

APPENDIX B.1

Evaluation of the system and capacity

In practice, for purposes of preparing lending projects, the evaluation process is modified here and differs from the more “ideal” method described in appendix A.6⁹ (CDC 2001; WHO 2001a). In order to evaluate the system and surveillance capacity at the state level, an evaluation of collection methods and use of information for six notifiable diseases or conditions should be conducted in six locations (that is, at the state or local level).

How?

1. Selection of states

One measure of performance is whether states are reporting anything to the national surveillance system. Select two states that are the most up-to-date in reporting (high capacity), two states that are average (reports are delayed by four to six weeks), and two states that have not reported for at least eight weeks (low capacity). During this evaluation the team should visit at least two of the local reporting areas in each selected state.

2. Selection of diseases

Diseases fall into three categories: (a) high numbers of cases, low specificity (diarrhea, influenza); (b) low number of cases, high specificity (measles, Chagas disease); (c) intermediate volume and specificity (hepatitis, meningitis).

3. Team composition

A team of two persons should visit each of the selected states to conduct the evaluation. These two persons should have experience in epidemiology and laboratory surveillance.

During this evaluation, the following questions should be answered:

1. How many persons are responsible for surveillance at the local and state level ...

These persons should be identified by task and quantified in terms of personnel per unit population (for instance, one state-level epidemiologist per 500,000 population, one computer support person per 1 million persons). This quantification should also take into account the proportion of time actually dedicated to surveillance activities.

2. ... and for each disease or condition...

- What are the sources of reports of this condition (for example, hospitals, clinics, laboratories)? Are they private or public?
- Do reporting sources know the definition? How well is it applied? (List the written case definitions for this condition.)
- Are cases defined by status (for instance “confirmed” as opposed to “suspected”)? What

⁹ Koo, D. and Ostroff, S. for VIGIA preparation mission. (See World Bank 1999—VIGIA PAD).

proportion of cases in this state are suspected, probable, or confirmed?

- Have local level reporters been trained in disease-recognition and reporting?
- Is there a standardized case report form specifically for this condition, and written instructions on how to fill out the form?
- What information is requested regarding cases of this condition?
- Who generally fills out the form?
- How often are data reported from the local level to the state and what mechanism is used for reporting (paper form by mail; telephone; fax)?
- How is information transferred?
- Are case report forms reviewed for completeness prior to their being sent to the state level?
- Are forms completely filled out? Review a sample.
- Are data sent as summary or individual cases, or both?
- Is laboratory diagnostic testing available for this condition in the state? If not, are laboratory specimens sent elsewhere (where)?
- What proportion of reported cases have had appropriate laboratory testing?
- Can case reports be linked to the corresponding laboratory data? If so, how?
- Are there written standards for case investigation and intervention?
- Have any outbreaks of this condition been identified through this system? How were these identified, and were investigations conducted? Who conducted the investigations (was it a local, state, or national team)?
- What is the time delay between the occurrence or detection of a case and its being reported to the state level?
- How is information about cases recorded or stored? (Is it computerized?)
- Who analyzes the data?
- How are data analyzed, and how often?
- How often are the reports disseminated, in what format, and to whom?
- Are the data provided to those who report them? (That is, is there feedback of data to the local level and to other groups, including physicians and laboratory personnel?)

The following resources may prove useful in evaluating surveillance systems:

www.cdc.gov/preview/mmrwhtml/rr5013a1.htm

www.who.int/emc-documents/surveillance/whocdscsr992c.html

APPENDIX B.2

Stakeholder Workshops

Goals of the workshop

1. Develop a more detailed, ideal vision for the revised surveillance system, its desired characteristics, and components;
2. Establish a system for prioritizing conditions for inclusion in the surveillance system; and
3. Develop strategies for stepwise implementation of the system.

Participants

Representatives from national, state, and local health departments. Preparation for this workshop should be coordinated with the National Epidemiological Council or equivalent body. Other participants in this workshop might include persons who represent private sources of health data (hospitals or private clinics) or academic medical societies or organizations, and health management organization. Given the activities involved in the second component of the workshop, it may be useful to invite MoH staff with expertise in the diseases, or at least to provide reports and information about these diseases.

Issues to be addressed during the workshop

Visions of the ideal surveillance system

- Sources of surveillance data (health centers, hospitals, laboratories, private insurance, and personal interviews)
- Surveillance methods (notifiable diseases, sentinel surveillance, surveys)

- Standards for reporting or linking surveillance data
- Integration with the health-care delivery system (through public and private health centers and assistance)
- Expected uses of surveillance data
- Desired timeliness of the system
- Level of computerization required
- Capacity needed within the MoH and at the state and local levels to ensure appropriate analysis, interpretation, dissemination, and use of surveillance data for public health action.

Prioritization of conditions for inclusion in the system

Criteria for selecting conditions that should be included in a surveillance system might include severity, incidence and prevalence, communicability, availability of a cost-effective control measure (a vaccine), societal concern, interest by the WHO or the PAHO, or ease of diagnosis. (See also appendix A.6 and p. 15—Setting priorities: What are the considerations in planning public health surveillance?). It is important to develop—with the participation of public health persons at local, state, and national levels—a method for prioritizing conditions that should be included in the national surveillance system.

Table 9 shows a sample agenda for a workshop for developing criteria for prioritizing conditions under surveillance.

Strategies for stepwise implementation

During this portion of the workshop participants would develop strategies for stepwise implementation of revisions to the system. Not all components of the system need to be implemented in all parts of the country. Some components may be pilot-tested

only in certain areas of the country (where there are regional problems with a specific disease or where human or other resources are already available or can be supplied).

Each strategy must be very specific and detailed, with the actions to be taken, by whom, and by what date. The strategy should also outline necessary resources and possible providers.

Table 9
Sample agenda for workshop

Day 1	<i>Morning</i>	Give the group a list of five diseases and explain that, hypothetically, the legislature has said they are cutting the MoH budget. In small groups, rank these five diseases in order of priority, so that when the MoH receives the budget there will already be an idea of how to spend the money. Each group then presents their rankings and the principles and rationale used to come to those conclusions.
	<i>Afternoon</i>	<ol style="list-style-type: none"> 1. (Individually.) Generate three criteria for selecting diseases. 2. (In groups of six.) Using criteria from individual activity above, establish a list of a maximum of 10 criteria. 3. A spokesperson from each group presents the criteria to the rest of the participants. There is no lengthy discussion, except to clarify concepts or meaning.
Day 2	<i>Morning</i>	<ol style="list-style-type: none"> 1. Meet in groups and try to find common categories among the lists presented by small groups the day before. 2. (Entire group.) List the overarching categories or criteria. 3. Determine whether all criteria are accounted for, and clarify the concepts or wording. Continue to collapse categories as needed. 4. Decide whether there should be a maximum number of criteria, or an appropriate system of weighting each criteria. 5. (Small groups.) Decide on the weight for each criterion (suggested: 0–5 points). 6. (Entire group.) Tally results and make decisions about weighting for each criterion. 7. Apply criteria to all conditions or diseases considered for surveillance, using the expertise of participants in the workshop or data from references or reports about these conditions and their prevalence in the country.
	<i>Afternoon</i>	<ol style="list-style-type: none"> 1. Tally results (including the respondent or source of the numbers—state or national, for instance). Present conditions in rank order by mean or median value (number of participants who responded, mean or median score, range of values, standard deviation of responses). 2. In small groups discuss how this list should be used. Should it be used to delete or add to the list of diseases or conditions under surveillance? Alternately, should it be used to determine the mode of surveillance and the resources allotted to surveillance for that condition (fewer resources or less frequent reporting for diseases lower on the list)? 3. Determine next steps.

APPENDIX B.3

Sample Terms of Reference for Specialists Participating in Preparation Missions

- Evaluation of the surveillance system
 - Assessment of laboratory infrastructure
 - Computer-based information and telecommunications system
 - Noncommunicable diseases and risk factor surveillance
 - Economic analysis
- Timing: frequency of reports communicated between levels.

Statement of mission objectives: Evaluation of the surveillance system

(Name of consultant) will evaluate the surveillance system regarding:

1. Objectives
2. Detection of events
 - Notifiable diseases, syndromes, and case definitions
 - Recording forms; and
 - Outbreaks: detection and control.
3. Reporting procedures
 - Levels to which the information observed is reported;
 - Reporting forms;
 - Means of communication used for reporting the information to each level;
 - Utilization of data;
 - Collation and management of data; and
4. Decisionmaking and action
 - Decisionmakers with respect to surveillance;
 - Adequacy of information: identify information collected systematically but not used;
 - Communication and implementation of decisions; and
 - Monitoring system—mechanism in place for monitoring the implementation of decisions.
5. Feedback
 - Adequacy of feedback for supervision and improvement;
 - Timing: adequacy of the schedule for those receiving feedback; and
 - Indicators to define the quality of reporting.
6. Resources
 - Current staff and job descriptions for each main facility and administrative office;
 - Equipment: inventory of equipment, noting shortages;

- Budget: budget allocated to the surveillance system, including financing mechanism.
7. Assess the need for sentinel sites or periodic surveys and (with the MoH) develop a strategy for implementation.
 8. Review the MoH proposal for a national health surveillance system.
 9. Provide recommendations for redesigning or improving the current surveillance system, addressing all weaknesses identified.
 10. Provide cost estimates for the project.
 11. Propose agenda for implementation, including selection of states.
 12. Identify the main risks in implementing a national surveillance system.

Written output: Using existing MoH documents and findings during the mission, produce a short report summarizing the surveillance system to be improved (bullet points) for the aide memoire and a full report no later than (give delivery date).

Statement of mission objectives: Assessment of laboratory infrastructure

(Name of consultant) will assess the laboratory infrastructure covering the following topics.

1. In keeping with project objectives, assess and describe (number, location, type, human resources, technical capacity, communication capacity, and so on) the current laboratory infrastructure regarding:
 - (a) National reference laboratories
 - (b) Public health laboratories
 - (c) Entomological units
 - (d) Centers for zoonosis control
 - (e) Blood banks
 - (f) Biosafety laboratories

- (g) Others you may think are pertinent to the project
2. Undertake a biosafety evaluation of the laboratories, using criteria in the CDC-NIH publication *Biosafety in Microbiological and Biomedical Laboratories, 3rd Edition*.
3. Define specimen rejection criteria, if applicable.
4. Review diagnostic reagents production and suggest modifications, if necessary.
5. Review the plan for routine proficiency testing of subordinate laboratories.
6. Define the needs for strengthening National Reference Laboratories in outbreak investigation.
7. Review specimen log-in and tracking, as well as management results, and suggest a computer-based program, if necessary.
8. Define the scope of public health laboratories within the context of the national surveillance system.
9. Describe plans for rehabilitation and expansion of the laboratory network, assess necessity of new infrastructure, and propose modifications, if necessary.
10. Review the need for laboratory personnel training, in terms of present deficiencies and project objectives.
11. Define a standardized system for laboratory data to be used in national reference laboratories and in state laboratories.
12. Propose terms of reference for additional work in areas where data is not currently available or analysis needs to be completed.

Written output: A full report presenting your findings and recommendations, to be remitted to the Bank no later than (insert date).

Statement of mission objectives: Computer-based information and telecommunications system

(Name of consultant) will be responsible for:

1. Establishment of computer-based telecommunications system at national, state and local levels, and possibly in other areas to routinely collect, analyze, and disseminate surveillance data; to rapidly communicate messages; and to assist in the investigation of epidemics, including needs for software, hardware, data transmission, and data outputs.
2. Confidentiality issues should be addressed, as well as systems' management. (Should they be internal or contracted?)
3. Define a standardized system for laboratory data to be used in national reference laboratories and in state laboratories. This system should address needs for communicable and noncommunicable diseases.
4. Define training needs, develop implementation program, and estimate cost.

Written output: Produce a short report (bullet points) for the client, summarizing findings during mission and a full report no later than 8 days after the mission.

Statement of mission objectives: Noncommunicable diseases and risk factor surveillance

(Name of consultant) will:

1. In keeping with project objectives, review the project proposal regarding chronic diseases and risk factors surveillance.
2. In collaboration with the project team, select the health conditions for surveillance.
3. Recommend the most appropriate type of surveillance (sentinel, survey, or other) for the conditions or risk factors selected.
4. Review the recording and reporting forms.

5. Assess training needs (trainees, trainers, type of training, cost).
6. Assess the cost of a NCD and risk factor surveillance system.
7. Assess the need for sentinel sites or periodic surveys, and develop a strategy for implementation.
8. Propose terms of reference for additional work you may find necessary.

Written output: A short report summarizing your findings and recommendations, remitted to the Bank no later than (insert date).

Statement of mission objectives: Economic analysis

(Name of consultant) will collect the data necessary to undertake the economic analysis and write a first draft of the economic analysis that will consist of the following:

1. A cost-effectiveness analysis whose purpose would be to examine the potential impact of the surveillance system on the incidence or prevalence of each notifiable disease. This analysis would yield a map of the burden of diseases in the country and help determine where to orient surveillance efforts.
2. An equity analysis which would attempt to investigate the equity implications of the surveillance system—in other words, who would benefit most from the project?
3. A sustainability analysis that would address three questions: (a) Will there be sufficient counterpart funding for the project? (b) What are the additional recurrent costs that will be generated by the project and who (that is, what level of government) will pay for them? (c) Is there reason to believe that these entities will be able to afford this additional financial burden?

4. A risk analysis to test the robustness of the cost-effectiveness and sustainability analyses to reasonable changes in the key parameters.

Written output: A short report (bullet points) regarding findings during the mission to appendix to the aide memoire, and a draft economic analysis no later than (insert date).

APPENDIX B.4

Specific Disease Surveillance “Tips”

Box 9

BEHAVIORAL RISK FACTOR SURVEILLANCE

Why are behaviors and noncommunicable diseases important?

Most countries of the world have undergone, or are undergoing, an epidemiologic transition with the burden of disease now primarily due to NCDs and injuries, not communicable diseases. In developing countries these changes place costly demands on the health sector because NCDs often require highly technical, expensive interventions and specialist care. The key to averting or controlling this global NCD epidemic is primary prevention.

How can NCDs be prevented?

The most common NCDs (diabetes, hypertension, coronary artery diseases, some cancers, and injuries) are largely preventable with changes in lifestyle and behaviors. Important BRFs for NCDs include: cigarette smoking, obesity, lack of physical activity, high dietary fat intake, and substance abuse. There is incontrovertible evidence that by modifying these risk factors NCDs can be prevented. Unintentional injuries due to traffic accidents are a leading cause of death, particularly among young adults. Many traffic injuries and deaths can be avoided by using seat belts in cars, and helmets while riding on motorcycles and bicycles. Other preventive behaviors are related to the utilization of health services; an example is Pap smears to screen for cervical cancer can lead to early diagnosis and cure. Information about the prevalence of these behaviors is vital to making health promotion and disease prevention programs more effective.

What is behavioral risk factor surveillance?

Surveillance of BRFs is essential to plan and evaluate programs that aim to prevent NCDs and injuries. BRF surveillance provides evidence about whether programs are having the desired impact of reducing risky behaviors and promoting healthy lifestyles. BRF surveillance in developing countries usually begins as a series of household surveys that include, at a minimum, questions regarding smoking, physical activity, alcohol use, and diet. Other topics include injury prevention, preventive health-seeking behaviors, mental health, sexual behaviors, and self-report questions on weight, height, and diabetes. In more developed surveillance systems BRF surveillance is continuous (such as ongoing phone surveys). This permits time-linked analyses that are more useful in assessing the impact of specific interventions and events on behaviors.

Are behaviors important only for noncommunicable diseases?

Behaviors and lifestyle contribute not only to the occurrence of NCDs, but to the occurrence of communicable diseases as well. Changing sexual behavior and condom use is essential to preventing STIs, including HIV/AIDS. Hand-washing is key to preventing transmission of diarrheal diseases, intestinal parasites, hepatitis, and skin infections. BRF surveillance often includes questions related to these behaviors.

What are youth surveys?

It is very important to focus prevention activities on youth, a time in life when risky behaviors often begin. Thus there are BRF surveys that focus specifically on young people. Youth surveys are usually carried out confidentially in schools.

Box 10**HIV/AIDS SURVEILLANCE***What conditions should be reported?*

- HIV infection, AIDS
- Deaths in persons with AIDS and HIV infection

Standard case definitions need to be addressed. Several public health organizations (the WHO, the PAHO, CDC) have established case definitions that can be used.

What information should be collected on these persons?

A standard set of data should be collected using a standardized report form for all cases that meet the reporting criteria, including: (a) personal identifier, (b) date of diagnosis, (c) basic demographic information, (d) place of residence, (e) risk behaviors, (f) opportunistic conditions, and (g) date of death. The data elements collected should be limited to those that will be routinely used for public health action. The simpler and shorter the case report form, the more likely it is that cases will be reported completely and quickly.

Who should report?

Hospitals, health-care workers who work in hospitals, private doctors, clinics, community health workers, and laboratories that perform HIV testing. Local laws can require these persons to report cases to health authorities. Health authorities may also actively contact health-care providers and institutions to ensure that all cases are reported.

How should they report?

There are many options for reporting, including mail, telephone, fax, e-mail, or through the Internet, if security can be maintained.

What are some of the key factors in a successful HIV/AIDS surveillance system?

- Strict confidentiality must be maintained in order for the system to remain acceptable to the community and providers.

- Underreporting may occur, especially in areas where HIV testing, health care, and resources are limited. Using active case findings may enhance surveillance in these areas.
- Dissemination of data to public health decisionmakers and back to the persons who reported the cases can help foster recognition of the importance and utility of HIV/AIDS surveillance.

What other sources of data may be useful in describing the HIV epidemic?

Data from HIV/AIDS surveillance should be interpreted with other available data for a more comprehensive picture of the HIV epidemic, such as (a) other surveillance systems (for instance, STI surveillance); (b) HIV serosurveys (in antenatal or STI clinics); and (c) vital statistics registries.

What is the role of HIV serosurveys (HIV sentinel surveillance) in describing the status of a country's HIV epidemic?

Population-based prevalence surveys are the most useful but may be difficult to undertake. Instead of those surveys, serosurveys of pregnant women in antenatal clinics most closely approximate the prevalence levels in the adult population (although the relationship between prevalence among clinic attendees and that of the general population remains uncertain).

High-quality sentinel surveillance systems have frequent and timely data collection, conduct surveillance in appropriate populations, are consistent in the sites and groups that are measured over time, and provide estimates that are representative of the population.

Box 11

SURVEILLANCE IN TUBERCULOSIS CONTROL

TB is a global public health threat. In the absence of treatment, the infectious disease can kill 50 percent of those who fall ill within two to five years. The epidemic is worsening where economic and social crises and the HIV/AIDS epidemic are raging. Persons with compromised immune systems are at high risk of infection and illness. The control of TB depends on the early detection and treatment of persons with infectious disease. This forms the core of the directly observed treatment (DOTS) strategy recommended by the WHO, the World Bank, and other partners. See <http://www.worldbank.org/TB> for further information and other links. Surveillance methods and several computerized reporting tools are available suitable for the capacity of different public health systems, and can form a part of an integrated surveillance system (see the WHO's EPI-TB and CDC's BOTUSA models).

Case detection

Sputum smear microscopy is the preferred cost-effective method of diagnosing infectious TB patients. In some countries registers of all respiratory symptomatics (those who have had a cough for two to three weeks) presenting at health services are kept, and are useful in determining whether all are referred for smear exams. Laboratory registers record all examined patients and results, which are then included in a TB treatment register. Assignment of proper case definitions are critical: new sputum-smear positive, sputum smear-negative, or extrapulmonary; relapse; or retreatment (which includes cases returning after default and previous treatment failures). Laboratory networks are formed to enable regular quality control of smear-microscopy and access to supplementary diagnostic tools. Quarterly reporting on new TB cases, by case category, and with age and sex disaggregation for smear-positive patients is recommended.

Treatment

The TB treatment register enables proper case management. TB treatment entails six to eight months of multi-drug therapy, with observation during at least the first two months, for new TB cases. Smear exams at two, five, and six to eight months are used to monitor treatment progress, and outcomes are recorded: cured (smear-negative); treatment completed (without final smear); lost for view; died; treatment failed; or transferred. Retreatment cases are monitored in a similar fashion, with drug susceptibility testing if available. Quarterly reports on treatment results are developed, usually at the local level. These reports enable examination of problems and progress in quality or access to services, and assist in tracking the epidemic and control efforts at state, national, and international levels. Global targets have been set for 2005 of: 70 percent detection of infectious patients and 85 percent cure rates of those treated.

Surveys to measure drug-resistant TB, HIV-TB, and trends in TB infection and prevalence

Additional surveillance tools are used in TB epidemiology and control. These include: (a) representative national surveys of drug-resistant TB; (b) surveillance of HIV-infection among registered TB patients and TB illness or infection among HIV-infected persons; (c) periodic population-based surveys (too costly for most low-income countries) to determine TB prevalence and incidence levels; (d) risk of TB infection surveys to estimate trends in incidence based on infection levels in schoolchildren or other subpopulations. Where routine death registration is operating, examinations of trends in reported TB mortality is useful. Investigations of TB outbreaks are more feasible in low-incidence countries or in subpopulations in higher-burden countries (prisons, hospitals, and so on).

See: <http://www.who.int> for the annual WHO reports on the global TB epidemic.

Box 12**MALARIA SURVEILLANCE**

1. The burden of malaria is heaviest in remote rural areas, which are often beyond the reach of health facilities. As many as 80 percent of malaria cases and deaths are managed without the patient ever accessing public health facilities. Of those who do seek care within the public health system, the vast majority will be managed at the periphery of the system. As a result, traditional public health facility-based surveillance systems will only detect a small fraction of malaria cases and deaths; these data are rarely used for planning or monitoring control programs. Therefore:
 - (a) Assess whether investments in routine surveillance systems are warranted, particularly in regions (Sub-Saharan Africa) where reporting infrastructure is not well developed. Support instead might be directed toward development or strengthening methods for collection of household level data, such as the Demographic and Health Surveys (DHSs) or Demographic Surveillance Systems, which provide better estimates of disease burden.
 - (b) Sentinel surveillance, using a small number of sites for monitoring malaria cases, has been used in some countries. One advantage of this approach is that one can better link changes in disease burden to specific interventions and investigations (such as entomologic studies).
 - (c) If investments in routine surveillance are warranted, all levels of the public health system must be involved in reporting malaria cases. Methods to include private sector providers (including pharmacies and drug sellers) in case reporting should also be explored.
2. In almost all countries where malaria is endemic cases will be diagnosed both by definitive methods (microscopy or rapid diagnostic tests) and by clinical findings. Definitive diagnostic methods are more widely available in Latin America and Asia than in Sub-Saharan Africa, but are rarely available in peripheral health facilities in any region. Therefore:
 - (a) Counting only definitively diagnosed cases greatly underestimates disease burden. Cases diagnosed on clinical grounds should also be included in case counts; reporting should not be limited to facilities with capability for definitive diagnosis.
 - (b) Because cases may be diagnosed by multiple methods, clear case definitions are required. These vary by the transmission intensity of the region. In Sub-Saharan Africa the definition of a clinical case often includes anyone with a recent fever history or measured temperature of more than 37.5° Centigrade. In other regions patients with fever may only be considered a malaria case if there is no other explanation for their illness. Care should be taken to not double-count cases diagnosed in both clinics and laboratories.
3. Regardless of the method chosen, surveillance data, in general, will greatly underestimate overall disease burden. In addition, malaria disease burden will vary with the seasons and from year to year based on changes in weather patterns. Interpretation of routine malaria surveillance data, therefore, should be based on trends, not absolute numbers, comparing case information with similar months over several years.
4. There are four species of *Plasmodium* that cause clinical malaria in humans. *Plasmodium vivax* is more common in Asia and the Americas and *P. falciparum* (the species responsible for almost all malaria associated deaths) causes more than 90 percent of cases in Sub-Saharan Africa. The other two species, *P. malariae* and *P. ovale*, are of little public health importance. Laboratory testing is the only method for determining species. The importance of differentiating these species for surveillance purposes must be weighed against the costs of laboratory testing and the additional burdens placed on data collectors. As a general rule, surveillance systems in Sub-Saharan Africa do not differentiate cases by species.

Box 13

VITAL STATISTICS AND SURVEILLANCE OF THE MILLENNIUM DEVELOPMENT GOALS: INFANT AND MATERNAL MORTALITY

What are vital statistics?

The measurement of vital events is “the single most important addition that developing countries can make to their existing surveillance system” (White and McDonnel 2000). Knowledge of levels, causes, and trends in mortality is fundamental to public health practice, and guides a country’s public health priorities. A vital registration system, using birth and death certificates, permits the reporting of key vital statistics such as the infant and maternal mortality rates (IMRs and MMRs).

What are Millennium Development Goals?

The MDGs were established by the international community as a roadmap for an expanded vision of development (<http://sima/mdg>). The MDGs are a focal point of the Bank Group’s strategic framework. Health-related MDGs include the reduction of under-five child mortality by two-thirds, and the reduction of maternal mortality by three-quarters between 1990 and 2015. The IMR and the MMR are indicators for these MDGs.

How is infant mortality measured and what is its importance at the local level?

The registration of births and deaths provides an accurate and timely measurement of IMR (number of infant deaths [under 1 year of age] per 1,000 live births). The international community has depended on household surveys (such as DHS) to estimate IMR. While these estimates may be accurate, they are not timely, representing a period five years prior to the survey, and quoted for years after. Furthermore, while surveys provide national, and sometimes regional estimates, they are rarely useful at an operational level (at the level of the state or municipality). Health systems are increasingly decentralized, requiring local assessments of IMRs. The need to focus scarce resources in areas with poorer health outcomes also argues for improved vital statistics at the local level.

How is maternal mortality measured?

The MMR is the number of maternal deaths (deaths during pregnancy, childbirth, or the puerperium that are due to the pregnancy or its management) per 100,000 live births. Measurement of maternal mortality has been an issue for many years and is not easily carried out even using household surveys. This highlights the need for identification of maternal deaths and their causes through improved death certification.

How is infant and maternal mortality surveillance carried out?

Reporting of IMR and MMR alone permits targeting areas with higher mortality rates. However, in order to focus resources more efficiently and reduce mortality rates more quickly, information about why women and infants are dying is needed. This is done through case investigations, or audits, that include information about events leading up to the death, whether proper care was obtained, whether there were economic, cultural, geographic, or other barriers to care, and so on.

What are obstacles and incentives to improving vital statistics?

Infant and maternal mortality surveillances are easier with a vital registration system. While coverage of death certification in low-income countries is often poor, it varies widely and is not necessarily related to gross domestic product. Obstacles to death and birth certification, such as fees, should be eliminated. Health facilities should provide birth and death certificates prior to discharge, rather than demand that people go to a special office to obtain those certifications. Local health-care providers can certify births and deaths in the community. Examples of incentives include the requirement of a death certificate for burial or to receive any inheritance. When building a system, vital registration can begin in small sentinel areas, and expand as it is evaluated and improved.

Proposed Intermediate indicators for health MDGs can be found at: <http://wbln0023/Networks/HD/HDdocs.nsf/Thematic+Group+Documents/All/By+Author/9FF92329E0A0EB5A85256B1300776723?OpenDocument>

Box 14

AVIAN AND HUMAN INFLUENZA SURVEILLANCE

What is influenza?

Influenza is caused by a virus that is spread from person to person primarily via respiratory droplets. Most people who are infected with influenza viruses will have mild respiratory and constitutional symptoms such as fever, cough, congestion, fatigue, and muscle aches. Nevertheless, influenza can cause severe disease requiring hospitalization and sometimes death. The influenza virus is constantly evolving, requiring the production of a new vaccine each year that will provide protection against the latest circulating virus strains.

What is avian influenza and why the concern about a pandemic?

Avian influenza refers to a variety of influenza viruses that primarily affect birds, but on rare occasions may infect other species including pigs and humans. Since 1997, more than 120 cases of human avian influenza infections have been documented caused by an influenza A(H5N1) subtype, with mortality rates of around 60%. The vast majority of cases have been among people who were in close contact with infected birds. A major concern is that the H5N1 virus may adapt into a strain that is easily transmitted from human to human. This could cause a global influenza pandemic. The possibility of such a mutation and new strain developing will persist as long as the virus continues to circulate in birds that have contact with humans - a situation which should endure for years to come. The world is considered to be in a pre-pandemic stage.

What surveillance activities are important in a pre-pandemic situation?

Surveillance during the pre-pandemic phase is more important than surveillance when a pandemic is underway. The greatest opportunity for preventing or delaying national and international spread occurs in the pre-pandemic phase when numbers are small and containment may still be possible. Resource-intensive activities, such as animal surveillance and the active detection, investigation and laboratory confirmation of human cases are vital pre-pandemic, but are neither sustainable nor a priority once a pandemic occurs.

Surveillance during a pre-pandemic is needed to detect the transition to efficient and sustained human to human transmission, carry out effective prevention and containment activities, and monitor circulating viral strains. Ideally, it is integrated within an existing public health surveillance system. Three types of surveillance are important:

1. An **early warning system that can detect human clusters of severe pneumonia** and lead to rapid containment of new cases should be developed in every country. Even in low resource settings, surveillance for clusters of deaths from pneumonia in health care settings can be implemented and such deaths quickly reported. At a bare minimum, clusters of deaths among hospital workers should be reported immediately. A rapid response team is needed to assist in investigating such clusters, and to swiftly begin containment interventions where appropriate. Ideally, communities should be involved in reporting unusual numbers of severe pneumonia or unexplained deaths (rumor registers). However, community reporting may be difficult to implement on a large scale.
2. Every country should also have a **system for identifying and investigating poultry die-offs**. In the pre-pandemic stage it is very important to work closely with animal control authorities and identify influenza outbreaks in bird and poultry in order to contain its spread and limit contact between infected birds and humans. This will reduce opportunities for human infection, thus decreasing the likelihood that the virus will adapt for human-to-human transmission. Any outbreak in birds should also lead to an active search for human cases.
3. Finally a **virologic surveillance system** should be implemented. Most countries, even those in low resource settings, have at least one laboratory with the potential for identifying viral types. Many countries have a network of laboratories. The system should monitor circulating influenza strains and reliably confirming whether the H5N1 sub-type is present, either in birds or humans. If a country has no laboratory, then arrangements should be made for confirming or discarding H5N1 by using laboratories in neighboring countries. The virus is highly pathogenic and laboratory bio-safety is an issue.

What are examples of prevention and containment activities carried out in the pre-pandemic phase?

A primary objective is to reduce opportunities for human infection. Multidisciplinary rapid response teams should be available to investigate poultry die-offs and human severe pneumonia clusters. Identification and culling of infected or exposed poultry limits their contact with humans. If human to human transmission is suspected, measures to limit contact among humans such as quarantines, closing schools and workplaces and limiting travel to and from affected areas may help delay spread. Protective gear should be provided to health workers. Vaccine development could

Much of this information comes from the WHO AI website (http://www.who.int/csr/disease/avian_influenza/en/), a very useful resource.

AVIAN AND HUMAN INFLUENZA SURVEILLANCE (CONTINUED)

be very effective in limiting the spread, however vaccine production usually takes several months after a new strain is identified. Anti-viral drugs may help decrease severe illness and death. Their mass use for prophylaxis is being discussed. Finally, it is necessary to communicate effectively with the public about risk and protection.

How is routine surveillance for seasonal influenza done?

In high income, and some middle income countries, routine influenza surveillance is carried out by monitoring people with flu-like illnesses, hospitalizations for flu, and via laboratory-based viral surveillance. Usually sentinel sites scattered throughout a country's health care system report the number of people with flu-like symptoms. Ideally, the sites also systematically test for influenza by collecting nasal or throat swabs and sending them to labs for viral typing. In addition, public health laboratories report trends in viral sub-types being isolated. This information is tracked by health departments and helps guide the care health workers provide. In addition to identifying the start of influenza outbreaks, these surveillance systems can detect unusual influenza strains. Implementing or enhancing seasonal influenza surveillance in as many countries as possible is important for pandemic preparation.

How is seasonal influenza controlled?

Vaccination is a key component of influenza control. Recommendations about who to vaccinate differ depending on a country's resources. Most high and some middle income countries target specific groups of people at high risk of severe influenza-associated disease. Health communication and education about individual protective strategies can also contribute to reduce the spread of influenza.

What is global influenza surveillance and why is it important?

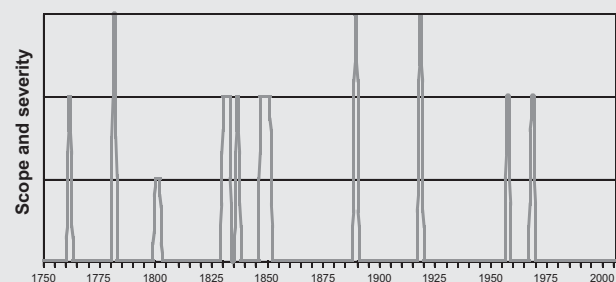
Continuous global surveillance of influenza is key for preparing annual vaccines and for identifying new or unusual strains that

may cause pandemics. WHO has a global network called Flu-Net. It consists of 112 National Influenza Centers (NICs) in 83 countries that monitor influenza activity and isolate influenza viruses. These NICs also report the emergence of "unusual" influenza viruses¹ that could be decisive for mounting a timely response to pandemics. The NICs send viral specimens to four WHO Collaborating Centers that carry out virus gene sequencing. Based on this system, every year WHO predicts the most likely strains to circulate. Influenza vaccines are updated semi-annually based on these predictions.

How are countries preparing for a pandemic?

Most countries have elaborated a pandemic preparedness plan that addresses the need for an adequate system for alert, response and disaster management. Depending on available resources, more specific preparations are made, such as stockpiling of antivirals, strengthening risk communications, investing in pandemic vaccine research and promoting domestic production of influenza vaccines. One component of such a plan should be to strengthen the capacity to respond to yearly epidemics of influenza. A surveillance network for human and animal influenza and a targeted influenza vaccination program are the cornerstones of a national influenza policy. The challenge now is to implement the plans.

Is a new flu due?
Major flu pandemics, 1750–2005



¹ According to the new International Health Regulations (IHR-2005) influenza A caused by a new viral subtype must be reported immediately to the WHO.

For further information, please visit:

http://www.who.int/csr/resources/publications/influenza/WHO_CDS_CSR_GIP_2005_8/en/index.html (Recommended strategic actions)

http://www.who.int/csr/disease/avian_influenza/consultation/en/index.html (Priority public health interventions)

APPENDIX B.5

The Who STEPwise Approach To Risk Factor Surveillance

The growing burden of NCD represents a major challenge to health development (Bonita and others 2001). The WHO has responded by giving higher priority to NCD prevention, control, and surveillance. The WHO STEPwise approach to risk factor surveillance (STEPS) is the WHO-recommended NCD surveillance tool. The WHO is building one common approach to defining core variables for surveys, surveillance, and monitoring instruments. The goal is to achieve data comparability over time and among countries. STEPS offers an entry point for low- and middle-income countries to get started in NCD activities. It is a simplified approach providing standardized materials and methods as part of technical collaboration with countries, especially those that lack resources.

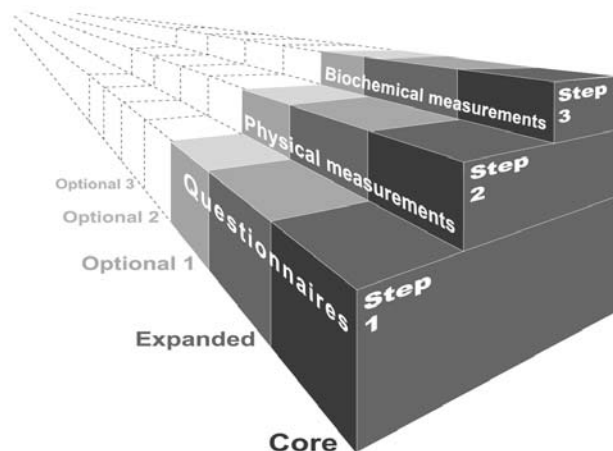
The STEPwise approach encourages the development of an increasingly comprehensive and complex surveillance system depending on local needs. The WHO emphasizes that, for surveillance to be sustainable, small amounts of good quality data are more valuable than large amounts of poor quality data.

Countries take the first step by adopting a core of standardized questions regarding behaviors including socioeconomic data, tobacco and alcohol use, physical inactivity, and nutrition. Questions that form the core data for each of these areas are simple and few—and ensure international comparability. Expansion of the basic questions is possible depending on local needs and resources. Optional modules on other behaviors can be incorporated.

Once step 1 is in place countries can build on it: more complex data can be added sequentially as resources allow. The core of step 2 includes physical measures of blood pressure, height, and weight. Step 3 involves blood sampling; the core includes blood glucose and cholesterol. Steps implementation at the country level is strategic and coordinated, builds capacity, and is sustainable.

The content of the WHO STEPS document is available on the Internet at: http://www.who.int/ncd/surveillance/surveillance_publications.htm.

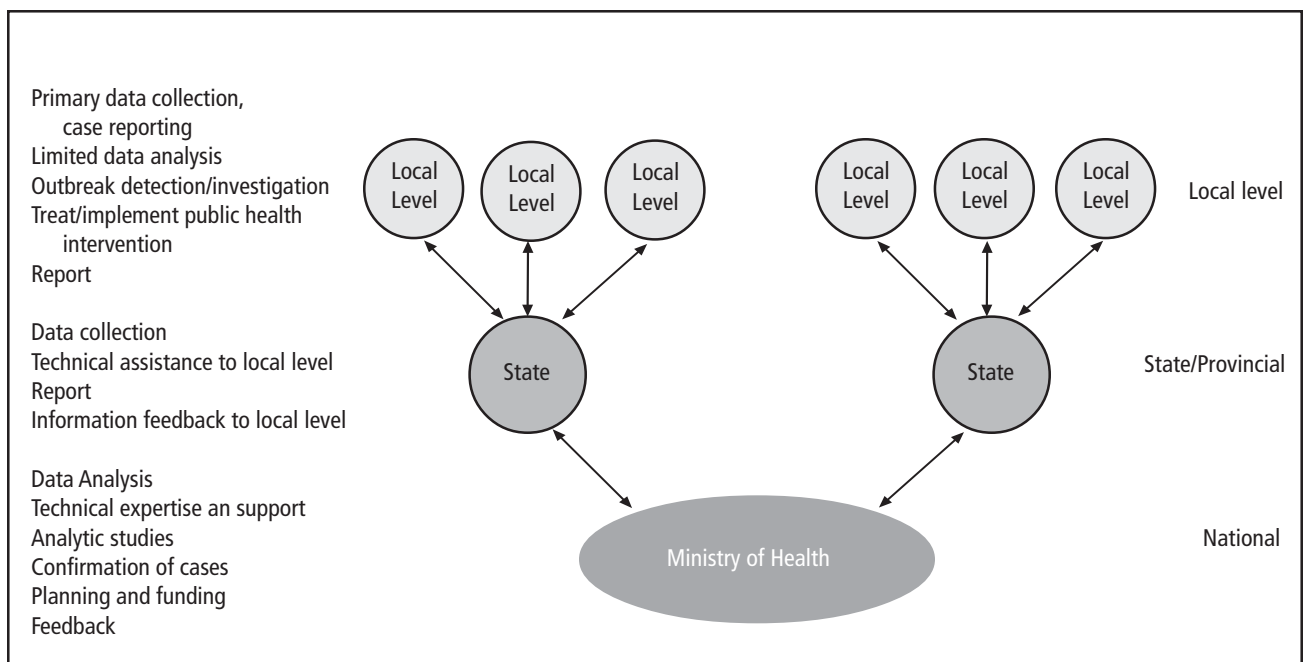
Figure 2
The WHO's STEPwise Approach



APPENDIX B.6

Surveillance Processes and Task by Level

Figure 3 Surveillance Processes and Task by Level



APPENDIX B.7

Surveillance Glossary

Active case finding	The dynamic identification of the occurrence of a disease or health event under surveillance (for example, house visits by community workers to identify cases of TB).
Active surveillance	The dynamic seeking of data from participants in the surveillance system on a regular basis.
Aggregate surveillance	The surveillance of a disease or health event by collecting summary data on groups of cases. In many general practice surveillance schemes clinicians are asked to report the number of cases of a specified disease seen over a period of time.
Attack rate	The proportion of those exposed to an infectious agent who become (clinically) ill.
Carrier	A person who harbors a pathogen and can transmit it but has no clinical signs of infection. In epidemiological investigation we depend on the use of case definitions. Definition may be based on clinical or laboratory criteria. We may also allow for gradations in the likelihood of being a case (definite, probable, possible). This is particularly useful when the pathogen is unknown.
Case	A person who meets the case definition. The definition of a case will depend on what one is trying to describe. Infection can be clinical or subclinical. Both types of infection can lead to a carrier state.
Case-based surveillance	The surveillance of a disease by collecting specific data on each case (reporting of details on each case of AFP).
Case-fatality ratio	The proportion of people who die as a proportion of all cases. This will vary depending on the case definition used.
Cluster	The occurrence of an unusual number of cases in persons, places, or time.

Community surveillance	Surveillance where the starting point is a health event occurring in the community and reported by a community worker or actively sought by investigators. 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, is an example of this type of surveillance.
Comprehensive surveillance	Surveillance of a specified disease or health event in the whole population at risk for that event (an example is AFP surveillance).
Contact	An individual who has had contact with a case in a way that is considered to cause significant exposure and therefore risk of infection.
Due dates	The dates by which reports from a specified period should be received by each level of the surveillance system (used to calculate timeliness).
Endemic	The constant presence of a disease within a given geographic area or population group.
Enhanced surveillance	The collection of additional data on cases reported under routine surveillance. Routine surveillance is a starting point for more specific data collection on a given health event.
Epidemic	The occurrence of cases of an illness clearly in excess of expectancy. This is often referred to as an outbreak (more neutral). Endemic diseases are those that exist at higher rates over a prolonged period.
Epidemiological case definition	The definition of a case used for reporting to the surveillance system. The definition may be clinical, laboratory, or both. It may relate to a specified disease (such as measles or yellow fever) or may identify a syndrome (for example, meningitis or AFP).
Exception flagging system	The existence of an automated system of data analysis that calculates thresholds for unusual events or exceptions.
Exposed	Someone who has met with an infectious agent in a way that may cause disease.
Feedback	The regular process of sending analyses and surveillance reports on the surveillance data back through all levels of the surveillance system so that all participants are informed of trends and performance.
Health event	Any event relating to the health of an individual (such as the occurrence of a specific disease or syndrome, the administration of a vaccine, or a hospital admission).
Hospital surveillance	Surveillance where the starting point for a report is the admission to a hospital of a patient with a particular disease or syndrome.
Incidence	The number of persons who fall ill with a certain disease during a defined time.

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 inanimate environment.
Integrated surveillance	Common approach that provides a universal surveillance service using similar structures and techniques.
Intensified surveillance	The upgrading from a passive to an active surveillance system for a specified reason and period (usually because of an outbreak). The system becomes more sensitive and secular trends need to be interpreted carefully.
Laboratory surveillance	Surveillance where the starting point is the identification or isolation of a particular organism in a laboratory (for example, surveillance of salmonellosis).
Mandatory surveillance	A surveillance where participants <i>must</i> report to the system. Notifiable diseases are one example of a mandatory system where reporting is mandated by law. In another example, health authorities may require that all public laboratories report specified diseases. This is usually not by law, but is linked to their contractual duties.
Notifiable disease	A disease that must be reported to the authorities by law or ministerial decree.
Outbreak	The occurrence of two or more linked cases of a communicable disease.
Passive surveillance	Surveillance where reports are awaited and no attempt made to actively seek reports from the participants in the system.
Performance indicators	Specific agreed-on measurements of how participants are functioning within the surveillance system. These indicators may measure both the process of reporting, action taken in response to surveillance information, and the impact of surveillance on the disease or syndrome in question.
Periodicity	The presence of a repeating pattern of excess cases. The repeater period can be in years, months, or weeks.
Prevalence	The number of persons who have a disease at a specific time
Primary care surveillance	Surveillance where the starting point for a report is a new consultation for a particular disease or syndrome with a primary care physician or health worker at a clinic.
Reporting completeness	Proportion of all expected reports that were actually received (usually stated as percent completeness as of a certain date).

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 that were received by a certain due date.
Routine surveillance	The regular systematic collection of specified data in order to monitor a disease or health event.
Sentinel surveillance	The surveillance of a specified health event in a sample of the population at risk. The sample should be representative of the total population at risk.
Surveillance	The systematic collection, collation, and analysis of data and the dissemination of information to those who need to know so that action may be taken.
Surveillance predictive value	The likelihood that an “ outbreak “ detected by a surveillance system is truly an outbreak.
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, and so on. In addition it may contain information on the performance of participants using agreed-on performance indicators.
Surveillance sensitivity	The ability of a surveillance system to detect an outbreak (the proportion of all outbreaks that could be detected by the system).
Survey	An investigation in which information is collected systematically. It is usually carried out in a sample of a defined population group and in a defined time. Unlike surveillance, it is not ongoing, although it may be repeated. If repeated regularly, surveys can form the basis of a surveillance system.
Unusual event	The occurrence of a disease or health in excess of expectations. This expectation is either a static or dynamic threshold set by the system.
Voluntary surveillance	A surveillance system wherein participants take part and report voluntarily.
Zero reporting	The reporting of zero cases when the participant has detected no cases. This allows the next level of the system to be sure that the participant has not sent incomplete or lost data.
Zero surveillance	The surveillance of an infectious disease by measuring disease specific antibodies in a population or subpopulation.

Source: WHO 2001a.