PART B

How to Prepare a Surveillance Project: Operational Aspects

Part A addressed the concepts of surveillance and the "ideal" way of implementing a surveillance project. In Bank operations there are multiple constraints, related not only to the Bank style of doing business but also to clients' demands and the pressures of prompt and timely delivery. These circumstances influence project preparation: Technical aspects, information needs, and loan preparation processes must be balanced against each other.

Part B offers a rapid surveillance system assessment within the usual time and cost constraints of project preparation. The most common surveillance issues that may be encountered are discussed, as are the main decisions necessary in project implementation. This chapter outlines the professional expertise needed for missions, where to find such professionals, as well as the corresponding terms of reference. The most common training and staffing needs are indicated. Projects might consider funding such training and staffing to assure a successful project and good system performance. Part B also touches on assessment of project progress and impact, and itemizes the most common budget lines that should facilitate the project costing process. Finally, all these elements will combine to outline the main conditions for successful project implementation.

Where do I begin?

When preparing a project to strengthen a national surveillance system several main steps are necessary to determine (a) the state of the current system, (b) the desired characteristics of the "ideal" system, and (c) strategies for attaining a better system.

Do I need to know all health data systems that exist in the country?

It is important to know the current data systems because they can be used to feed the epidemiological surveillance system. An information system can be built to link those that already exist; in doing so there will be more information available for policy and decisionmaking purposes.

The most common data systems are:

1. Mandatory disease notification systems
2. Vital statistics
3. National laboratory systems
4. Vertical programs
5. Periodic surveys
6. Hospital discharge information systems

Current system needs assessment. What should I look for?

The seven elements of surveillance are:

1. Detection and notification of a health condition or event
2. Epidemiological, clinical, and laboratory investigation and confirmation

3. Data collection and consolidation
4. Data analysis
5. Reporting
6. Data transmission, communication, and feedback
7. Resources
8. Connection to action

Based on the above seven elements of surveillance there are four main areas to assess:

1. Communicable disease and NCD risk factor surveillance
2. Laboratory network
3. Information and telecommunications system
4. Economic analysis

In this paper these four areas will be referred to as the "epidemiological surveillance system." Due to time constraints in Bank operations, it is not generally possible to fully assess the system as recommended in appendix A.6 and as described in various documents cited in this toolkit. However, there is a set of core information needed to establish the objectives of the project and to identify areas for improvement (WHO 2001a). The relevant questions are presented below.

Communicable Disease Surveillance Systems

The assessment should strive to answer the following questions (based on Koo and Ostroff's report No: 19154—for World Bank 1999).

Policies and conditions under surveillance

- How many health conditions are notifiable at the national level?
- Are the notifiable health conditions well defined, and are definitions properly applied by reporting personnel?
- What were the selection criteria? Who was part of the selection committee?
- Are there also syndromes under surveillance?
- Are these diseases and syndromes reported nationally?
- Besides this set of health conditions reported nationally, are there more reported only at the state and local level, or both?
- Do specific surveillance guidelines exist?
- Are there systems for surveillance of communicable diseases besides the mandatory notification system (such as vertical programs)?

Organization of the system

- How is the system organized?
- Is there a clear definition of the tasks and responsibilities of the three levels of the system?
- Is there clear assignment and awareness of responsibilities? Do providers know their responsibilities?
- Are those functions adequate for the surveillance process?
- Does the national level recognize and understand the need for a good relationship between the national and state levels?
- Are the personnel at all levels of the system committed to data collection and disease surveillance?

Reporting procedures and quality of data

- Are there standardized reporting forms? Are they nationally adopted, maintained, and used?
- Is the information that is collected adequate for action to be taken?

- Is there too much or too little information?
- What is the periodicity of reporting?
- Are there substantial lag times in the reporting system?
- Is there zero reporting? (See definition in glossary, appendix B.7.)
- What are the main sources of reporting data? Does the private sector also report?
- Are data reported in a way that is easy to interpret? How are data reported—electronically or on paper?
- Are reporting procedures consistent and standardized?
- Are reported cases in concordance with the epidemiological profile of the states and states?

Disease investigation: data use

- Is the investigative capacity adequate?
- Is the investigative response timely?
- How much of the information collected is actually used for reports, public health action, or research.
- Do investigations lead to public health actions?
- Who is responsible for case investigation? Are jurisdictions clearly drawn?
- Are there regular interactions between the public sector and other groups (for instance academic centers and medical organizations)?
- Is there a core team with investigative capacity at the national level?

Information dissemination

- What kind of reports does the national epidemiology unit produce? Are they simple numerical summaries, or do they include more sophisticated analysis and interpretation?
- What is the periodicity of the dissemination?
- To whom is information distributed?

Capacity issues

- How are data transmitted (fax, telephone, mail, vehicle, Internet)?
- Does the system have adequate personnel in terms of quantity and quality to perform surveillance tasks?
- How many staff are at the national level, and what are their profiles? How many staff are in each state or local epidemiology department, and what are their profiles?
- Do they have computers?
- Do they have standardized software, no software at all, or various levels of software?
- Provide case studies of recent events that stressed the system—where it failed or performed well.

Noncommunicable diseases and behavioral and other risk factor surveillance

There are countries with epidemiological profiles that justify surveillance for NCDs and their risk factors Countries in Eastern Europe, Latin America, the Middle East; and China have all undergone the transition from a disease burden largely attributable to communicable diseases to one primarily due to NCDs (such as heart disease, diabetes, cancer, and injuries). A public health surveillance project can help countries start or strengthen NCD surveillance and BRFSSs.

Most of the questions raised above for communicable disease surveillance—for instance organization, reporting, dissemination, capacity—also apply to NCD surveillance. However, NCDs differ

from communicable diseases in that most cannot be cured. Disease investigation is not usually a component of NCD surveillance, and public health actions focus on primary prevention. NCDs can be entirely prevented through lifestyle and behavior change. Early diagnosis and adequate management are important for secondary prevention—for preventing the complications they cause (heart attacks, strokes, blindness and amputations, among others). Specific issues that should be addressed include:

Behavioral and other risk factor surveillance

- Have any surveys—national, state, or local—been conducted that address behaviors? How many? Are there plans to continue the surveys?
- Will these surveys be periodic, or are there plans to make data collection continuous and systematic?
- What risk factors are included in the survey or surveys? Is the information collected just about behaviors, or are physical measurements (such as weight or blood pressure) included?
- Have any clinical samples (such as cholesterol or glucose) been collected?
- Are BRFs limited to NCDs, or is there interaction with communicable disease programs and collection of key communicable disease behavior data (such as sexual behaviors and hand-washing)?

(See appendixes A.3, A.5, B.4, and B.5 for more information on behavioral and other risk factor surveillance.)

NCD mortality

- Is there a periodic assessment of mortality from NCDs?
- How complete is death registration? How accurate is classification of cause of death?

NCD morbidity

- Is there any information about the prevalence of NCDs in the population?
- Is there any information about the prevalence of undiagnosed disease?
- What sources of information are used? Is the source self-reported information or health facility information? Hospital discharge surveys, or ambulatory surveys?

NCD control

- Is there a survey or routine information collected on treatment and control of NCDs?

Organization and data utilization

- What is the link between those who do NCD and BRF surveillance, and those who develop and implement prevention and control activities? Is there good communication between these departments?
- Do those who work in prevention and control contribute to the development or modification of the data collection instruments? Does the information collected address their needs?
- Are the data utilized to improve prevention and control?
- Have priorities been set and criteria developed for measuring success against surveillance goals for NCD?

Prevention and control activities

- What types of health promotion activities does the health department carry out? Are there any school health activities, workplace activities, activities in health clinics,or public service announcements in the media?
- More specifically—what work is being done to reduce tobacco addiction? Are there any smoking regulations?

- Are there activities to encourage physical activity, promote injury reduction (such as seat belt campaigns), or better eating habits?
- What about treatment of NCDs such as diabetes and hypertension—is identification and treatment included in the primary health-care package?

Laboratory network

Usually the national laboratory system is comprised of different types of laboratories, such as national reference laboratories, public health laboratories, entomological units, zoonosis control centers, blood banks, and biosafety laboratories, among others. Due to limited project preparation time, it is advisable to assess a representative sample of laboratories at each corresponding level of the system, rather than the entire laboratory network. Concurrent with the Bank's assessment a situational analysis should be conducted by authorities in the national laboratory network. There should be consensus between the two assessments.

The assessment should review:

- Building facilities and working conditions
- Laboratory equipment and reagents
- Training of laboratory staff and whether there is a sufficient number of laboratory personnel
- Diagnostic capability (speed of diagnoses, number of diseases diagnosed, and major gaps)
- Reporting (links up and downstream, timeliness of reports, ability to communicate emergencies)
- Participation in national quality programs
- Laboratory management, quality control procedures, proficiency programs

While the client may be tempted to spend large amount of resources on renovating or building new laboratories, this temptation should be counterbalanced by the critical need to invest in personnel and training to efficiently and effectively use existing laboratories.

Information and telecommunications system

There are many components of the information and telecommunications system. The most important is staff trained in the use of data and information technology. Other important aspects include the availability of desktop computer equipment and software, and the overall communications infrastructure (paper mail, fax machines, e-mail, Internet, and so on).

Depending on the resources available, countries have adopted a variety of different models for collecting and analyzing data. At one end is a highly centralized approach, such as where most of the work is done at the national level. At the other end is a decentralized model where states or local levels have staff and equipment that allow them to manage their own data. There are also hybrid models where larger states and local levels manage their own data, while smaller states rely on national staff, or smaller local levels rely on state staff.

The questions that should be answered with respect to the information and telecommunication systems fall into three categories:

- How are data collected and reported to local, state, and national health authorities?
- Who is responsible for managing, analyzing, and interpreting data?
- How, in what form, and to whom are results communicated?

Responses to these questions should be used to determine what infrastructure (staff, hardware, software, telecommunications links) are currently available and what will be needed in the future.

Data collection

Data collection can be paper-based, electronic, or some combination thereof. For example, notifiable disease surveillance may use an Internet-based electronic system, while NCD surveillance may use a field survey with information initially collected on paper and later entered into a computer.

- For each health data system identified, how does information flow—who reports the data, and how (and on what medium—paper, fax, e-mail, Internet-based data entry) is it reported?
- How do the data get to the state or local health department?
- How are these data then communicated to the national health authority?
- Where and when is paper, fax, e-mail, Internet used?
- Does the current system allow easy querying or correcting of data?

Data analysis and interpretation

- Once the data are collected, who does the analyses? Is it expected that staff at the national level will do all analyses, or should state and local health departments be able to produce their own analyses and reports?
- Are health program staff involved in analysis, interpretation and reporting, or is it all done by surveillance staff?

Data dissemination and communication

- Once the analyses are completed, how are results communicated to potential users? Are state and local staff, and individual data reporters given routine feedback based on the information they collect? How do they receive the information? Are reports printed on paper and mailed to them? Are they faxed or sent via e-mail? Are they accessible on the Internet?
- What about the general public? Are summary reports prepared and published? Are they made available on the Internet?
- Is there effective communication between the health department and the media? Is the media utilized for public health messages?
- Are health programs in the communication loop? NGOs? Communitinues?

Computer equipment

- What kind of computer and telecommunications infrastructure is available or needed to support and expand the data collection, analysis, and information dissemination efforts?
- Do states and local levels have the staff and equipment needed to collect and analyze their own data, or will this be done for them at the national level?
- How will sensitive and confidential data be secured? What safeguards are in place to assure that no breaches of confidentiality—accidental or intentional—occur?

In preparing for the future it is important to think creatively about the role the Internet may play. A number of national systems have been, or are being, developed that use the Internet to collect data directly from health care providers and local authorities to disseminate preformatted reports and analyses based on those data, and to allow users to request custom analyses of data. For such a system to work effectively, providers and users of data will need Internet access. Application development, database management, and security are best handled centrally because of the complexity and expense in setting up such systems. Because local and state governments do not need to create and manage their own separate infrastructure there can be substantial cost savings and increased managerial efficiency over the long term.

What are some general issues and needs of the surveillance system?

Coordination and standardization

- Does the system have leadership and coordination from the national level? Are data collected nationally, representatively, and in a uniform fashion?
- Do all states and local levels collect, investigate, record, and report in the same fashion?
- Are there standard definitions and guidelines easily accessible for notifiable diseases?
- Are there standardized disease investigation forms for each notifiable disease? Which kind of data do these forms include?
- Are disease reporting and laboratory data linked? How simple and successful is this linkage?

Integration

- Are the main components of the system (the surveillance system, the disease-specific programs, and the national laboratory network) working in an integrated manner and effectively sharing information?
- Is there a link to datasets in place?

Consolidation and assessment

This assessment should include a review of each disease, why it is being reported, what actions need to be taken at the local, state, and national levels and how data should be reported. Information needs may vary depending on the disease and on the level of the health system (see table 1, appendix B.6). Surveillance information generally gets consolidated and condensed as it moves up the pipeline from the local to state to national level. "High volume" conditions such as influenza, diarrheal diseases, and pneumonia, may overwhelm surveillance personnel if detailed information is collected about every single case. In order meet public health needs and provide appropriate information for control programs, alternative methods of surveillance (such as sentinel site surveillance) that provide higher quality data more efficiently can been devised.

In addition to consolidating information on any particular disease, the system should be streamlined to avoid duplication—for instance multiple reporting systems for the same disease.

Training and capacity building

- Usually there is a great need to have well trained personnel at all levels of the system.
- Assess the number of persons involved in disease monitoring.
- Have cases been properly investigated?
- How skilled are personnel at the national level?
- Identify the critical staffing needs and type of training needed.

Analytic capability

Systems often generate numbers and disease rates, but lack data analysis and interpretation.

- Are data sufficient to develop meaningful information on risk factors and provide diagnostic confirmation in order to appropriately plan prevention and control activities?
- Is there a GIS or capacity for developing one?

Quality control

- Is there a quality control system in place?
- What proportion of cases meet case definitions for disease?

For instance, diarrhea is usually defined as "presence of illness for at least 24 hours with more than three loose bowels in that period," so unless charts

are reviewed there is no way to tell what proportion of cases meet the case definition.

Investigation

- Does the system have outbreak response capacity at all levels, and conduct epidemiological studies to address priority diseases?
- Do personnel know their main tasks and degree of responsibility when an outbreak occurs?
- How many investigations have been performed at the national level?
- Are there written reports or publications of these investigatiµons?

Data reporting and feedback

- Does the system produce periodic bulletins and provide feedback to disease reporters?
- Are data appropriately summarized and presented and easily available for decisionmakers to take appropriate control and prevention actions?

Alternative surveillance methods

As mentioned above (in discussion of consolidation and assessment), there is a need to determine the best methods for collecting data of sufficient quality for use in developing control programs.

- Are appropriate alternative methods of surveillance such as sentinel networks used appropriately for influenza or diarrheal diseases?
- Are these alternative systems linked to the national laboratory network?

Regulatory aspects

A system of mandatory disease notification means that notification is compulsory. Obliging health providers to report certain diseases and information that may otherwise be confidential requires a basis in law,

Box 6

Lessons learned from Jean-Jacques de St. Antoine, Task Manager for preparation of the Brazil's disease surveillance project (VIGISUS)

In 1997, we received a request from Brazil basically saying: "Our disease surveillance system is 20-years-old. We need to modernize it; we would like to make it become the Brazilian CDC. Can the Bank help us with that?"

"Of course we will help you," I replied (not having even written a PCD for the project). The challenge was to agree on a vision of what the system should look like in 10 years, what would need to be done technically and financially, at what pace, and who would have the responsibility to do what at the federal or the local level. The technical work consisted of compiling the best package to strengthen skills at the center, as well as regional and municipal staff, to improve the collection, transmission and analysis of data and create mechanisms to ensure the link with decision-making required to address diseases (either prevent diseases, deal with outbreaks of communicable diseases, or reducing the risk factors for noncommunicable ones), and finally modernizing the laboratory network. The role of the various levels of the system (federal, state, and municipal) would be reviewed. The work with partners in CDC and PAHO gave me great professional satisfaction. The work with the client presented the challenge of addressing the needs of a sophisticated client in an immense country, making sure to keep project design fairly simple and flexible. It was a great learning experience for me. *Based on that experience, if I had a chance to do a second project, I would*:

- Fully evaluate the existing system as part of project preparation or sector work to make things easier later. *I would involve the client as much as possible in the exercise.*
- Build strong partnerships with CDC and the WHO and its regional offices, the key actors in this field.
- Get the *best* consultants (they need to have both the theoretical and practical knowledge and be able to sell their ideas to the client).
- Press the client to limit the number of disease and risk factors under surveillance, but pick them well.
- Design a project with a few key activities that are sure to have a strong and lasting impact in the country (training, improvement of data collection, and upgrading of laboratories).
- Pay close attention to what should be done at different levels of the system (national, state, and municipal)."

ideally. Most countries with this type of reporting have some type of statutory provision that enumerates exactly how, to whom, and within what period the reporting must occur. In the United Sates, for instance, this power resides in the states, and reporting requirements vary from state to state (Matthews, Neslun, Churchill 2000).

What are the main decisions and options for project implementation?

Responses should be consistent with the level of development of the health service infrastructure, personnel, available funding, and project duration, among other factors.

Flexible project design versus rigid structure

One alternative project design is a federal, fully detailed, and standardized national surveillance system. This approach might not properly fit the system needs, given the specific gaps and capacity of different states and local levels. In addition, despite the current climate of decentralization, local surveillance needs are often unrecognized at the national level. A top-down approach could weaken local ownership since the local level might not have the opportunity to articulate its needs. At the same time, a national surveillance system requires an overall conceptual framework and standardization of data collection, laboratory procedures, case definitions, and basic norms to be followed by all participants of the system. The most common approach is a project partly predetermined and partly flexible during implementation, based on state and local level development plans. This alternative balances the need for national consistency with the opportunity to respond to local needs and targeted interventions.

Comprehensive versus focused

The surveillance system should be developed rationally, based on national capacity and cost-effectiveness. It is not always appropriate to have a large number of health conditions under surveillance since it may be difficult to properly address and respond to each one. Criteria should be applied to determine high-priority events for surveillance, and the system should rely on alternative surveillance methods, such as sentinel sites, when needed. These sentinel sites are often more successful when implemented gradually.

Phasing by region or diseases versus phasing by activity

There are several options to consider. First, the project may be implemented by geographic area. This is a difficult option, because most of the time states or local levels are not willing to wait for "their turn." The second option is to implement the project for a few diseases at a time. This option could potentially be used, but probably not when financed by a loan, since phasing by disease could require costly duplication of training efforts, standardization of procedures, and many other activities related to implementation of the system. A third, and possibly best, option is to implement the project for high priority events, or to begin in sites where the maximum number of cases would be detected, using the least effort. Certain project activities could then be implemented gradually (for example, training programs, sentinel networks, telecommunications systems, and NCD surveillance, if applicable).

Communicable diseases versus noncommunicable diseases

Addressing NCDs and BRFs depends on the epidemiological profile and development of the country. Middle-income countries with longer life expectancies and increasingly urban populations have reached the point where chronic diseases and diseases related to lifestyle cause the majority of deaths and illnesses. Understanding current disease patterns and related behaviors in those countries and long-term monitoring of changes in these patterns and behaviors over time is critical to effective plan-

ning and execution of appropriate public health interventions. Most of these countries are not prepared in this field. Therefore, an incremental, strategic approach to chronic disease surveillance and associated risk factors is advised. The project could begin by setting priorities in chronic disease control and prevention, determining staffing needs, and then implementing an appropriate training program.

Private versus public intervention

Health surveillance and disease control are public goods and are core areas of responsibility of the national ministries of health, and their state and local counterparts. Nevertheless, there may be ways in which private health insurers could become partners in the system and contribute through cost-recovery. Clearly, health insurance providers have a vested interest in seeing that disease incidence is reduced through surveillance, control, and public health programs, and may be willing to pay for these services through contributions or levies on insurance premiums. Health insurance providers could be contracted to perform certain services.

What about the economic analysis?

One of the most common problems observed in surveillance systems is a high number of health conditions under surveillance that burden the system and prevent it from working efficiently. Often, strengthening surveillance is automatically associated with increasing the number of health conditions included in the system. This can become a difficult issue for negotiation; it is crucial to give evidence of the negative impact of choosing too many health conditions for monitoring.

To establish priorities and to address the cost-effectiveness of the proposed interventions on which the economic justification of the surveillance system is based, a quantitative analysis can be carried out to help determine the optimal scope of surveillance and disease control. The establishment of priorities and the final decision of which diseases to include can be based on the following criteria: (a) disease impact on national DALYs; (b) approximate cost-effectiveness of control interventions; (c) outbreak potential of emergent diseases; (d) plan or potential for eradication; (e) vaccine preventability; (f) classification as an indicator or risk factor for an important disease; and (g) the probability that improved surveillance would lead to better control (that is, reduced mortality, morbidity, or disability) of the disease.

This analysis should take place early in the project preparation cycle in order to have an impact on the design of the system, both in scope and method, and should use a participatory process, involving the stakeholders in the analysis. This early involvement will ease the process of discussing the final list of health conditions to be included in the system as well as the corresponding surveillance methods.

This process was successfully carried out in the preparation of a World Bank surveillance project. The original list of 50 notifiable health conditions targeted for surveillance (too many for an efficient system) was reduced to 29 for notification, and 4 to be surveyed by alternative methods such as sentinel sites.

Sustainability analysis

Aside from quantitative analysis to prioritize the health conditions targeted for surveillance, a sustainability analysis should also be undertaken. In other words, will the changes initiated by the project be sustainable?[7]

[7] This two-part economic analysis (carried out by G. Beeharry and D. Akhavan) can be found in the Project Appraisal Document (PAD) of the Argentina Public Health Surveillance and Disease Control Project, Report No: 19154.

What expertise do I need on missions?

The minimum core technical personnel necessary to prepare the project include:

- A *communicable diseases surveillance specialist* and, in some middle-income countries, a noncommunicable disease and BRF surveillance specialist.
- A *laboratory expert* with experience in laboratory surveillance.
- An *information technology expert* with experience in designing and establishing telecommunications systems. In less-developed countries this specialty may be replaced by an information specialist, since these countries may lack the capacity to implement and sustain a telecommunications system.
- A *health economist* to develop a cost-effectiveness and sustainability analysis. Understanding of surveillance and disease control is desirable.

Ideally, the consultants should not only have knowledge about the subjects but also practical experience, especially in developing countries.

Where can I look for this expertise?

There is no organized network or directory of surveillance experts. However, there is a very effective informal network. One can access the informal network by contacting the many national and international agencies that are in the forefront of public health activity, such as the CDC in the United States, parallel organizations in other countries, and the WHO and its regional offices, which provides a Web site directory of national surveillance centers (www.who.int/emc/surveill/mohglobal.html). Numerous for-profit and not-for-profit consulting firms can also provide or identify expertise. Schools of public health are a resource, as are specialists of national surveillance systems, especially from countries that have proven, high quality, surveillance systems. Finally, there is a new effort by retirees from state and federal public health agencies in the United States to establish a nonprofit consortium in order to continue their contributions to public health. This organization, Public Health Emeritus, may be reached in the United States at (973) 972-4422. Terms of reference for some specialties can be found in appendix B.3.

National stakeholders need to be involved, right?

Right! The system assessment described in the beginning of this section will provide the minimal information needed to establish the project options available based on a needs assessment of each state in terms of resources (personnel, equipment, infrastructure, and financial) and perceived and actual disease priorities. In one state the critical need may be personnel, in another computers, while in another it may be improved laboratory capacity. One model will probably not suit the needs in all states, so active involvement of the national stakeholders may help determine the most appropriate and suitable model. This has two main benefits: better data are obtained for decisionmaking in key areas for improvement; and ownership and commitment of the key project implementers is established through making them part of the team-based decisionmaking process.

How do I involve the stakeholders in the process?

Rather than addressing all diseases, the evaluation should focus on certain diseases and can be conducted in specific high-, medium-, and low-capacity states, as well as at the national level. A stakeholder workshop should be planned to address questions regarding the main problems assessed by the Bank team (see an example of such a workshop in appendix B.2). Every assessment should include participation of national experts and personnel involved in the national surveillance system.

Box 7

Lessons learned from Marcelo Bortman, Coordinator for the Public Health Surveillance and Disease Control Project in Argentina (VIGI-A)

Argentina is a federal country in which provincial states have been responsible for health-related services since Argentina was made a republic. This "independence" results in significant differences among the health services provided by each state. Thus, the surveillance system suffered not only problems of quality and coverage, but it also struggled with structural differences among states with substantial differences in the performance of their surveillance systems. Although well-developed states had better coverage and greater capacity for analysis and response, many states lacked capacity.

Therefore, the following was key for a smooth implementation and involvement of the states:

- Consensus among *state*s regarding surveillance norms. Support from the state level was key for project success and consistency.
- States were involved in the selection of trainers and development of training plans.
- The training program was designed to develop incrementally, with intermediate and final products identified. Jurisdictions, epidemiology instructors, and epidemiology personnel were involved in the design of this program.
- Ensuring participation of state authorities in the selection of trainers, requiring a screening for knowledge of epidemiology prior to hiring.
- Internet-based surveillance software was developed for three standard modules encompassing most of the system: mandatory notification, active surveillance, and sentinel surveillance.
- Integrate laboratories, clinical personnel, and epidemiologists to create independent strategies and protocols for each of the conditions to be under surveillance by the sentinel surveillance units.

Due to the complexity of surveillance systems and the relationship with other areas of the health system, project preparation should not be rushed; rushing could result in overlooking the above-mentioned issues. If necessary, the first year's loan funds could be used to complete the needs assessment.

After these activities, the team should be able to identify the system's capacity and its main problems, and start discussing areas in need of investment, as well as to create ownership and support from the main stakeholders for project implementation.

What are the staffing needs?

The most common specialties are:

- Epidemiology
- Infectious diseases
- Statistics
- Data entry
- Computer support
- Microbiology (relationship between epidemiologists and laboratory technicians)
- Editing (editing epidemiological bulletins)

Staffing needs at the national, state, and local levels should be identified by task and quantified in terms of personnel per unit population (such as one state-level epidemiologist per 500,000 population, one computer-support person per 1 million persons) and specific circumstances (for instance geographic barriers, rural as opposed to urban) should be recognized and addressed.

At the national level a core group with technical expertise is required to provide leadership and supervision. At the state level technical people are needed to support surveillance activities (to analyze, investigate, report, respond, and provide feedback and technical support to the local level). At the state level the project will need at least an epidemiologist responsible for project implementation and collaboration with the Project Coordination Unit. Depending on the size of the state, it may also require a as well as another epidemiologist to assist with training.

The number and profile of staff for surveillance or project implementation depends on many factors,

from the degree of decentralization of the country, to its size, population, and development. But there is always a common need—training. Regardless of the country characteristics, a national surveillance system needs to have a team of field-trained epidemiologists who are competent in the practical application of epidemiological methods as they relate to a wide range of contemporary public health problems.

What are the most common training needs?

Most countries lack epidemiology expertise, so projects should consider training actions in several areas. There is often a strong desire on the part of countries and Bank personnel to invest in renovating or building new facilities, particularly laboratories. This temptation should be resisted. Instead, it should be recognized that competent and qualified personnel, including laboratory personnel, are key to effective surveillance (see table 7). Training is fundamental to the success of any surveillance project.

What are the most common budget lines for public health surveillance?

(table 8 Common Budget Lines for Public Health Surveillance)

How can I assess project progress and impact?

Progress

There is a wide array of activities that can be implemented to increase efficiency, and strengthen and support surveillance systems—from training, to definition of surveillance norms and upgrading laboratory networks and communications systems. All these activities should be included in project implementation plans, and should be phased according to priority for system development. Potential indicators for assessing progress in the system development include: (a) definitions and coding standards defined and approved; (b) key personnel trained in various areas of expertise and; (c) upgrading a certain number of laboratories to biosafety levels 3 and 2, and other laboratories to biosafety level 1;[8] (d) number of case reports from each area reporting (e) number of cases from each area with completed disease investigation and appropriate response (f) epidemiological bulletin development and production of a certain number of bulletins;

Impact

Given the nature of the investments often required to develop or strengthen surveillance systems, it may not be possible to measure the impact of the project on surveillance during its short lifetime. Much of the project's lifetime is devoted to preparing the system; only when the project is close to an end will we start to see results. Therefore, it is advisable to be conservative in defining impact indicators, and to place greater emphasis on process indicators. The indicators used depend on the system and its resources. Impact measures should be quantifiable, including items such as:

(a) Notifiable disease data appropriately utilized (for instance, X percent of cases of invasive meningococcal disease detected have been investigated and appropriate control measures instituted);

(b) Surveillance system detects at least X percent of invasive meningococcal disease per 100,000 inhabitants. This level should be met or exceeded in Y percent of the provinces, B percent culture confirmed, and C percent of isolates sero-grouped;

[8] Four biosafety levels exist depending on laboratory practices and techniques, safety equipment, and laboratory facilities (CDC/NIH 1999).

Table 7
Training and targeted personnel

Training	Targeted personnel
Basic epidemiology • Health indicators • Information systems	Local (health center or hospital), state, and laboratory personnel, and the outbreak control team
State-level epidemiology training • Epidemiologic methods • Epidemiological studies and types of error • Epidemiology of communicable diseases and chronic illnesses	Professionals at the national and state levels (working in epidemiology)
Basic principles of outbreak investigation (level I) • Case analysis • Description of outbreaks • Causes • Epidemic curves	State-level doctors and nurses who would be future trainers
Principles of outbreak investigation (level II) To avoid long absences of professionals from the workplace, this training can be developed as 2 two-week courses, separated by a 6-month field project, and a one-week follow-up course	State personnel, health specialists, and outbreak control team who would be future trainers
Outbreak investigation (advanced level) • FETP • TEPHINET (usually two-year program). (See appendix A.4 for more information.)	Epidemiologists, infectious disease specialists, laboratory experts, entomologists at national epidemiological unit—all of whom make up the national team to assist the country in the most difficult outbreaks
Laboratory biosafety One national and one international instructor (presence of the international instructor depends on national capacity in the subject) would provide training in instrument handling, and methods and equipment for biosafety	Laboratory personnel who would become biosafety specialists, providing training to other personnel.
Laboratory reporting systems Use of new computerized laboratory reporting system	Future trainers from 1 state laboratory and national laboratories
Training in information systems for state workers • E-mail and the Internet • Network security • New applications	State computer experts who will then train and support other computer personnel at the state and local levels.
Software for surveillance systems • Basic operations and use of the computerized surveillance network • Transfers and protection of databases • Basic maintenance • Data input and output (one-week national training followed by a three-day evaluation six months later)	Data entry clerks and computer software personnel to operate the disease notification software at the national, state and local level
Data for decisionmaking Collection, analysis, and use of data.	Heads of epidemiology, working with state programs and statistics, and public health specialists from national institutes and MoH
Management course • Improvement of management skills at the state level	Directors of epidemiology programs, and state and national laboratories

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Table 7 Training and targeted personnel (continued)

Publication of bulletins or reporting system for surveillance data • Design standards • Presentation of tables and graphics • Report writing	At least one at the state level, and three at the national level
Training to implement NCD and risk factor surveillance • Establish data needs, priorities and management needs for NCD control • Training in data collection, follow-up, and so on • Instrument design (questionnaires, scales, reliability, validity, sampling methods, and so on) • Data format, record keeping, aggregation, and data analysis	Public health professionals
Training for health promotion • Communication skills • Basic training in surveillance and disease control • Basic training in behavior change and priority BRFs.	Epidemiology unit staff TV and radio journalists

Table 8
Common budget lines for public health surveillance

Budget line item	Sub-items
Personnel (salaries or per diem)[8]	• Case or outbreak investigators • Surveillance officers • Data managers or statisticians • Laboratory staff • Trainers • Editors
Workshops or meetings for advocacy or coordination	• Planning workshops • Subnational training or planning workshops • Clinician advocacy • Coordination meetings • Newsletters (surveillance advocacy and project accomplishments)
Equipment (capital costs)	• Specimen carriers • Cold chain • Vehicles, motorbikes, boats, bicycles • Laboratory equipment • Computer equipment • Communications and data transfer equipment
Operations and supplies (recurrent costs)	• Specimen kits • Specimen collection and dispatch • Specimen shippers (for instance cross-border shipment) • Laboratory consumables • Computer maintenance • Communication equipment and maintenance • Creation of standard forms and feedback • Social mobilization and advocacy • Materials and activities • Ad hoc reimbursements for notifications

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Table 8 Common budget lines for public health surveillance (continued)

	• Vehicle maintenance and spare parts • Petrol (gasoline) • Transportation of equipment • Publication and distribution of surveillance guidelines/norms • Epidemiological bulletins
Training	Personnel involved in surveillance at national, state, and local level, and laboratory staff

Source: Adapted from WHO 1999b.

(c) Three cases of bacterial meningitis reported for every case of meningococcal disease recognized and X percent culture confirmed and;

(d) An etiologic agent identified in at least X percent of stool cultures obtained from all persons identified with diarrheal diseases at sentinel sites.

What about project evaluation?

During project implementation the capacity of the system should be assessed again, not only to evaluate project impact but also to create a culture of evaluation. The MoH needs to understand the value of a surveillance assessment and lead the process. Evaluation should involve the main stakeholders, those who will benefit from the surveillance system. The assessment team should be multidisciplinary (such as epidemiologist, laboratory specialist, telecommunications specialist) and consist of national and international expertise. The WHO and CDC can be involved and provide coordinated support (see appendix A.6).

What are the most common problems in surveillance systems?

1. *Surveillance activities are usually centrally controlled by the MoH;* other players have a limited role. The national level makes decisions based on data collected by the local level, yet the local level usually receives no feedback on that data. Communities are not involved in surveillance or disease control.
2. *The surveillance system is fragmented and uncoordinated* across all levels of the system and between epidemiological and laboratory surveillance. Thus duplication of activities, highly variable information, lack of standardization, and inefficient use of resources are common.
3. Surveillance systems are often *overly ambitious and unrealistic*, with too many health conditions under surveillance. They are often geared toward producing large numbers rather than useful information.
4. *Integration with the health-care delivery system* (public and private) is weak or nonexistent.
5. *Laboratory support for surveillance varies greatly between diseases.* Results are often delayed: timely, reliable confirmation of suspected cases to those who will make decisions and take action is rare. Poor conditions of biosecurity are common.
6. *Data management, transmission, and utilization are usually weak*. Much of the data collected are not analyzed or used for action. Minimal analysis and use is generally found at the national level, while at the state and local levels there is nothing but data collection. Usually the data transmission system is rudimentary and introduces inaccuracies, and

there is a lack of methods for easily querying or correcting data.

7. *Training and capacity building is usually a low priority.* This is more evident at the state and local levels. Often clients would rather use resources to upgrade facilities or even build new ones than invest in personnel and training.

Box 8

Lessons learned from Jarbas Barbosa da Silva, Jr., Director of the National Epidemiology Department of Brazil

The decentralization process in epidemiology, surveillance, prevention, and disease control is very different from decentralization of health-care delivery. Faced with a decentralization process in these areas, in a country with the geographic dimension, socioeconomic and epidemiological diversity of Brazil, is a huge challenge.

The VIGISUS project[a] has been an essential tool for enabling the "change of roles within the three levels of the system." At the federal level, a higher response capacity for the most complex problems (for instance emergent diseases) was developed, and strong leadership was established for issues of standardization and coordination, to avoid fragmentation of the system and lack of effectiveness. At state and municipal levels, VIGISUS helped develop capacity to execute the intermediate and basic surveillance and disease control activities, with greater capacity for anticipating problems and increased efficiency in addressing them.

If I were beginning project preparation today, I would:

- Have a more detailed assessment of the surveillance system (preproject) at the state and municipal levels.
- Based on that assessment I would create a more detailed design of the investments for each level of the system.
- I would define, up-front, the content of the training program according to the needs of the state and municipal levels, since there were difficulties in negotiating the content with teaching institutions.
- Emphasize the importance of maintaining a minimum core team of Bank staff and consultants, from preparation to supervision, in order to have a good knowledge base of the country and the project.

[a] Forty percent of the VIGISUS investment on surveillance is executed at state and municipal levels.

8. Worker *motivation* in many places *is low*.
9. Information obtained is *not linked to and utilized for public health action*.
10. The *private sector and the community* are not usually involved in disease surveillance. Most systems rely almost entirely on the public health system as the sole source of information.

What are the main conditions for successful project implementation?

1. *An evaluation of the system performed.* If there are resources and time, you ideally undertake all that is suggested in appendix A.6. If you do not have the time, and usually you do not, follow the assessment described in this part and also see appendix B.1. Get the client involved in the exercise (appendix B.2).
2. *A well defined and agreed-on list of health conditions* to be surveyed, standardization and acceptance of case definitions and surveillance methods.
3. *Sentinel surveillance*. A defined, *stepwise implementation* plan for sentinel sites, with health conditions and sites confirmed.
4. *Revised surveillance guidelines* which should include "what and how," "when, who, and where." Guidelines should be revised by national health surveillance officials, external review should take place and the final product approved by the main policy decisionmakers.
5. *Personnel and training*. Number and profile of staff at national and state levels, as well as a training plan for the corresponding target personnel, reporters, along with its cost.
6. *List of laboratories targeted for improvement* and, if possible, identification of the kind of rehabilitation required. Design upfront, if

possible, the bidding documents for laboratory rehabilitation.

7. *Telecommunication system defined or improvement of the existing one established*. Design upfront, if possible, the bidding documents for data transmission systems.

8. *Clear definition of the roles and responsibilities* of the three levels of the surveillance system. Often, these roles are not well defined and task overlap is common (see appendix B.6).

9. *Local ownership and commitment to the project*. This can be achieved through early involvement of the main stakeholders in project preparation and decisionmaking processes. It is important to actually visit and engage sites outside of the national capital. These activities should also include national professional associations and social sectors other than health, which may also benefit from a good surveillance system (tourism, agriculture, treasury, and so on). Periodical dissemination of information to the press, and involving one or two health-related journalists, might also promote the project. As stated earlier, emphasis should be placed not only on technical aspects but also on the process as part of the strategy for maximizing ownership.

10. *Do as much project design as possible*. A detailed implementation plan that includes the identification of the task, and its objectives, the location, starting date and ended date, the responsible staff or entity for its implementation, the description of the main steps, unit cost and procurement procedures, and the outputs is an important management tool for the client, as well as for the Bank.