by direct contact to a laboratory-confirmed case in which rash onset occurred 7–18 days earli er.

MENINGOCOCCAL DISEASE (MENINGITIS AND SEPTICAEMIC FORM)

Infectious agent Bacterium: *Neisseria meningitidis* serogroups A, B, C, Y, W135

Case definition Clinical case definition:

An illness with sudden onset of fever (>38.5 °C rectal; >38.0 °C axillary)
and one or more of the following:
neck stiffness
altered consciousness
other meningeal sign or petechial or purpural rash.
In patients aged under one year, suspect meningitis when fever is accompanied by bulging fontanelle.

Laboratory criteria:

Positive CSF antigen detection, **or**
Positive culture.

Case classification:

Suspected: a case that meets the clinical case definition above.
Probable: a suspected case as defined above **and:**
Turbid CSF (with or without positive Gram-stain), **or**
Ongoing epidemic and epidemiological link to a confirmed case.
Confirmed: a suspected or probable case with laboratory confirmation.

PERTUSSIS (WHOOPING COUGH)

Infectious agent *Bordetella pertussis* , the pertussis bacillus.

Case definition Clinical description:

The initial stage, the **catarrhal stage** , is characterized by the insidious onset of coryza (runny nose), sneezing, low-grade fever and a mild, occasional cough, similar to the commom cold. The cough gradually becomes more severe and irritating, and after 1 – 2 weeks the second stage, or **paroxysmal stage** , begins. The patient has bursts, or paroxysms, of numerous, rapid coughs, apparently due to difficulty in expelling thick mucus from the tracheobronchial tree. At the end of the paroxysm, a long inspiratory effort is usually accompanied by a characteristic whoop.
In younger infants, periods of apnoea may follow the coughing spasms, and the patient may become cyanotic (turn blue). Pneumonia is a relatively common complication (reported 21.7% of cases in developed countries); otitis, haemorrhages (subconjunctival petechiae and epistaxis), convulsions, encephalopathies and death occur more rarely). The disease lasts 4 – 8 weeks. Complications are more frequent and severe in younger infants. In developed countries, the case-fatality rate among infants aged less than 1 month has been reported to be around 1%. Older persons (adolescent and adults) and those partially protected by the vaccine may become infected with *B. pertussis* but usually have milder disease.
In the **convalescent stage** , recovery is gradual. The cough becomes less paroxysmal and disappears over 2 – 3 weeks. However, paroxysms often recur with subsequent respiratory infections for many months after the onset of pertussis. Fever is generally minimal throughout the course of pertussis.

Clinical case definition:

A case diagnosed as pertussis by a physician, or
A person with a cough lasting at least 2 weeks **with at least one** of the following symptoms:

Parox ysms (i.e. fits) of coughing
Inspiratory "whooping"
Post-tussive vomiting (i.e. vomiting immediately after coughing).

Laboratory criteria:

Isolation of *Bordetella pertussis* , or
Detection of genomic sequences by polymerase chain reaction (PCR)
Positive paired serology.

Case classification:

Clinical case: A case that meets the clinical case definition.
Confirmed case: A clinical case that is laboratory-confirmed.

POLIOMYELITIS

Infectious agent

Poliovirus (Enterovirus group): types 1, 2, 3.

Case definition and classification Clinical description:

All three types of wild poliovirus may cause paralysis, although most infections (at least 95%) remain asymptomatic.
Most symptomatic cases report a nonspecific febrile illness lasting a few days, corresponding to the **viraemic** phase of the disease. In a few cases, fever can be followed by the abrupt onset of **meningitic and neuromuscular** symptoms such as stiffness in the neck and pain in the limbs. Initial symptoms may also include fatigue, headaches, vomiting, constipation (or, less commonly, diarrhoea). In a very small percentage of cases (<1 of 100 infected susceptible persons), this is fol low ed by gradual onset (2 – 4 days) of flaccid paralysis. **Paralytic** disease usually affects the lower limbs and is typically asymmetric and more severe proximally. Bulbar (brainstem) paralysis may also occasionally occur, leading to respiratory muscle involvement and death unless artificial respiration can be applied. The mortality from paralytic poliomyelitis is 2–10%, mainly as a result of bulbar involvement and/or respiratory failure.

- Risk factors for paralytic disease are a large inoculum of virus, increasing age, pregnancy, recent tonsillectomy, strenuous exercise and intramuscular injections during the incubation period.
- After the acute illness there is often a degree of recovery of muscle function; 80% of eventual recovery occurs within 6 months, although recovery of muscle function m ay continue for up to 2 years.
- After many years of stable neurological impairment, new neuromuscular symptoms (weakness, pain and fatigue) develop (post-polio syndrome) in 25 – 40% of patients.

Clinical case definition:

- Acute flaccid paralysis (AFP) in a child aged <15 years, including Guillain - Barré syndrome*; **or**
- Any paralytic illness in a person of any age when poliomyelitis is suspected.

–

* For practical reasons, Guillain Barré syndrome is considered as poliomyelitis until proven otherwise.

Case classification:

- Suspected: A case that meets the clinical case definition.
- Confirmed: AFP with laboratory-confirmed wild poliovirus in stool sample.
- Polio-compatible: AFP clinically compatible with poliomyelitis, but without adequate virological investigation.

RABIES

Infectious agent Rabies virus, a Rhabdovirus of the genus *Lyssavirus* .

Case definition Clinical description

- Paresis or paralysis, delirium, convulsions.
- Without medical attention, death in about 6 days, usually due to respiratory paralysis.

Clinical case definition

An acute neurological syndrome (encephalitis) dominated by forms of hyperactivity (furious rabies) or paralytic syndrome (dumb rabies) that progresses towards coma and death, usually from respiratory failure, within 7 – 10 days after the first symptom.

Laboratory criteria

One or more of the following:
Detection of rabies viral antigens by direct fluorescent antibody (FA) in clinical specimens, preferably brain tissue (collected po s t mo rte m).
Detection by FA on skin or corneal smear (collected antemortem).
FA positive after inoculation of brain tissue, saliva or CSF in cell culture, in mice or

in suckling mice.
Detectable rabies-neutralizing antibody titre in the CSF of an unvaccinated person.
Identification of viral antigens by PCR on fixed tissue collected post mortem or in a clinical specimen (brain tissue or skin, saliva or urine).
Isolation of rabies virus from clinical specimens and confirmation of rabies viral antigens.

Case classification

Human rabies:

Suspected: A case that is compatible with the clinical case definition.
Probable: A suspected case plus history of contact with a suspected rabid animal.
Confirmed: A suspected case that is laboratory-confirmed.

Human exposure to rabies :

Possibly exposed: A person who had close contact (usually a bite or a scratch) with a rabies-susceptible animal in (or originating from) a rabies-infec ted area.
Exposed: A person who had close contact (usually a bite or a scratch) with a laboratory-confirmed rabid animal.

SCHISTOSOMIASIS

Infectious agent Helminths: *Schistosoma haematobium* (agent of urinary schis tos omiasis) and *Schistosoma mansoni* (agent of intestinal schistosomiasis), blood fluke worms belonging to the class Trematoda .
Other *Schistosoma* species are not present in Sudan.

Case definition **URINARY SCHISTOSOMIASIS**

1. ENDEMIC AREAS (MODERATE OR HIGH PREVALENCE)

Suspected: Not applicable.
Probable: Not applicable.
Confirmed: A person with:
visible haematuria **or**
positive reagent strip for haematuria **or**
S. haematobium eggs in urine (microscopy).

2. NON-ENDEMIC AREAS AND AREAS OF LOW PREVALENCE

Suspected: A person with:
visible haematuria **or**
positive reagent strip for haematuria, **and**
possible contact with infective water.
Probable: Not applicable.
Confirmed: A person with *S. haematobium* eggs in urine (microscopy).

INTESTINAL SCHISTOSOMIASIS

1. ENDEMIC AREAS (MODERATE OR HIGH PREVALENCE)

Suspected: A person with nonspecific abdominal symptoms, blood in stool, hepato(spleno)megaly.
Probable: A person who meets the criteria for presumptive treatment, according to the locally applicable diagnostic algorithms.
Confirmed: A person with *S. mansoni* eggs in stools (microscopy).

2. NON-ENDEMIC AREAS AND AREAS OF LOW PREVALENCE

Suspected: A person with nonspecific abdominal symptoms, blood in stool, hepatosplenomegaly **and** possible contact with infective water.
Probable: Not applicable.
Confirmed: A person with *S. mansoni* eggs in stools (microscopy).

TUBERCULOSIS

Infectious agent Bacterium: *Mycobacterium tuberculosis.* This complex includes *M. tuberculosis* and *M. africanum* primarily from humans, and *M. bovis* primarily from cattle.

Diagnosis in
Adults Clinical description

The most important symptoms in the selection of tuberculosis (TB) suspects in adults (aged older than 15 years) are: productive cough for more than 2 weeks, **and/or** haemoptysis **and** significant weight loss. Patients with TB may also have other symptoms (which are more common, but less suggestive) such as: chest pain breathlessness fever/night sweats tiredness, **and** loss of appetite.

Among refugee and internally displaced populations , it is unusual to have ready

access to X-ray facilities. It is the priority of health services to detect the sources of infection by sputum microscopy, and cure them.

Clinical case definition

Tuberculosis suspect: Any person who presents with symptoms or signs suggestive of TB, in particular cough of long duration (more than 3 weeks)

Case of tuberculosis: A patient in whom TB has been bacteriologically confirmed or diagnosed by a clinician.

Note: *Any person given treatment for TB should be recorded as a case. Incomplete "trial" tuberculosis treatment should not be given as a method for diagnosis.*

Definite case of tuberculosis: A patient with positive culture for the *M. tuberculosis* complex. (In countries where culture is not routinely available, a patient with two sputum smears positive for acid-fast bacilli (AFB) is also considered a "definite" case.)

Laboratory criteria for diagnosis

Each TB suspect should have three sputum samples examined by light binocular microscopy for AFB.

The chances of finding TB organisms are greater with three sputum samples than with one or two samples. Secretions build up in the airways overnight, so that an early-morning sputum sample is more likely to contain the TB organism than a sample taken later in the day. In practice, a suspect provides sputum samples in the following manner:

Day 1

Sample 1 – Person suspected of TB provides an "on-the-spot" sample under supervision on presentation to the health facility. He or she is given a sputum container to take home for an early-morning sample the following day.

Day 2

Sample 2 – Person suspected of TB brings an early-morning sputum sample collected just after waking up.

Sample 3 – Person suspected of TB provides another "on-the-spot" sample.

At least two sputum smears are positive

Smears should be stained using the Ziehl–Neelsen method. Any TB suspect with two positive smears is a smear-positive TB patient, who must then be registered and started on anti-TB treatment.

If only one initial sputum smear is positive

A suggestive X-ray showing active pulmonary TB interpreted by an experienced medical officer may lead to a diagnosis of smear-positive TB. AFB microscopy may be repeated and, if at least one smear is again positive with compatible X-ray, the patient should be considered a smear-positive TB patient. In the absence of X-ray, one sputum smear with positive culture for *M. tuberculosis* is also classified as sputum-positive TB.

If all three sputum smears are negative

If the initial three smears are negative, but pulmonary TB is still suspected because of persistent symptoms, the suspect should be treated for acute respiratory infection with broad-spectrum antibiotics (e.g. amoxicillin or co-trimoxazole, **but not rifampicin or any other anti-TB drug**) for at least 1 week. If there is no improvement, sputum samples must be re-examined 2 weeks after the first sputum examination.

Between 65–80% of all pulmonary TB cases are expected to be confirmed by positive sputum smear examination. X-ray lesions compatible with active TB should encourage further sputum examination if the three sputum smear examinations were negative. X-ray itself is not a diagnostic tool for pulmonary TB.

In *some* circumstances, a compatible X-ray together with symptoms consistent with TB will lead to the diagnosis of pulmonary TB in smear-negative cases. Thus, if all three samples are again negative after the trial of antibiotics, either a compatible X-ray interpreted by an experienced physician or, in the absence of X-ray facilities, the experienced physician's judgement alone will decide whether a patient is categorized as having TB (classed as smear-negative TB).

Additional cases of TB may be found among close contacts of known smear-positive cases, either family members or persons sleeping in the same shelter. Symptomatic contacts should be screened using the procedures described above.

TB in HIV-positive patients

HIV-positive patients are more susceptible to TB infection, and HIV in a TB patient is a potent cause of progression of TB infection to disease. The principles of TB control are the same even when there are many HIV/TB patients. In HIV-infected patients, pulmonary TB is still the commonest form of TB. The clinical presentation of TB depends on the degree of immunosuppression.

Early in HIV infection, when immunity is good, the signs of TB are similar to those in an individual without HIV infection. As HIV infection progresses and immunity declines, the risk of TB dissemination increases. TB meningitis, miliary TB and widespread TB lymphadenopathy occur.

It is important to look systematically for signs or symptoms of TB in HIV-positive patients and to start treatment without delay based on clinical, bacteriological and, in some circumstances, radiological evidence.

Diagnosis in Children

TB in children is a general disease, which may affect any part of the body. Children rarely have smear-positive TB, so they are rarely infectious. In complex emergency situations with a large number of children, extrapulmonary forms of TB should be suspected, diagnosed and treated appropriately. This may often require referral to a hospital for X-ray and special examinations (e.g. lumbar puncture).

In children with headache, change of temperament, recent squint or ocular muscle paralysis, or dyspnoea, meningitis should be suspected. TB is one cause of meningitis, although rare – meningococcal meningitis is more common in complex emergency settings. Definitive diagnosis requires hospital referral.

Children with high fevers, dyspnoea, gastrointestinal symptoms, confusion (i.e. those with suspicion of acute miliary TB) must also be referred to hospital for assessment and diagnosis. Suspected bone and joint TB, or pleural effusions, also require referral.

Commoner forms of extrapulmonary disease (e.g. cervical or auxiliary lymphadenitis, peritonitis with ascites) can be diagnosed and treated in a camp situation.

The diagnosis of TB in children should be carefully considered in a child if there is:

illness lasting for more than 10 days
history of close contact with a TB patient
poor response to antibiotic therapy
poor response to 1 month of nutritional rehabilitation
weight loss or abnormally slow growth
loss of energy, or
increasing irritability and drowsiness over a period of 2 weeks.

Nutritional support and rehabilitation should be given for at least 1 month to a child in whom TB is suspected.

Note: *The considerations explained above for the diagnosis of TB in HIV-positive adults a lso apply in to children.*

Diagnostic criteria for classification of TB

Pulmonary tuberculosis (PTB)

Pulmonary TB refers to disease involving the lung parenchyma. Tuberculous intrathoracic lymphadenopathy (mediastinal and/or hilar) or tuberculous pleural effusion, without radiographic abnormalities in the lungs, therefore constitutes a case of extrapulmonary TB. A patient with both pulmonary and extrapulmonary TB should be classified as a case of pulmonary TB.

- **Smear-positive pulmonary TB**

Either:

A patient with at least two sputum specimens positive for AFB by microscopy;

or:

A patient with at least one sputum specimen positive for AFB by microscopy and radiographic abnormalities consistent with pulmonary TB;

or:

A patient with at least one sputum specimen positive for AFB by microscopy, which is culture-positive for *M. tuberculosis* .

- **Smear-negative pulmonary TB**

A case of PTB that does not meet the above definition for smear-positive TB. This group includes cases without smear result. This commonly occurs in children

but is comparatively uncommon in adults.

Diagnostic criteria for PTB (which is also used to exclude sputum negative PTB) is based on the following criteria:

– at least three sputum specimens negative for AFB, **and**
– no clinical response to a one-week course of broad-spectrum antibiotics, **and**
– radiographic abnormalities consistent with active PTB, **and**
– decision by a clinician to treat with a full course of anti-TB chemotherapy.

A patient whose initial sputum smears were negative and whose subsequent sputum culture result is positive is also considered to have smear-negative pulmonary TB.

Extrapulmonary tuberculosis (EPTB)

EPTB refers to TB of organs other than the lungs, e.g. pleura, lymph nodes, abdomen, genitourinary tract, skin, joints and bones, meninges. Diagnosis should be based on one culture-positive specimen, or on histological or strong clinical evidence consistent with active EPTB, followed by a decision by a clinician to treat with a full course of anti-TB chemotherapy.

The case definition of an EPTB case with several sites affected depends on the site representing the most severe form of disease.

Some cases will be easy to diagnose with peripheral lymphadenitis, swelling of cervical or axillary lymph nodes, chronic evolution and/or production of caseous discharge. Other cases, such as severe, life-threatening forms (e.g. miliary TB, TB meningitis), TB of bone joints, TB peritonitis, TB laryngitis, will be suspected but should be referred to a hospital for assessment.

TYPHOID FEVER

Infectious agent Bacterium: *Salmonella eneterica* serovar Typhi *(S.* Typhi *).*

Case definition Clinical case definition

Clinical diagnosis is difficult. In the absence of laboratory confirmation, any case with fever of at least 38 °C for 3 or more days is considered suspect if the epidemiological context is conducive.

Confirmed case

Isolation of *S. typh i* from blood or stool cultures.

Mode of Faecal–oral route, particularly through contaminated water and food.

YELLOW FEVER

Infectious agent

Yellow fever virus, belonging to the Flaviv irus group.

Case definition Clinical description:

Characterized by acute onset of fever followed by jaundice within 2 weeks of onset of first symptoms. Haemorrhagic manifestations and signs of renal failure may occur. There are two disease phases for yellow fever:

Acute phase : While some infections have no symptoms whatsoever, this first phase is normally characterized by fever, muscle pain (with prominent backache), headache, shivers, loss of appetite, nausea and/or vomiting. Often, the high fever is paradoxically associated with a slow pulse (Faget's sign). Most patients improve after 3–4 days and their symptoms disappear, but 15% enter the toxic phase.

Toxic phase : Fever reappears; the patient rapidly develops jaundice and complains of abdominal pain with vomiting. Bleeding can occur from mouth, nose, eyes and/or stomach. Once this happens, blood appears in the vomit and faeces. Kidney function deteriorates; this can range from abnormal protein levels in the urine (albuminuria) to complete renal failure with no urine production (anuria). Half the patients in the toxic phase die within 10–14 days. The remainder recovers without significant organ damage.

Laboratory criteria:

Isolation of yellow fever virus, **or**
Presence of yellow-fever-specific IgM or a fourfold or greater rise in serum IgG levels in paired sera (acute and convalescent), **or**
Positive postmortem liver histopathology, **or**
Detection of yellow fever antigen in tissues by immunohistochemistry, **or**
Detection of yellow fever virus genomic sequences in blood or organs by polymerase chain reaction.

Case classification:

Suspected: a case that is compatible with the clinical description.
Probable: not applicable
Confirmed: a suspected case that is laboratory-confirmed (national reference laboratory) or epidemiologically linked to a confirmed case or outbreak.

10.10 CDSS Final State Report Sample

وزارة الصحة - ولاية الخرطوم

الادارة العامة للطب الوقائى - برنامج التقصى المرضى

مترددين
اكبر من 5 اقل من 5

المترددين الكلى

الاسبوع رقم للفترة من الى

اصابات ولاية الخرطوم

المرض	اقل من عام		1--4		5--14		15--24		25--34		35--44		45 فاكثر		المجموع		الكلى	النسبة
	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا		
الملاريا															0	0	0	#DIV/0!
اسهال مائى															0	0	0	#DIV/0!
اسهال دموى															0	0	0	#DIV/0!
التهاب رئوى															0	0	0	#DIV/0!
رمد صديدى															0	0	0	#DIV/0!
تسمم طعام															0	0	0	#DIV/0!
يرقان															0	0	0	#DIV/0!
سحائى															0	0	0	#DIV/0!
حصبة															0	0	0	#DIV/0!
شلل رخو															0	0	0	#DIV/0!
سعال ديكى															0	0	0	#DIV/0!
دفتريا															0	0	0	#DIV/0!
تتانوس حديثى الولادة															0	0	0	#DIV/0!
سل رئوى															0	0	0	#DIV/0!
التهاب نكفة															0	0	0	#DIV/0!
جدرى كاذب															0	0	0	#DIV/0!
سعر															0	0	0	#DIV/0!
بلهارسيا															0	0	0	#DIV/0!
تيفويد															0	0	0	#DIV/0!
لشمانيا جلدية															0	0	0	#DIV/0!
حمى نزفية															0	0	0	#DIV/0!
جرب															0	0	0	#DIV/0!
المجموع	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	#DIV/0!

دخولات

ولاية الخرطوم

الدخولات الكلية | 0

المرض	اقل من عام		4--1		14--5		24--15		34--25		44--35		45	فاكثر	المجموع		الكلى	النسبة
	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا		
الملاريا															0	0	0	#DIV/0!
اسهال مائى															0	0	0	#DIV/0!
اسهال دموى															0	0	0	#DIV/0!
التهاب رئوى															0	0	0	#DIV/0!
رمد صديدى															0	0	0	#DIV/0!
تسمم طعام															0	0	0	#DIV/0!
يرقان															0	0	0	#DIV/0!
سحائى															0	0	0	#DIV/0!
حصبة															0	0	0	#DIV/0!
شلل رخو															0	0	0	#DIV/0!
سعال ديكى															0	0	0	#DIV/0!
دفتريا															0	0	0	#DIV/0!
تتانوس حديثى الولادة															0	0	0	#DIV/0!
سل رئوى															0	0	0	#DIV/0!
التهاب نكفة															0	0	0	#DIV/0!
جدرى كاذب															0	0	0	#DIV/0!
سعر															0	0	0	#DIV/0!
بلهارسيا															0	0	0	#DIV/0!
تيفويد															0	0	0	#DIV/0!
لشمانيا جلدية															0	0	0	#DIV/0!
حمى نزفية															0	0	0	#DIV/0!
جرب															0	0	0	#DIV/0!
المجموع	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	#DIV/0!

وفيات

ولاية الخرطوم

الوفيات الكلية 0

المرض	اقل من عام		4--1		14--5		24--15		34--25		44--35		45	فاكثر	المجموع		الكلى	النسبة
	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا	ذ	ا		
الملاريا															0	0	0	#DIV/0!
اسهال مائى															0	0	0	#DIV/0!
اسهال دموى															0	0	0	#DIV/0!
التهاب رئوى															0	0	0	#DIV/0!
رمد صديدى															0	0	0	#DIV/0!
تسمم طعام															0	0	0	#DIV/0!
يرقان															0	0	0	#DIV/0!
سحائى															0	0	0	#DIV/0!
حصبة															0	0	0	#DIV/0!
شلل رخو															0	0	0	#DIV/0!
سعال ديكى															0	0	0	#DIV/0!
دفتريا															0	0	0	#DIV/0!
تتانوس حديثى الولادة															0	0	0	#DIV/0!
سل رئوى															0	0	0	#DIV/0!
التهاب نكفة															0	0	0	#DIV/0!
جدرى كاذب															0	0	0	#DIV/0!
سعر															0	0	0	#DIV/0!
بلهارسيا															0	0	0	#DIV/0!
تيفويد															0	0	0	#DIV/0!
لشمانيا جلدية															0	0	0	#DIV/0!
حمى نزفية															0	0	0	#DIV/0!
جرب															0	0	0	#DIV/0!
المجموع	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	#DIV/0!

اصابات بعض الامراض حسب المحليات:

الاسهالات	الملاريا	المحليات	الاسهالات	السحائى	الملاريا	المحليات	الاسهالات	الملاريا	المحليات
									محلية الامير
		بلدية بحرى				بلدية الخرطوم			محلية البقعة
		محلية بحرى شمال				محلية الشهداء			محلية السلام
		محلية الريف الشمالى بحرى				محلية الخرطوم شرق	0	0	محافظة امبدة
0	0	محافظة بحرى				محلية النصر			
						محلية الازهرى			
						محلية الكلاكلات			
						محلية النيل الابيض			
			0	0	0	محافظة الخرطوم			
		محلية الحاج يوسف							بلدية ام درمان
		محلية شرق النيل							محلية ابوسعد
		محلية ام ضوابان والعسيلات							محلية الثورة
		محلية العيلفون							محلية كررى
		محلية وادى سوبا							محلية الريف الجنوبى
		محلية ابو دليق							محلية الريف الشمالى ام درمان
0	0	محافظة شرق النيل					0	0	محافظة ام درمان

إصابات بعض الإمراض حسب المحليات

المحليات	ملاريا	إسهال	شلل رخو	تتانوس حديثى الولادة	**سحائي**	**حصبة**	**سعر**	**سعال ديكي**
الخرطوم								
جبل أولياء								
إمدرمان								
كرري								
أمبدة								
بحري								
شرق النيل								
ولاية الخرطوم								

المترددين وشرائح الملاريا حسب المحليات

المتررددين			المراكز	الشرائح الكلية	الشرائح الايجابية	نسبة الايجابية
اقل من 5	اكبر من 5					
0	0	0	الخرطوم			#DIV/0!
			جبل أولياء			#DIV/0!
			إمدرمان			#DIV/0!
			كرري			#DIV/0!
			أمبدة			#DIV/0!
			بحري			#DIV/0!
			شرق النيل			#DIV/0!
			ولاية الخرطوم			#DIV/0!

المراكز
الخرطوم
جبل أولياء
إمدرمان
كرري
أمبدة
بحري
شرق النيل
ولاية الخرطوم

10.11 Consent letter

Questionnaire for assessment of communicable diseases surveillance system in Khartoum state

Serial Number…… Date……

Name of Respondent …… locality ……

Introduction: My name is…. I'm working for Epidemiology Department

We are interviewing communicable disease surveillance health personnel in the Khartoum State to assess the system.

Confidentiality and consent: I'm going to ask you some questions. Your answers are completely confidential. We will use your name and the serial number just for the purpose of matching and completeness of the information we received from you and other information we need from your documents. You may end this interview at any time you want. However, your answering to these questions will help us to assess the system to strengthen it. We would greatly appreciate your help in responding to our study. The interview will take about 2 hours. Would you be willing to participate?

(Signature of interviewer certifying that informed consent has been given verbally by the respondent.)

Signature…… Date……

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